Preventive Repression and Authoritarian Regime Dynamics

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Abstract

Authoritarian regimes vary in their durability, violence, and likelihood of democratization. This paper links these differences to heterogeneous incentives for and consequences of repression, analyzed in an infinite horizon game between a government and a societal actor that endogenously mobilizes in response to the government's repression choices. Preventive repression exerts a short-term effect that deters mobilization but a long-term effect that inhibits peaceful bargaining. Personalist regimes repress at high levels because they are most vulnerable to insider removal when society mobilizes, face low-valued outside options under democracy, and have considerable scope for extracting rents—providing incentives for personalist dictators to take strategic actions that *increase* the likelihood of violent revolutionary overthrow. Although military regimes are also vulnerable to insider removal, they often face favorable exit options to democracy, which yields shorter regimes more likely to transition to democracy. Party-based regimes are least vulnerable to insider removals and therefore tolerate societal mobilization, yielding durable and relatively non-violent regimes.

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Authoritarian regimes exhibit consequential differences in their institutional structure and sources of support. Geddes (1999, 2003) and Geddes, Wright and Frantz (2014) distinguish regimes into three types based on the extent to which the dictator personally concentrates power, as opposed to more dispersed decision-making among collegially organized military officers or within institutionalized party organizations.[1] Empirically, the dynamics of personalist, military, and party regimes differ in three important regards. First, party-based authoritarian regimes are least likely to fall, with failure occurring on average in only 2.6% of years, compared to 6.7% in personalist regimes and 13.1% in military regimes among a broad global sample of authoritarian regimes between 1946 and 2008 (Geddes, Wright and Frantz, 2014, 320).[2]

Second, military regimes are most likely to transition to democracy, at 8.1% of years compared to 1.1% for party-based regimes and 2.4% personalist.[3] This trend arises in part because of the general instability of military regimes, but also because conditional on failing, military regimes are most likely to transition to democracy: 62%, and this figure rises to 84% after the Cold War ended. By contrast, only 43% of failed party regimes and 36% of failed personalist regimes transition to democracy (Geddes, Wright and Frantz, 2014, 325).

Third, personalist regimes are most associated with violence. Using the same sample, personalist regimes were 1.9 times as likely as other types of authoritarian regimes to experience major civil wars and—conditional on regime breakdown—3.1 times as likely to be violently overthrown by outsiders than other types of authoritarian regimes.[4] Personalist regimes also repress at elevated levels, whether measured using civil liberties or political terror tactics such as torture and mass killings (Davenport, 2007),[5] an observation illustrated in many case studies on "sultanistic" regimes (Chehabi and Linz, 1998, 41-45). Nor do personalist dictators fare well after regime failure. They are 43% more likely than ex-military dictators and 87%

[1] The discussion following the model analysis defines these authoritarian regime types in more detail.

[2] Geddes, Wright and Frantz (2014) define authoritarian regime failure as changes in the leadership group. Therefore, changes in the leader himself or herself does not constitute regime change if the leadership group remains largely the same, whereas regime transitions can be coded for cases in which democratization does not occur.

[3] Author's calculation using Geddes, Wright and Frantz's (2014) data.

[4] Author's calculation using Geddes, Wright and Frantz's (2014) authoritarian regimes data and Fearon and Laitin's (2003) civil war data.

[5] This sample differs from the main one because Davenport (2007) only includes data from 1976 to 1996.

more likely than ex-party dictators to be exiled, jailed, or killed following the transition (Geddes, Wright and Frantz, 2014, 322).

This paper links these three key differences among authoritarian regimes to heterogeneous incentives for dictators to repress the opposition and to its consequences. The focus is primarily on preventive forms of repression such as denial of civil liberties and surveillance intended to prevent mass mobilization, as opposed to higher-intensity coercion such as firing on protesters or defeating insurgencies that have already formed. The main results arise from two key features of an infinite-horizon game in which an authoritarian government bargains with a representative societal actor that endogenously mobilizes in response to the government's repression choices. First, higher levels of government repression exert countervailing effects on the possibility of regime breakdown. Repression makes societal organization less likely in the short-term by raising the costs of mobilization. However, repression also increases the likelihood of revolutionary attempts in the long term by raising the costs of living in the status quo regime and by emboldening violent revolutionaries relative to would-be democrats. Therefore, although repression can prolong authoritarian regimes, it also increases the likelihood that the regime will end in revolutionary upheaval rather than through a negotiated transition to democracy.

Second, different types of authoritarian face varying incentives to repress. Personalist regimes repress at high levels because they are most vulnerable to insider removal in a period of societal organization, face low-valued outside options under democracy, and have considerable scope for extracting rents. This explains their relative durability juxtaposed with high violence, high rates of post-tenure leadership punishment, and infrequent democratization. Intriguingly, personalist dictators' political and economic incentives encourage them to take actions that *increase* the likelihood of violent revolutionary overthrow. Although military regimes are also vulnerable to insider removal, they often face favorable exit options to democracy, which yields shorter regimes more likely to transition to democracy. Finally, party-based regimes are the least vulnerable to insider removals and therefore tolerate societal mobilization, yielding durable and relatively non-violent regimes.

The theoretical findings presented here generate three main contributions elaborated upon in the next section. First, a broad literature examines differences in authoritarian institutions (Gandhi, 2008; Svolik, 2012), and the present findings highlight a new logic of authoritarian survival and rent-seeking to explain variance in survival, violence, and democratization across authoritarian regimes. Unlike earlier theoretical explana-

tions for these outcomes, the model explains empirical differences using a unified framework focused on incentives for and consequences of preventive repression. Second, this paper addresses important puzzles about dictators' strategic usage of repression that studies of repression have yet to convincingly address. Why would higher costs of mobilization make revolutions more likely? Why would a ruler ever use preventive repression if this strategy increases the likelihood of a violent revolution? Third, the model contributes to a broad formal literature on authoritarian regimes and regime transitions (Acemoglu and Robinson, 2006; Gehlbach, Sonin and Svolik, 2016; Tyson, 2017) and bargaining models of conflict (Fearon, 2004; Powell, 2004; Krainin, 2017), by examining a dynamic strategic environment with endogenous mobilization that enables studying strategic repression and its effects on bargaining failure.[6]

1 Contributions to Existing Research

1.1 Authoritarian Institutions Literature

The motivating empirical pattern for this paper arises from a vast literature that examines differences in authoritarian institutions (Gandhi, 2008; Svolik, 2012). The key contribution here is to present a unified theoretical framework—based on incentives for and consequences of repression—for understanding dynamics of various authoritarian regime types. Building off earlier scholarship on authoritarian regimes, Geddes (1999) sought to explain why military, party-based, and personalist authoritarian regimes exhibit varied paths to democratization. Although her argument is based on several important premises incorporated into the present analysis—such as military generals being able to command political influence even after democratization, which increases their willingness to concede democracy—she categorizes different regime types into distinct 2×2 games and assumes dictators in different types of regimes seek divergent political goals. This makes it difficult to understand why dictators might vary in their usage of a common policy tool such as repression and why this creates heterogeneous consequences for authoritarian dynamics.

Subsequent work by Barbara Geddes and co-authors has examined other important differences across authoritarian regimes that affect durability, violence, and democratization, albeit without highlighting a similar

[6]For models that specifically study repression, see Pierskalla (2010); Dragu and Polborn (2013); Ritter (2014); Gibilisco (2017); Shadmehr and Boleslavsky (2017); Slantchev and Matush (2017).

unified framework based on repression analyzed here. Geddes, Wright and Frantz (2014, 321) discuss how the lack of institutions such as a professionalized military or well-developed party lead personalist leaders to be prosecuted at high rates after losing office, even after democratization occurs. Wright and Escribà-Folch (2012) discuss the role of institutions such as parties in sustaining authoritarian regimes (see also Geddes (2008)), and in facilitating transitions to democracy. Institutionalized parties are often competitive in democratic elections and protect the military's corporate interests (Wright and Escribà-Folch, 2012, 284), which Frantz and Kendall-Taylor (2017) show is also true for personalist dictators that create parties. Regarding the relationship between authoritarian institutions and repression, Frantz and Kendall-Taylor (2014) and Escribà-Folch and Wright (2015) discuss how institutions affect information and agency problems involved with repression. This shares the key focus of many formal models reviewed below, but differs from the present focus on dynamics of preventive repression.

Key assumptions linking aspects of the model to different types of authoritarian regimes also draw from the broader authoritarian institutions literature. Many scholars have analyzed how party institutions can effectively solve commitment problems among regime insiders and among the masses to facilitate regime stability (Brownlee, 2007; Gandhi, 2008; Magaloni, 2008; Svolik, 2012; Meng, 2017). Debs (2016) argues that military dictators are more likely to transition to democracy than are other types of authoritarian rulers. Military rulers fear punishment by future autocrats because generals' comparative advantage in violence makes them a threat to retake power. By contrast, democracies place greater constraints on punishing ex-rulers, and ex-military rulers are less threatening when power is obtained via elections. Bratton and van de Walle (1997) and Chehabi and Linz (1998) categorize sultanistic/personalist regimes and describe challenges created by a lack of institutional constraints. Broadly, the present theory shares some aims as Bueno de Mesquita et al.'s (2003) selectorate theory with regard to developing a unified institutional logic of authoritarian regimes, although the setup and key findings are quite distinct. Selectorate theory does not feature strategic repression or endogenous societal mobilization in a repeated game, and rulers never lose power in equilibrium nor is there an option to change institutions (as with democratization in the present model).

1.2 Repression Literature

Existing research on repression has generated an intriguing "repression-dissent" paradox whereby government repression often spurs societal mobilization and escalates conflict, rather than dampens mobilization prospects (Lichbach, 1987; Moore, 2000), although the empirical evidence for this pattern is mixed (Escribà-Folch, 2013, 545).[7] Similarly, scrutinizing government strategy is also important for state-centric studies that show repression has fueled many social revolutions. Exclusionary authoritarian regimes often leave "no other way out" than violence for societal actors (Skocpol, 1979; Goodwin and Skocpol, 1989; Goodwin, 2001), as in Russia, China, Cuba, and Nicaragua. However, these accounts do not answer key strategic questions. Why would *raising* the costs of mobilization encourage individuals to protest? If a strategic government fears escalation in response to repression, then why would it repress in the first place—as opposed to accommodating citizens' demands in order to prevent overthrow? Although some of these studies "place the state at the center of analysis of revolutions" (Goodwin, 2001, 24), they treat governments' actions as fixed rather than evaluate governments' strategic incentives for repression.

The present framework shows why a forward-looking and strategic government may choose repressive strategies either to prevent overthrow by insiders or to gain rents in the short-term, even though these actions raise the probability of revolution in the long-term. Repression does deter mobilization (short-term effect), but—conditional on citizens mobilizing—makes revolution more likely (long-term effect). This result provides one strategic rationale for the repression-dissent paradox and for state-centric approaches to revolutions.

This paper also differs in focus from other game theoretical analyses of repression and dissent. Existing work evaluates one-shot interactions between a government and protesters, and most focus only on *reactionary* repression—that is, reacting to societal challenges that have already formed (Pierskalla, 2010; Ritter, 2014; Shadmehr, 2015; Shadmehr and Boleslavsky, 2017; Slantchev and Matush, 2017). These articles and working papers provide critical contributions to a literature that previously had not explicitly analyzed strategic interactions between governments and protesters. This paper provides new insights by modeling these interactions in a dynamic framework that uncovers distinct short-term and long-term effects of *preventive*

[7] Ritter and Conrad (2016) describe the selection effect challenges inherent to estimating this relationship and propose a plausible source of exogenous variation in dissent.

repression and links these effects to divergent trajectories among authoritarian regime types.

Nor do other formal analyses of repression in a dynamic setting generate the same mechanism as the present analysis: governments balance between a short-term gain from repression by deterring mobilization and a long-term cost by making revolution more likely when society does mobilize. In Acemoglu and Robinson's (2006) models of regime transitions, the masses mobilize due to exogenous factors—as opposed to strategically reacting to government repression. Furthermore, whenever applied, repression is assumed to succeed with probability 1, and therefore a long-term repressive strategy does not cause revolution. Gibilisco (2017) evaluates a different setup in which repression in one period is assumed to increase societal grievances in the next period. However, once again, there is no strategic mobilization choice by the masses, and repression—if applied in a particular period—is assumed to prevent revolution with probability 1 in that period.

Acemoglu and Robinson (2006, 215-218) also briefly present an extension in which repression fails with positive probability, in which case a revolution is assumed to occur. However, they do not evaluate the strategic actions that might underlie this relationship, as mobilization is exogenous and there is no possibility of bargaining or of negotiating democratization following failed repression. In the present setup, repression fails in any period that society chooses to pay the costs of mobilization, but revolution is only one possible outcome—peaceful authoritarian bargaining or democratization are also possibilities following failed repression. More broadly, although insightful for explaining other empirical patterns, Acemoglu and Robinson's (2006) setup does not enable linking repression strategies to dynamics of different authoritarian regime types.

1.3 Broader Formal Literature on Political Regimes and Conflict

Considerable formal work has studied the survival of and transitions between political regimes. Most formal theoretic research on militaries and repression in authoritarian regimes focuses on agency problems related to preventing overthrow by armed subordinates, i.e., guarding the guards (Besley and Robinson, 2010; Acemoglu, Ticchi and Vindigni, 2010; Acemoglu, Vindigni and Ticchi, 2010; Svolik, 2013; Casper and Tyson, 2014; McMahon and Slantchev, 2015; Zakharov, 2016), and to inducing coercive agents to exert costly effort protect the regime against threats (Myerson, 2008; Dragu and Polborn, 2013; Tyson, 2017).[8] The

[8] Gehlbach, Sonin and Svolik (2016) have recently summarized this vast literature.

current setup assumes away agency considerations to isolate the key novel mechanisms regarding the divergent short-term and long-term effects of preventive repression and divergent incentives across authoritarian regime types to use repression. However, relaxing the assumption of perfect military control could act as a conditioning factor by either decreasing or increasing incentives to use repression. On the one hand, standard guardianship logic stresses that creating militaries used for repression or other activities can be used to overthrow the regime, which should deter repression-based strategies. On the other hand, (McMahon and Slantchev, 2015) argue that threats external to the regime—such as mass mobilization—can induce military loyalty and therefore provide stronger incentives for repression.

This paper also contributes to bargaining models of conflict. Similar to many existing models, this model features a commitment problem-based explanation for costly fighting (Fearon, 2004; Powell, 2004; Krainin, 2017). As in Acemoglu and Robinson (2006), there are choices regarding repression, bargaining under authoritarianism, and democratization. The novel elements in the present model are that the challenger mobilizes endogenously and the government's repressive strategy affect the challenger's equilibrium mobilization frequency. This generates the key mechanism that maximizing rents may compensate the government for the cost of fighting. By contrast, most complete information conflict bargaining models with limited commitment ability assume that exogenous shocks enable challengers to mobilize, and therefore are unable to analyze how strategic actions by the government affect the frequency of mobilization (see Powell (2013, 811-813)). Powell (2013) evaluates an endogenous shifting model in which a government's offer to a rebel groups also contains a proposal to shift power in the future. Although the government can always offer small enough power shifts to prevent fighting from occurring, if there are "contingent spoils" from eliminating the rebels, then the government may optimally choose to shift power more rapidly even if this triggers fighting. The present model offers an alternative way to model endogenous shifts in power to highlight the strategic implications of endogenous mobilization frequency.

2 Theory

2.1 Setup

An authoritarian government (G) and societal group (S) interact over an infinite time horizon in a game of complete and perfect information. Future payoffs are discounted by a common factor $\delta \in (0, 1)$ and time is denoted by $t \in \mathbb{Z}_+$. There are two main phases in every period of the game in which the authoritarian regime is in power.

Repression and mobilization. G chooses a repression spending amount $r_t \in [0, 1 - \phi_a]$. Spending is constrained by the per-period budget constraint normalized to 1, minus a guaranteed transfer to S in every period, $\phi_a \in (0, 1)$. This parameter 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.

The literature generally categorizes repression into restrictions on civil liberties (i.e., U.S. First Amendment-type rights) aimed at the broad population and physical repression targeted at individuals, ranging from political arrests to mass killings (Davenport, 2004; 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." Repression in the present model is more closely related to the low-intensity type because the only role of repression is to raise the costs of mobilizing for S. In addition to broad denial of civil liberties, this 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. Related 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. In the present model, it would also be possible to have multiple or a continuum of societal members that need to coordinate in order to mobilize, but that would not alter the main focus on how repression affects the likelihood of bargaining breakdown. Even with the unitary societal

actor, it will not mobilize in every period.

There are three components to S's cost of mobilization. First, a fixed cost $F \in (0, \hat{F})$.[9] Second, a cost determined by G's repression spending. This equals $c(r_t)$, where $c(\cdot)$ is continuous, strictly increasing, and strictly concave.[10] Third, after G chooses repression spending, Nature draws a stochastic element for the mobilization cost, ϵ_t, which 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.[11] Therefore, even if G chooses the same level of repression spending in every period, S's costs 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. In sum, S's cost to mobilizing in period t is $C_t \equiv F + c(r_t) + \epsilon_t$.

After perfectly observing the cost of mobilization, S decides whether or not to mobilize to demand concessions from G. If S does not mobilize, then the period ends and G consumes $1 - \phi_a - r_t$ and S consumes ϕ_a. An identical interaction occurs in period $t+1$, with respective future continuation values denoted as V_k^G and V_k^S. The subscript for the continuation values depend on the phase of the game and will be introduced below.

Bargaining. If S mobilizes, then the government either makes a transfer offer $x_t \in [0, 1 - \phi_a - r_t]$ or offers to democratize. S observes G's offer and decides whether to accept or to launch a revolution. Accepting a transfer offer yields consumption of $1 - \phi_a - r_t - x_t$ for G and $\phi_a + x_t - C_t$ for S in period t. If G and S achieve a peaceful bargain without democratization, then the final move of the period is a Nature move. With probability $q \in (0, 1)$, G loses power. This is conceived of as insider overthrow facilitated by the turmoil of mass mobilization. A social movement may directly facilitate the coup attempt, as with Egypt in 2011 when protesters demanded that the military depose Hosni Mubarak. In other cases, coup

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

[10] There are several additional technical restrictions: $c(0) = 0$; $\lim_{r_t \to 0} c'(r_t) = \infty$; and $\left|c''(r_t)\right| > \underline{c}''$, for $\underline{c}''$ defined in the proof of Lemma A.3.

[11] The associated probability density function is $h(\epsilon_t)$.

opportunities caused by mass mobilization can be distinct from protesters' demands. For example, in Sudan during its two major civil wars against the South, disagreements over how to best prosecute the war often provided excuses for military takeover or for shuffling within the junta (Tartter, 1992, 234-237). Finer (2002, 72-79) argues that civil wars and broader conditions of social unrest create opportunities for military intervention because of increased civilian dependence on the military to stay in power, and Powell (2012) provides statistical evidence that coups are more likely to be attempted and to succeed under conditions of domestic instability.

If G retains power following a peaceful bargain under authoritarian rule, then the continuation values are identical to the case in which S does not mobilize, V_k^G for G and V_k^S for S. If an insider overthrows G, then G consumes 0 in all future periods. A new, identical dictator is drawn, and therefore S's future continuation value is still V_k^S. If G proposes to democratize and S accepts, then the game reaches an absorbing state with payoffs described in the analysis.

If instead S launches a revolution in period t, then the only consumption comes from the transfer ϕ_a already delivered to S and the costs each side has already sunk—repression spending for G and cost of mobilizing for S. S wins the revolution with probability $p \in (q, 1)$ and loses with complementary probability.[12] If S wins, then its continuation value equals $V_r^S = \frac{\phi_r}{1-\delta}$, for $\phi_r \in (\phi_a, 1)$. G consumes 0 in all future periods. Therefore, the total surplus following a revolution is strictly lower than under the authoritarian regime, expressing the long-term costs of revolution. If S loses, then the game continues under the authoritarian regime with the same continuation values V_k^G and V_k^S.

The empirical events that correspond most closely to this conceptualization of revolution are the major social revolutions described by Skocpol (1979) and Goodwin (2001). 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 zero consumption following a successful revolution. However, interpreting the payoffs in relative terms 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

[12] Assuming $p > q$ avoids the strategically uninteresting case in which pursuing high repression and causing revolutions strictly improves political survival prospects.

fates for leaders as well. Any irregular leadership removal triggered by societal protests can usefully be conceived as a revolution in the model.

Timing of events. In sum, the timing of events within a period in which the status quo authoritarian regime remains in power is:

1. G sets repression spending, followed by a Nature move that determines S's cost of mobilization.
2. S decides whether or not to mobilize. If S mobilizes:
   (a) G proposes a transfer offer, or offers to democratize.
   (b) S accepts G's offer or launches a revolution.
   (c) Nature decides whether G remains in power in the next period.
3. Consumption occurs.

2.2 Equilibrium Concept

The analysis assesses the conditions under which the following strategy profile composes a subgame perfect Nash equilibrium (SPNE) of the game. If G has not previously deviated from the strategy profile, then it chooses the same low repressive spending amount in every period. S mobilizes in a period if the overall costs of mobilizing are sufficiently low in that period, and does not mobilize otherwise. If S mobilizes, then G either offers a transfer amount or proposes to democratize,[13] and S will accept the equilibrium offer. If G instead ever deviates to a higher repression level, then the players enter a punishment phase that entails high repression and revolution. Specifically, G represses at a high level in every period, S mobilizes according to a different threshold, and—in a period that S mobilizes—it launches a revolution in response to any proposal by G. If a revolution fails during the punishment phase, then the players return to the low repression phase.

[13] Generically, G will strictly prefer either to bargain under authoritarianism or to democratize, and the "either" part of the statement expresses that either of these actions can compose part of the strategy profile.

3 Analysis

3.1 Short-Term and Long-Term Repression Effects

The analysis begins by deriving two key effects of repression. The short-term effect makes societal mobilization less likely in a particular period by raising the costs of 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 short-term effect increases the amount that the government must offer in a period that society does mobilize—decreasing the likelihood of successful peaceful bargaining. The following posits that an equilibrium exists in which neither revolution nor democratization occurs along the equilibrium path, and analyzes society's optimal choices for a fixed amount of repression spending, $r_t = r$.

Bargaining phase. If S has mobilized, then it accepts any 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 potentially gain control of the government starting in the next period.

$$\underbrace{\phi_a - C_t + x_t + \delta \cdot V_l^S(r)}_{E[U_S(\text{accept})]} \geq \underbrace{\phi_a - C_t + \delta \cdot \Big[p \cdot V_r^S + (1-p) \cdot V_l^S(r)\Big]}_{E[U_S(\text{revolt})]} \tag{1}$$

Society's future continuation value for fixed repression spending, $V_l^S(r)$, equals the weighted sum of consumption in periods that S does mobilize and does not mobilize. The equilibrium frequency of mobilization periods is denoted as $H_l(r)$, which will be endogenized below. In an average mobilization period, in addition to the guaranteed transfer ϕ_a, S consumes the equilibrium transfer $x^*(r)$ minus the average cost of mobilizing, $\overline{C}_l(r)$, which will also be endogenized below. In either case, S remains the societal actor in the next period. This can be recursively characterized as:

$$V_l^S(r) = \phi_a + H_l(r) \cdot \big[x^*(r) - \overline{C}_l(r)\big] + \delta \cdot V_l^S(r) \tag{2}$$

Combining Equations 1 and 2, and substituting in the continuation value $V_r^S = \frac{\phi_r}{1-\delta}$ that follows from revolution being an absorbing state, yields the unique transfer (as a function of r) that satisfies Equation 1

with equality. This composes the equilibrium patronage offer in periods that S mobilizes in the peaceful phase because it cannot be optimal for G to offer an amount that S strictly prefers to accept.[14]

$$x^*(r) = \frac{\delta \cdot p \cdot \left[\phi_r + H_l(r) \cdot \overline{C}_l(r) - \phi_a\right]}{1 - \delta \cdot \left[1 - p \cdot H_l(r)\right]} \tag{3}$$

Mobilization decision. S mobilizes in any period t if and only if it will receive concessions at least as large as the costs of mobilization. The optimal mobilization strategy follows a cut-point rule in which S mobilizes if the costs are sufficiently low, and does not mobilize if the costs are high. The posited strategy profile requires G to choose the same repression spending amount in every period. This implies that S mobilizes if the stochastic component of the organization cost is low, and therefore the mobilization threshold is defined in terms of ϵ_t. Substituting in the term for $x^*(r)$ from Equation 3 enables implicitly defining the mobilization threshold.

Lemma 1 (Mobilization threshold)**.** *For every constant repression spending amount $r_t = r$ that yields peaceful bargaining in mobilization periods, a mobilization threshold $\underline{\epsilon}_l^*(r) \in (-F, F)$ exists, is unique, and is implicitly defined as:*

$$\Theta_l\left(\underline{\epsilon}_l^*(r)\right) \equiv \underbrace{\frac{\delta \cdot p \cdot \left[\phi_r + H\left(\underline{\epsilon}_l^*(r)\right) \cdot \overline{C}(r) - \phi_a\right]}{1 - \delta \cdot \left[1 - p \cdot H\left(\underline{\epsilon}_l^*(r)\right)\right]}}_{x^*(r)} - \left[F + c(r) + \underline{\epsilon}_l^*(r)\right] = 0,$$

for:

$$H_l(r) \equiv H\left(\underline{\epsilon}_l^*(r)\right) = \int_{-F}^{\underline{\epsilon}_l^*(r)} dH(\epsilon_t)$$

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

Analyzing the mobilization threshold yields the first key effect of repression spending. Lemma 2 shows that higher r strictly decreases the mobilization threshold, i.e., the set of ϵ_t values small enough such that S will optimally choose to mobilize. This occurs because repression spending raises the cost of mobilizing.

Lemma 2 (Short-term repression effect)**.** *S's equilibrium mobilization frequency strictly decreases in G's repression spending. Formally, $\frac{d\underline{\epsilon}_l^*}{dr} < 0$.*

Repression and revolution. Can G buy off a social revolt in a period that S mobilizes? This is possible if

[14] Assuming $\phi_r > \phi_a$ implies that $x^*(r) > 0$ for all r.

and only if G can afford the allocation given the per-period budget constraint:

$$B^*(r) \equiv 1 - \phi_a - r - x^*(r) \geq 0 \tag{4}$$

The second key effect of repression spending is to make Equation 4 harder to satisfy for two reasons, which Lemma 3 shows. First is the direct cost: higher r leaves fewer resources to devote to transfers. Second, higher r increases the amount of transfers necessary to prevent S from revolting. Lemma 2 shows that higher repression causes S to pay higher average costs in periods that it mobilizes. By decreasing S's expected consumption under the status quo authoritarian regime, this effect raises S's transfer demand in a period that it mobilizes. A threshold level of repression spending $\hat{r}$ determines whether or not revolution will occur in equilibrium.

> **Lemma 3** (Long-term repression effect)**.** *Revolutions occur along the equilibrium path if and only if repressive spending is high. Formally, for B^* defined in Equation 4, there exists a unique threshold $\hat{r} > 0$ such that:*
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> - *If $r < \hat{r}$ in every period, then $B^* > 0$.*
> - *If $r = \hat{r}$ in every period, then $B^* = 0$.*
> - *If $r > \hat{r}$ in every period, then $B^* < 0$.*

3.2 Why Repress?

If the government sought solely to prevent revolution, then characterizing its optimal strategy would be straightforward. Lemma 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 2)—benefits rulers through two effects. 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 highly repressive strategy—even though this action causes revolution to occur eventually. The following evaluates the full game with the exception of the democratization option.

Equation 5 recursively characterizes G's lifetime expected consumption, V_l^G, if it chooses the optimal low

repression spending amount r_l^*—which, given Lemma 3, implies repression spending no greater than the threshold that triggers revolution in a mobilization period, $\hat{r}$.[15] This choice 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 transfers the minimal amount ϕ_a and remains as government in the next period with probability 1. In periods with societal mobilization, G additionally pays the transfer x^* and—following successful bargaining—loses power to an insider after the period ends with exogenous probability q.

$$V_l^G = 1 - \phi_a - r_l^* + \underbrace{\left[1 - H\left(\underline{\epsilon}_l^*\right)\right] \cdot \delta \cdot V_l^G}_{\text{Non-mobilization period}} + \underbrace{H\left(\underline{\epsilon}_l^*\right) \cdot \left[-x^* + (1-q) \cdot \delta \cdot V_l^G\right]}_{\text{Mobilization period}} \tag{5}$$

Equation 6 recursively characterizes G's lifetime expected consumption, V_h^G, if it deviates to the optimal high repression spending amount r_h^*—which, given Lemma 3, implies repression spending higher than $\hat{r}$.[16] Therefore, a revolution attempt will occur in the first period with societal mobilization. Periods without societal mobilization are identical to those in Equation 5 except for differences in repression spending. In social mobilization periods, a revolution occurs and therefore G pays the cost of repression spending without additional consumption. With probability p, the revolution succeeds and G loses power forever. By contrast, with probability $1-p$, the revolution fails and G remains in power, in which case G reverts to a low-repression strategy.

$$V_h^G = -r_h^* + \underbrace{\left[1 - H\left(\underline{\epsilon}_h^*\right)\right] \cdot \left[1 - \phi_a + \delta \cdot V_h^G\right]}_{\text{Non-mobilization period}} + \underbrace{H\left(\underline{\epsilon}_h^*\right) \cdot (1-p) \cdot \delta \cdot V_l^G}_{\text{Mobilization period}} \tag{6}$$

Combining Equations 5 and 6 shows that G cannot profitably deviate from the low-repression strategy if and only if:

$$\Omega_{l,h} \equiv \underbrace{\frac{1 - \phi_a - r_l^* - H(\underline{\epsilon}_l^*) \cdot x^*}{1 - \delta \cdot \left[1 - q \cdot H(\underline{\epsilon}_l^*)\right]}}_{\text{Low repression}} - \underbrace{\frac{\left[1 - H(\underline{\epsilon}_h^*)\right] \cdot (1 - \phi_a) - r_h^*}{1 - \delta \cdot \left[1 - p \cdot H(\underline{\epsilon}_h^*)\right]}}_{\text{High repression}} \geq 0 \tag{7}$$

[15] Lemma A.3 formally characterizes $r_l^* \in [0, \hat{r}]$, which also yields the corresponding mobilization threshold $\underline{\epsilon}_l^* \equiv \underline{\epsilon}_l^*(r_l^*)$, for $\underline{\epsilon}_l^*(r_l)$ defined in Lemma 1.

[16] Lemma A.3 formally characterizes $r_h^* \in (\hat{r}, 1 - \phi_a]$ and demonstrates existence despite the absence of a closed constraint set. This also yields the corresponding mobilization threshold $\underline{\epsilon}_h^* \equiv \underline{\epsilon}_h^*(r_h^*)$, for $\underline{\epsilon}_h^*(r_h)$ defined in Lemma A.1.

The direct cost of high repression is that G spends more on the military and related coercive organizations in every period. However, high repression causes S's mobilization frequency to decrease from $H(\underline{\epsilon}_l^*)$ percent of periods to $H(\underline{\epsilon}_h^*)$, which Lemma A.4 establishes.[17] Deterring mobilization generates two possible benefits for G. First, it is possible that high repression causes G to retain power for longer. On the one hand, there is a *political survival* effect whereby repression increases the expected time until there will be an attempt to depose G from power, which only occurs in a mobilization period. Under low repression, the survival threat is an (exogenous) insider coup whereas under high repression the threat is an (endogenous) revolution, and either can only occur in a mobilization period. On the other hand, G's *overall* expected length in power depends not only on the frequency of mobilization but also on the probability of losing either type of struggle. The per-period failure in a low repression regime is $H(\underline{\epsilon}_l^*) \cdot q$, and is $H(\underline{\epsilon}_h^*) \cdot p$ in a high repression regime. If the ratio of mobilization frequencies under low relative to high repression is small relative to the ratio of preventing a coup versus surviving a revolution, then more repressive regimes survive longer on average. There exists a unique threshold $\tilde{q} \in \mathbb{R}$ such that low repression is optimal if $q < \tilde{q}$ and high repression is optimal if $q > \tilde{q}$.[18] It is implicitly defined as:

$$\Omega_{l,h}(\tilde{q}) = 0, \tag{8}$$

for $\Omega_{l,h}(\cdot)$ defined in Equation 7. If q is high, then using repression to prevent mobilization increases prospects for regime survival.

Second, high repression generates a *predation effect* for G because it does not have to offer transfers above ϕ_a in periods that S does not mobilize. The predation effect implies that G may repress at high levels even if this *decreases* its expected time in power. If ϕ_a is low, then G enjoys considerable rents in periods that S does not mobilize, which creates incentives to repress even under parameter values in which minimally repressive regimes are expected to survive longer than highly repressive regimes. G cares about total lifetime expected consumption rather than directly about political survival. Therefore, G may trade off between durability and rents, contrary to the standard assumption that "The basic expected benefit of repression is to increase the likelihood of staying in power" (Escribà-Folch, 2013, 546). Lemma 4 summarizes these two incentives for repression.

[17] The intuition for this result resembles that for Lemma 2.

[18] This claim follows directly from Lemma 4, part a.

Lemma 4 (Incentives to repress: political survival and predation)**.**

Part a. *Higher probability of insider removal in mobilization periods strictly increases G's incentives to deviate to high repression. Formally, $\frac{d\Omega_{l,h}}{dq} < 0$, for $\Omega_{l,h}(\cdot)$ defined in Equation 7.*

Part b. *The predation effect strictly increases G's incentives to deviate to high repression. Formally, $-\frac{d\Omega_{l,h}}{d\phi_a} < 0$.*

3.3 Democratization to the Rescue?

The final strategic option for the government is to offer a negotiated transition to democracy if the masses mobilize. However, the aims of mass organizations are themselves endogenous to government repression. Correspondingly, highly repressive regimes tend not to be able to peacefully negotiate a transition to democracy in the face of mass mobilization because repression marginalizes the would-be democratic moderates in society. This leads to revolution in a period that society mobilizes. However, there exist equilibrium parameter values in which a dictator that would otherwise choose high repression—because of the political survival or predation effects described in Lemma 4—may instead repress at low levels and then democratize in a mobilization period.

A key assumption is that the democratization option is only assumed to be possible if repression occurs at low enough levels. Substantively, repression tends to embolden extreme members of society and deter moderates (Della Porta, 2013, 67).[19] Although many models of democratic transitions assume that mass movements necessarily seek democratic concessions (Boix, 2003; Acemoglu and Robinson, 2006), this is often not true. Throughout the 20th century, communist revolutionaries, warlords, and 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 imple-

[19] Shadmehr (2015) formalizes this idea by showing that an increase in the minimum punishment that individuals pay to join a movement endogenously creates more extreme demands by the group.

ment 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.

Formally, after S's mobilization decision in any period, G can choose whether or not to grant democracy. If G grants democracy and S accepts, then the strategic aspect of the interaction ends. G consumes $1-\phi_d$ in the period of democratization and in every subsequent period, and S consumes $D(r_t) \cdot \phi_d$, for $\phi_d \in (\phi_r, 1]$. The function $D(r_t)$ captures the relationship between repression and the political strength of would-be democrats in society. To simplify notation and to avoid studying strategically redundant cases, the analysis assumes $D(r_t) = 0$ if G has chosen repression spending exceeding $\hat{r}$ since the last revolution (or since the beginning of the game), and otherwise equals 1. This implies that if G has repressed at low enough levels to facilitate peaceful bargaining in a period that society organizes (see Lemma 3), then it is assumed that moderates dominate the societal organization and value democracy at ϕ_d. Importantly, assuming $\phi_d > \phi_r$ is sufficient for societal moderates to prefer democratization to revolution, implying that modeling the possibility of democratization is strategically relevant. By contrast, if G has repressed at high enough levels to undermine prospects for peaceful bargaining in a mobilization period, then it is assumed that extremists who place no value on democracy dominate the social movement. Therefore, the high repression strategy undermines the possibility of substituting democratization for revolution in a societal mobilization period.

Equation 9 recursively characterizes G's expected payoff in a strategy profile with low repression and democratization in every mobilization period. The continuation value V_d^G characterizes the dictator's payoff under authoritarian rule along this path that eventually leads to democratization, and G receives $1 - \phi_d$ in every period including and following the democratization period. Repressive spending r_d^* and the corresponding mobilization threshold $\underline{\epsilon}_d^*$ differ from the original low repression case because G's payoff differs

following a mobilization period, but repression spending is subject to the same constraint $r_d^* \leq \hat{r}$.[20]

$$V_d^G = \underbrace{\left[1 - H\left(\underline{\epsilon}_d^*\right)\right] \cdot \left[1 - \phi_a - r_d^* + \delta \cdot V_d^G\right]}_{\text{Non-mobilization period}} + \underbrace{H\left(\underline{\epsilon}_d^*\right) \cdot \frac{1 - \phi_d}{1 - \delta}}_{\text{Mobilization period}} \tag{9}$$

Two thresholds determine whether or not democratization will occur in equilibrium. First, the probability of a successful insider coup in a societal mobilization period must be sufficiently high for G to prefer to democratize rather than to bargain under authoritarian rule. In neither case will a revolution occur, but if q is high, then G prefers to grant democracy in response to imperiled authoritarian rule. Equation 10 compares low repression with and without democratization, and Equation 11 defines the q threshold.

$$\Omega_{d,l} \equiv \underbrace{\frac{\left[1 - H(\underline{\epsilon}_d^*)\right] \cdot (1 - \phi_a) - r_d^*}{1 - \delta \cdot \left[1 - H(\underline{\epsilon}_d^*)\right]} + H(\underline{\epsilon}_d^*) \cdot \frac{1 - \phi_d}{1 - \delta}}_{\text{Low repression w/ democratization}} - \underbrace{\frac{1 - \phi_a - r_l^* - H(\underline{\epsilon}_l^*) \cdot x^*}{1 - \delta \cdot \left[1 - q \cdot H(\underline{\epsilon}_l^*)\right]}}_{\text{Low repression w/o democratization}} \tag{10}$$

$$\Omega_{d,l}\left(\hat{q}\right) = 0 \tag{11}$$

Democratization is not the only possible response to the insider coup threat. The second necessary threshold for democratization is that $1 - \phi_d$ must be sufficiently high relative to $1 - \phi_a$ for G to choose a low repression path with eventual democratization over high repression. The logic of the predation effect in Lemma 4 implies that if ϕ_a is low relative to ϕ_d, then G loses considerable rents by transitioning to democracy. Alternatively, a favorable democratic exit option could prevent dictators that would otherwise be inclined to pursue high repression—i.e., if $\Omega_{l,h} < 0$ (see Equation 7)—to grant democracy as an alternative to their internal instability problem. Equation 12 compares low repression with democratization to high repression, and Equation 13 defines the $1 - \phi_d$ threshold.

$$\Omega_{d,h} \equiv \underbrace{\frac{\left[1 - H(\underline{\epsilon}_d^*)\right] \cdot (1 - \phi_a) - r_d^*}{1 - \delta \cdot \left[1 - H(\underline{\epsilon}_d^*)\right]} + H(\underline{\epsilon}_d^*) \cdot \frac{1 - \phi_d}{1 - \delta}}_{\text{Low repression w/ democratization}} - \underbrace{\frac{\left[1 - H(\underline{\epsilon}_h^*)\right] \cdot (1 - \phi_a) - r_h^*}{1 - \delta \cdot \left[1 - p \cdot H(\underline{\epsilon}_h^*)\right]}}_{\text{High repression}} \tag{12}$$

$$\Omega_{d,h}\left(1 - \tilde{\phi}_d\right) = 0, \tag{13}$$

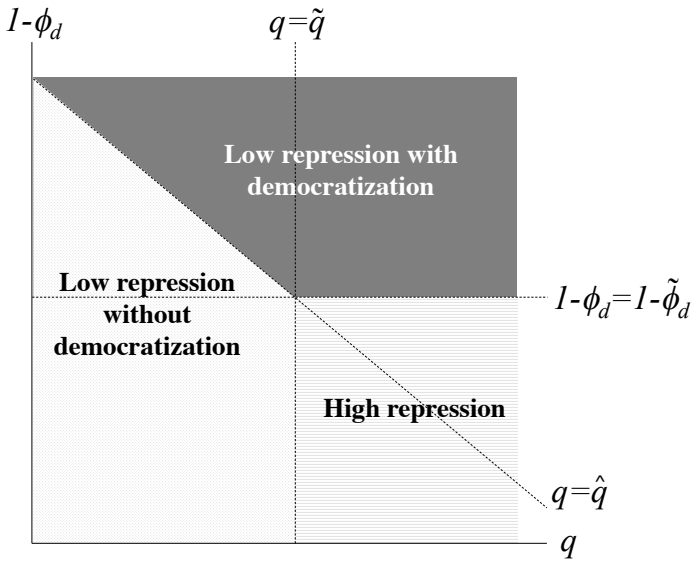
[20] Their existence and uniqueness follow from the same logic used to characterize r_l^* and $\underline{\epsilon}_l^*$. This logic also enables characterizing a unique optimal offer x_d^* to which S responds off the equilibrium path if G otherwise pursues the optimal actions in a democratization path of play.

3.4 Equilibrium Regime Trajectories

Overall, the model generates three distinct regime trajectories. First, the dictator represses at low levels and bargains with society under continued authoritarian rule in mobilization periods. Second, the regime represses at low levels and democratizes in mobilization periods. Third, the dictator represses at high levels and faces revolutionary attempts in mobilization periods.[21] Figure 1 summarizes these trajectories as a function of parameters. Persistent authoritarian rule with low repression requires the likelihood of a coup in a mobilization period to be low enough that G does not choose to democratize—in which case G loses power, but consumes $1 - \phi_d$ in future periods rather than 0—or deviates to high repression to push the first mobilization period further into the future. Even with low q, high repression can still be optimal if G enjoys high rents in periods that S does not mobilize, $1-\phi_a$. For high levels of q, whether G prefers high repression or democratization depends on its payoff under democracy, $1 - \phi_d$, relative to the rents it accrues while in power. Proposition 1 states an equilibrium of the game, and Proposition 2 states the equilibrium outcomes for regime durability, violence, and democratization.

[21] More precisely, under the conditions in which G can profitably deviate to high repression, there does not exist an equilibrium with the strategy profile presented in Proposition 1.

Figure 1: Optimal Repression and Democratization Strategies



Notes: Figure 1 plots G's optimal choice—low repression without democratization, low repression with democratization, high repression—as a function of q and $1-\phi_d$. Equation 7 defines $\tilde{q}$, which determines whether or not G prefers low repression without democratization to high repression. Equation 11 defines $\hat{q}$, which determines whether or not G prefers low repression with democratization to low repression without democratization. Equation 13 defines $1-\tilde{\phi}_d$, which determines whether or not G prefers low repression with democratization to high repression.

Proposition 1 (Equilibrium)**.** *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 $t-1$.*

1. *G's repression choice:*

   (a) *If the parameter values are such that G's optimal strategy is low repression without democratization, and G has not previously deviated to a high repression level, then G spends the optimal low repression without democratization amount in period t. Formally, if $q<\tilde{q}$, $q<\hat{q}$, and $r_j \leq \hat{r}$ for all $j \in \mathbb{P}_t$, then $r_t = r_l^*$.*

   (b) *If the parameter values are such that G's optimal strategy is low repression with democratization, and G has not previously deviated to a high repression level, then G spends the optimal low repression with democratization amount in period t. Formally, if $q>\hat{q}$, $1-\phi_d > 1-\tilde{\phi}_d$, and $r_j \leq \hat{r}$ for all $j \in \mathbb{P}_t$, then $r_t = r_d^*$.*

   (c) *If G has previously deviated to a high repression level, then G spends the optimal high repression amount in period t. Formally, if $r_j > \hat{r}$ for any $j \in \mathbb{P}_t$, then $r_t = r_h^*$.*

2. *S's mobilization choice:*

   (a) *If the conditions from 1.a are true and if $r_t \leq \hat{r}$, then S mobilizes if $F + c(r_t) + \epsilon_t < F + c(r_l^*) + \underline{\epsilon}_l^*$ and does not mobilize otherwise.*

   (b) *If the conditions from 1.b are true and if $r_t \leq \hat{r}$, then S mobilizes if $F + c(r_t) + \epsilon_t < F + c(r_d^*) + \underline{\epsilon}_d^*$ and does not mobilize otherwise.*

(c) *If the condition from 1.c is true, or if $r_t > \hat{r}$, then S mobilizes if $F + c(r_t) + \epsilon_t < F + c(r_h^*) + \underline{\epsilon}_h^*$ and does not mobilize otherwise.*

3. *Bargaining (only occurs if S has mobilized):*

   (a) *If the conditions from 2.a are true, then G proposes $x_t = x^*$. S accepts any $x_t \in [x^*, 1 - \phi_a - r_t]$ and accepts democratization, and initiates a revolution in response to $x_t < x^*$.*

   (b) *If the conditions from 2.b are true, then G proposes to democratize. S accepts any $x_t \in [x_d^*, 1 - \phi_a - r_t]$ and accepts democratization, and initiates a revolution in response to $x_t < x_d^*$.*

   (c) *If the conditions from 2.c are true, then G proposes $x_t = 0$. S initiates a revolution in response to any $x_t \in [0, 1 - \phi_a - r_t]$ and in response to a democratization proposal.*

Proposition 2 (Durability, violence, and democratization)**.**

- *Case a in Proposition 1 corresponds with low repression without democratization. The per-period failure rate of such authoritarian regimes is $H(\underline{\epsilon}_l^*) \cdot q$, they will not experience revolutions, and conditional on failure they will not democratize.*
- *Case b in Proposition 1 corresponds with low repression with democratization. The per-period failure rate of such authoritarian regimes is $H(\underline{\epsilon}_d^*)$, they will not experience revolutions, and conditional on failure they will democratize.*
- *Case c in Proposition 1 corresponds with high repression. The per-period failure rate of such authoritarian regimes is $H(\underline{\epsilon}_h^*) \cdot p$, they will experience revolutions, and conditional on failure they will not democratize.*

4 Implications for Authoritarian Regime Dynamics

The model generates three distinct regime trajectories. First, the dictator represses at low levels and bargains with society in mobilization periods. This type of regime will only lose power via insider overthrow, although a dictator will only choose this strategy if the likelihood of insider overthrow during a mobilization period is relatively low. Therefore, these authoritarian regimes last relatively long periods of time. Second, the regime represses at low levels and democratizes in mobilization periods. These regimes should be relatively short for two reasons—they will choose to democratize when society mobilizes, and low repression implies mobilization will occur earlier—and will transition to democracy when they fail. Third, the dictator can repress at high levels and face revolutionary attempts in every mobilization period. These regimes last longer on average than the second type of regime for two reasons: repression decreases expected time

until a mobilization period, and the regime may last even if society mobilizes. It is ambiguous whether they should last longer than the first type of regime, although under plausible parameter values this third type will be less durable. Leaders select into high repression in part because of their vulnerability to insider overthrow—contrary to the first type.[22] Overall, the first type of authoritarian regime should survive the longest, only the second type will democratize, and only the third type will be violent in the sense of experiencing revolutions.[23]

The three trajectories implied by the model correspond, respectively, with party-based regimes, military regimes, and personalist regimes. This section shows that these three types of regimes tend to exhibit the conditions implied by the model to generate the different regime trajectories. Personalist regimes repress at high levels because they are most vulnerable to insider removal in a period of societal organization, face low-valued outside options under democracy, and have considerable scope for extracting rents. 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, yielding shorter regimes more likely to transition to democracy. Finally, party-based regimes are the least vulnerable to insider removals and therefore tolerate societal mobilization, yielding durable and relatively non-violent regimes.

The following distinction among authoritarian regime types follows Geddes, Wright and Frantz's (2014) definitions. Two distinctive features of their typology that are appropriate given the present theoretical framework are distinguishing personalist regimes as a distinct type, and also differentiating personalist military dictators from collegially ruled military regimes. Authors of alternative authoritarian regime datasets have argued that Geddes, Wright and Frantz (2014) conflate the background of a ruler (civilian versus military) with a distinct dimension regarding the extent of institutionalized policy-making (party versus personalist), and do not include personalism as a distinct type of dictatorship in their typology (Hadenius and Teorell, 2007; Svolik, 2012). Additionally, even if a ruler served in the military when he or she came to power via a coup, Geddes, Wright and Frantz (2014) code the regime as personalist rather than military if they

[22] Future drafts will formally analyze this relationship.

[23] Although the latter two predictions are deterministic in the model, they will be treated as probabilistic when examining empirics. Adding additional, although strategically uninteresting, stochastic terms to the model would formally generate probabilistic predictions.

rule without institutional constraints. The theoretically important distinctive aspects of personalist regimes described below highlight the value of Geddes, Wright and Frantz's (2014) typology.[24]

4.1 Personalist Regimes, Repression, and Revolution

Personalist dictatorships frequently possess all three characteristics in the model that encourage dictators to choose a high repression strategy. First, the lack of institutionalized constraints on the dictator, denoted by low ϕ_a, provide considerable scope for rent-seeking. There are many famous cases of kleptocratic rule, such as 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). 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." Chehabi and Linz (1998) provide many 20th century examples of such predatory behavior.

Second, personalist dictators have much to fear from societal mobilization. Finer (2002, 72-79) argues that civil wars and broader conditions of social unrest create opportunities for military intervention because of increased civilian dependence on the military to stay in power, which is particularly relevant for personalist regimes. The narrow basis of elite power in such regimes implies that social movements will tend to have broad bases of support in society (Goodwin and Skocpol, 1989), which exacerbates dependence on the military to retain power.

Of course, leaders suspicious of their military's loyalty can take strategic actions to coup-proof their military, a choice that lies outside the scope of the present model.[25] The result is that high-ranking generals in many personalist regimes are dependent on the patronage of the ruler (Snyder, 1998), which would seemingly

[24]Several reasons motivate why this paper does not also analyze Geddes, Wright and Frantz's (2014) fourth major regime type, monarchies. Since 1945, monarchies are not only been empirically rare, they are also concentrated in the Middle East and North Africa (MENA)—especially within oil-rich countries. These distinct characteristics make it difficult to disentangle the effects of monarchical institutions from characteristics specific to MENA or to oil wealth. Furthermore, monarchies vary considerably in the extent of institutionalized constraints and prospects for insider removal of leaders (Herb, 1999), which are key features of the present theory.

[25]Quinlivan (1999) details how several Middle Eastern leaders in the 20th century coup-proofed their

result in low q. A slight alteration of the model can account for this discrepancy. Suppose that q strictly decreases in r_t, implying that the process of repression can induce military loyalty. Substantively, this effect could arise because the military directly benefits from increased spending and because the small payments to broader elements of society leave more rents that can be shared within the elite. Soldiers may also fear punishment for human rights violations if the incumbent loses power. Therefore, empirically, the probability of insider coup in a mobilization period may tend to be low in personalist regimes, but this is endogenous to the high repression strategy chosen by the ruler. As described below, this contrasts with party-based regimes in which the military is less likely to attempt coups regardless of repression spending because of constraints imposed by parties and, in some cases, because of revolutionary regime origins.

Third, the option of democratization does little to alleviate a personalist dictator's fear of societal mobilization. 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 in Africa in the 1990s and Latin America in the 1980s and 1990s. The many personalist regimes in Africa conceded power only in the face of widespread protests, whereas pacted transitions to democracy occurred more frequently in Latin America's military regimes.

These three characteristics produce the paradoxical result that personalist dictators deliberately take actions that *increase* the probability of revolution, given the unpalatable alternative of repressing at low levels and either risking insider coups or democratizing.

4.2 Military Regimes and Democratization

The most important difference between collegially ruled military regimes and personalist regimes is that military dictators often have relatively favorable exit options to democratization (Bratton and van de Walle, 1994; Geddes, 1999).[26] Unlike narrowly constructed personalist ruling coalitions, collegial military regimes share power more broadly and expect to survive as an intact institution following democratization. In many

regimes.

[26]Recall that in Geddes, Wright and Frantz's (2014) conceptualization, 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.

cases, many generals may in fact have a preference for remaining in the barracks as opposed to ruling (Geddes, 1999; Finer, 2002), although the model assumes that all dictators have identical goals. Furthermore, the greater degree of institutionalization in collegial military regimes creates lesser scope for predating society than in personalist regimes, hence lowering the opportunity cost of democratization.

In addition to authoritarian institutions, ethnic considerations are important for affecting prospects for negotiated transitions to democratization. Bellin (2012) discusses variance in military loyalty among Middle Eastern regimes that faced mass protests during the Arab Spring period in 2011. She asks: "Are the interests of the military intrinsically linked to the longevity of the regime?" (132). In Tunisia and Egypt, both of which are largely ethnically homogeneous, the military did not perceive its fate as intrinsically related to the incumbent, although Egyptian generals did enjoy some patrimonial rents that were unlikely to be replicated if Hosni Mubarak lost power. By contrast, in Bahrain, Libya, and Syria, the military was ethnically distinct from the protesters. In these cases, the military expected to be punished or otherwise lose their positions if the incumbent lost power, which led officers to repress the protesters.

More broadly, this discussion relates to arguments about the importance of elite safeguards under democracy. Ziblatt (2017) produces the paradoxical conclusion that protecting the fates of conservative parties was crucial for democratization and democratic consolidation in 19th and 20th century Europe. Countermajoritarian 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. Regimes that simultaneously fear 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.

4.3 Party Regimes and Authoritarian Durability

The central difference from either personalist and military regimes is that party-based regimes are less vulnerable to societal mobilization. Instead, many party regimes actively promote social mobilization to create mass organizations that support the regime (Magaloni and Kricheli, 2010; Svolik, 2012). Mass support

can deter insider coups (lower q) because the party machine can rally citizens *in support* of the regime, as opposed to the implicit assumption throughout the present analysis that mass mobilization is necessarily confrontational toward the regime. 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).

The same sources of mass support for party regimes also corresponds with relatively high ϕ_a, which reduces predation incentives for high repression. 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.

The present analysis advances our understanding of why party-based regimes tend to survive long periods of time by linking the frequency of mobilization to prospects for bargaining breakdown. 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 can explain this paradox by accounting for why frequent mobilization is consistent with bargaining under stable authoritarianism, whereas periodic mobilization generates regime instability. Furthermore, the analysis explains how inherent attributes of party-based regimes affect strategic choices that in turn affect mobilization frequency.

5 Conclusion

Authoritarian regimes vary in their durability, violence, and likelihood of democratization. This paper links these differences to heterogeneous incentives for and consequences of repression, analyzed in an infinite horizon game between a government and a societal actor that endogenously mobilizes in response to the government's repression choices. Preventive repression exerts a short-term effect that deters mobilization but a long-term effect that inhibits peaceful bargaining. Personalist regimes repress at high levels because they are most vulnerable to insider removal when society mobilizes, face low-valued outside options under democracy, and have considerable scope for extracting rents—providing incentives for personalist dictators

to take strategic actions that *increase* the likelihood of violent revolutionary overthrow. Although military regimes are also vulnerable to insider removal, they often face favorable exit options to democracy, which yields shorter regimes more likely to transition to democracy. Party-based regimes are least vulnerable to insider removals and therefore tolerate societal mobilization, yielding durable and relatively non-violent regimes.

The analysis offers at least three possible future directions for future theorizing. First, the present analysis focuses entirely on preventive repression, or what Levitsky and Way (2010) denote low-intensity coercion. However, repression spending also affects "high-intensity coercive" techniques such as the ability to forcibly break up protests or to defeat insurgencies. This highlights countervailing long-term repression effects. On the one hand, there is the effect described here that makes revolutions more likely. On the other hand, repression spending can also lower the probability of a revolution succeeding in the model, which makes both revolutionary attempts and successful revolutions less likely. Personalist regimes may be vulnerable to political violence not only for the reasons described here, but also because attempts to coup-proof their militaries have frequently resulted in weakened coercive apparatuses less able to defeat social movements when they arise (Goodwin 2001, 49; Herbst 2004).

There are also different types of social mobilization that could be useful to disaggregate. China, for example, experienced roughly 180,000 local-level protests in 2010, which Lorentzen (2013) argues provide an important source of information to the Chinese Communist Party. By contrast, mass mobilizations similar to those in Tiananmen Square in 1989 do fundamentally threaten regime stability. It could be useful in future research to add multiple mobilization options for citizens in a dynamic setting to understand how repression affects prospects for different forms of mobilization, and in turn how these affect regime stability.

Finally, to focus on the countervailing short-term and long-term effects of preventive repression and on dictators' strategic incentives to use repression, the model parameterized many factors that could be endogenized in future work. For example, an explicit contest could be modeled between societal moderates and extremists as opposed to assuming that moderates automatically lead social movements in contexts of low repression and vice versa for extremists under high repression. An explicit military actor could be included to endogenize the probability of coup attempts. Overall, the model provides a framework rich enough to provide new insights about the relationships among authoritarian institutions, repression, and authoritarian regime dynamics, but future extensions of the framework could provide insight into additional aspects of

authoritarian regime survival.

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Online Appendix

A Proofs

Before proving Lemma 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 A.1 (Bounds on mobilization costs)**.** *For all* $r \in [0, 1-\phi_a]$:

$$0 < \frac{\delta \cdot p \cdot (\phi_r - \phi_a)}{1-\delta} - c(r) < \left[2 - \frac{\delta \cdot p}{1-\delta \cdot (1-p)}\right] \cdot F$$

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

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

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

for:

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

This term equals 0 because, by definition of $\underline{\epsilon}_l^*(r)$, $x^*(r) = F + c(r) + \underline{\epsilon}_l^*(r)$. ■

Proof of Lemma 2. Need to show:

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

$\frac{\partial x^*}{\partial c} = \int_0^{\underline{\epsilon}_l^*} dH(\epsilon_t)$, which the fundamental theorem of calculus implies equals $H(\underline{\epsilon}_l^*)$. Because $H(\cdot)$ is a cumulative density function and because $c'(r) > 0$ by assumption, the numerator is strictly negative. The proof of Lemma 1 showed that the denominator equals 1, and therefore the overall term is $-\big[1 - H(\underline{\epsilon}_l^*)\big] \cdot c'(r) < 0$. ■

Proof of Lemma 3. Applying the intermediate value theorem demonstrates the existence of at least one $\hat{r} > 0$ such that $B^*(\hat{r}) \equiv 1 - \phi_a - \hat{r} - x^*(\hat{r}) = 0$. To establish the lower bound, because $c(0) = 0$, setting $r = 0$ implies $\lim_{F \to 0} \overline{c}(r) = 0$ and $\lim_{F \to 0} \underline{\epsilon}_l^*(r) = \infty$. This, in turn, implies $1 - \phi_a > x^*$.

Furthermore, because $x^*(r)$ strictly increases in F and $\lim_{F\to\infty} x^*(r) = \infty$, there exists a unique $\hat{F}$ such that $B^*\big(r = 0, F\big) > 0$ if $F < \hat{F}$ and $B^*\big(r = 0, F\big) < 0$ if $F > \hat{F}$. The setup assumes $F < \hat{F}$. To establish the upper bound, $B^*(r) < 0$ for any $r > 1 - \phi_a$. Finally, the assumed continuity of each function in r and applying the theorem of the maximum to prove that $\underline{\epsilon}_l^*(r)$ 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 2. ■

The following preliminary results will be used to prove Lemma 4.

Lemma A.1 (Mobilization threshold in high repression phase)**.** *For every constant repression spending amount $r_t = r_h$, a unique mobilization threshold $\underline{\epsilon}_h^*(r_h) \in (-F, F)$ exists.*

Before proving Lemma A.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 A.2 (Bounds on mobilization costs)**.** *For all $r_h \in [0, 1 - \phi_a]$:*

$$0 < x^* - c(r_h) + \frac{\delta}{1-\delta} \cdot H(\underline{\epsilon}_l^*) \cdot \left[\underline{\epsilon}_l^* - \frac{\int_{-F}^{\underline{\epsilon}_l^*} \epsilon_t dH(\epsilon_t)}{H(\underline{\epsilon}_l^*)}\right] < \frac{2-\delta}{1-\delta} \cdot F$$

Proof of Lemma A.1. In the high repression phase, for fixed repression spending $r_t = r_h$, S is indifferent between mobilizing and not if and only if ϵ_t satisfies:

$$\underbrace{\phi_a - \big[F + c(r_h) + \epsilon_t\big] + \delta \cdot \Big[p \cdot V_r^S + (1-p) \cdot V_l^S\Big]}_{E[U_S(\text{mobilize})]} = \underbrace{\phi_a + \delta \cdot V_h^S}_{E[U_S(\text{not mobilize})]} \tag{A.1}$$

Substitute $x^* + \delta \cdot V_l^S = \delta \cdot \big[p \cdot V_r^S + (1-p) \cdot V_l^S\big]$ (which follows from solving Equation 1 with equilibrium values) to express the indifference condition similarly to the term in Lemma 1:

$$\Theta_h\big(\underline{\epsilon}_h^*(r_h)\big) \equiv x^* - \big[F + c(r_h) + \underline{\epsilon}_h^*(r_h)\big] + \delta \cdot \big(V_l^S - V_h^S\big) = 0 \tag{A.2}$$

S's continuation value under high repression can be defined recursively:

$$V_h^S = \phi_a + \Big[1 - H\big(\underline{\epsilon}_h^*(r_h)\big)\Big] \cdot \delta \cdot V_h^S + H\big(\underline{\epsilon}_h^*(r_h)\big) \cdot \Big\{\delta \cdot \Big[p \cdot V_r^S + (1-p) \cdot V_l^S\Big] - \overline{C}_h(r_h)\Big\}, \tag{A.3}$$

Substitute Equation 1 into Equation 2 (both solved with equilibrium values) to express V_l^S in a similar form:

$$V_l^S = \phi_a + \Big[1 - H\big(\underline{\epsilon}_l^*\big)\Big] \cdot \delta \cdot V_l^S + H\big(\underline{\epsilon}_l^*\big) \cdot \Big\{\delta \cdot \Big[p \cdot V_r^S + (1-p) \cdot V_l^S\Big] - \overline{C}_l\Big\}, \tag{A.4}$$

for $\overline{C}_l \equiv \overline{C}_l(r_l^*)$. Substitute $x^* + \delta \cdot V_l^S = \delta \cdot \big[p \cdot V_r^S + (1-p) \cdot V_l^S\big]$ into the expression from Lemma 1 to yield the benefit and costs of mobilizing in the low-repression phase that implicitly define

the mobilization threshold:

$$\underbrace{\delta \cdot \left[p \cdot V_r^S + (1-p) \cdot V_l^S\right]}_{\text{LT benefit}} = \underbrace{F + c(r_l^*) + \underline{\epsilon}_l^*}_{\text{ST cost}} + \underbrace{\delta \cdot V_l^S}_{\text{LT opp. cost}} \tag{A.5}$$

Equation A.1 directly enables stating a similar term for the high-repression phase:

$$\underbrace{\delta \cdot \left[p \cdot V_r^S + (1-p) \cdot V_l^S\right]}_{\text{LT benefit}} = \underbrace{F + c(r_h^*) + \underline{\epsilon}_h^*}_{\text{ST cost}} + \underbrace{\delta \cdot V_h^S}_{\text{LT opp. cost}} \tag{A.6}$$

Substitute Equation A.5 into Equation A.4, and Equation A.6 into Equation A.3 (solved with equilibrium values), to yield:

$$V_l^S = \phi_a + \left[1 - H\left(\underline{\epsilon}_l^*\right)\right] \cdot \delta \cdot V_l^S + H\left(\underline{\epsilon}_l^*\right) \cdot \left[F + c(r_l^*) + \underline{\epsilon}_l^* + \delta \cdot V_l^S - \overline{C}_l\right] \tag{A.7}$$

$$V_h^S = \phi_a + \left[1 - H\left(\underline{\epsilon}_h^*\right)\right] \cdot \delta \cdot V_h^S + H\left(\underline{\epsilon}_h^*\right) \cdot \left[F + c(r_h^*) + \underline{\epsilon}_h^* + \delta \cdot V_h^S - \overline{C}_h\right], \tag{A.8}$$

for $\overline{C}_h \equiv \overline{C}_h(r_h^*)$. The intuition behind these substitutions is that the mobilization costs that S pays if indifferent between mobilizing or not equal the expected gains of mobilizing. Algebraic rearranging and substituting in the definitions for $\overline{C}_l$ and $\overline{C}_h$ yields simplified expressions:

$$V_l^S = \frac{1}{1-\delta} \cdot \left\{\phi_a + H(\underline{\epsilon}_l^*) \cdot \left[\underline{\epsilon}_l^* - \frac{\int_{-F}^{\underline{\epsilon}_l^*} \epsilon_t dH(\epsilon_t)}{H(\underline{\epsilon}_l^*)}\right]\right\} \tag{A.9}$$

$$V_h^S = \frac{1}{1-\delta} \cdot \left\{\phi_a + H(\underline{\epsilon}_h^*) \cdot \left[\underline{\epsilon}_h^* - \frac{\int_{-F}^{\underline{\epsilon}_h^*} \epsilon_t dH(\epsilon_t)}{H(\underline{\epsilon}_h^*)}\right]\right\} \tag{A.10}$$

These state that the continuation values are determined by the guaranteed transfer and by the frequency of mobilization multiplied by the difference between maximum and average mobilization costs. Substitute these terms into Equation A.2 to yield:

$$\Theta_h\left(\underline{\epsilon}_h^*(r_h)\right) \equiv x^* - \left[F + c(r_h) + \underline{\epsilon}_h^*(r_h)\right]$$

$$+ \frac{\delta}{1-\delta} \cdot \left\{H(\underline{\epsilon}_l^*) \cdot \left[\underline{\epsilon}_l^* - \frac{\int_{-F}^{\underline{\epsilon}_l^*} \epsilon_t dH(\epsilon_t)}{H(\underline{\epsilon}_l^*)}\right] - H\left(\underline{\epsilon}_h^*(r_h)\right) \cdot \left[\underline{\epsilon}_h^*(r_h) - \frac{\int_{-F}^{\underline{\epsilon}_h^*(r_h)} \epsilon_t dH(\epsilon_t)}{H\left(\underline{\epsilon}_h^*(r_h)\right)}\right]\right\} = 0 \tag{A.11}$$

Applying the intermediate value theorem demonstrates the existence of at least one $\underline{\epsilon}_h^*(r_h)$ that satisfies $\Theta_h\left(\underline{\epsilon}_h^*(r_h)\right) = 0$. The first inequality in Assumption A.2 implies that $\Theta_h(-F) > 0$ for all $r_h \in [0, 1 - \phi_a]$. The second inequality in Assumption A.2 implies that $\Theta_h(F) < 0$ for all $r_h \in [0, 1 - \phi_a]$. Finally, the assumed smoothness of the distribution function $H(\cdot)$ implies that $\Theta_h(\cdot)$ is continuous.

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

$$\frac{\partial \Theta_h}{\partial \underline{\epsilon}_h^*(r_h)} = -1 - \frac{\delta}{1-\delta} \cdot H\left(\underline{\epsilon}_h^*(r_h)\right) < 0$$

■

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. Within the set $(\hat{r}, 1-\phi_a]$, a sufficient condition for the maximum value of V_h^G not to occur at $r_h = \hat{r}$ is for V_h^G to strictly increase at $r_h = \hat{r}$, which Assumption A.3 imposes.

Assumption A.3.

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

This is not a restrictive assumption because it only rules out a strategically uninteresting case. Lemma A.2 shows that if instead $\left.\frac{dV_h^G}{dr_h}\right|_{r_h=\hat{r}} < 0$, 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 A.2. *If Assumption A.3 is strictly violated, then $V_h^G(r_h) < V_l^G(\hat{r})$ for all $r_h > \hat{r}$.*

Proof. Two results establish the lemma. First, G experiences a discrete drop in lifetime expected consumption at $\hat{r}$: $V_l^G(\hat{r}) > \lim_{\alpha \to 0^+} V_h^G(\hat{r}+\alpha)$. Rearranging Equation 7 and recalling that $1-\phi_a-\hat{r}-x^*(\hat{r}) = 0$ shows that $q < p$ is a sufficient condition for the result. Second, if V_h^G is strictly concave, then a strict violation of Assumption A.3 implies that V_h^G strictly decreases in r_h for all $r_h > \hat{r}$. The proof for Lemma A.3 establishes sufficient conditions for the strict concavity of V_h^G. ■

Lemma A.3 (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 $r_h^* \in (\hat{r}, 1-\phi_a]$.*

Proof of part a. Solving Equation 5 yields:

$$V_l^G(r) = \frac{1-\phi_a-r-H\left(\underline{\epsilon}_l^*(r)\right)\cdot x^*(r)}{1-\delta\cdot\left[1-q\cdot H\left(\underline{\epsilon}_l^*(r)\right)\right]}$$

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

$$\max_r \quad \frac{1-\phi_a-r-H\left(\underline{\epsilon}_l^*(r)\right)\cdot x^*(r)}{1-\delta\cdot\left[1-H\left(\underline{\epsilon}_l^*(r)\right)\cdot q\right]} + \lambda_1\cdot r + \lambda_2\cdot(\hat{r}-r)$$

The KKT conditions characterize the solution:

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

$$\underbrace{+\frac{\left[1-\phi_a-r^*-H(\underline{\epsilon}_l^*)\cdot x^*\right]\cdot\delta\cdot h(\underline{\epsilon}_l^*)\cdot q}{\left[1-\delta\cdot\left[1-H(\underline{\epsilon}_l^*)\cdot q\right]\right]^2}\cdot\left[1-H(\underline{\epsilon}^*)\right]\cdot c'(r^*)}_{\text{MB: decreases \% of periods w/ internal overthrow possibility}}$$

$$\underbrace{-\frac{\delta\cdot\left[H(\underline{\epsilon}_l^*)\right]^2\cdot p}{\left[1-\delta\cdot\left[1-H(\underline{\epsilon}_l^*)\cdot q\right]\right]\cdot\left[1-\delta\cdot\left[1-H(\underline{\epsilon}_l^*)\cdot p\right]\right]}\cdot c'(r^*)}_{\text{MC: increases } x^*}$$

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

$$r\geq 0,\ \ \hat{r}\geq r,\ \ \lambda_1\geq 0,\ \ \lambda_2\geq 0,\ \ \lambda_1\cdot r=0,\ \ \lambda_2\cdot(\hat{r}-r)=0 \tag{A.12}$$

Assuming $\lim_{r_t\to 0} c'(r_t)=\infty$ 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 A.13 characterizes the unique maximum. Taking the second derivative of the objective function and making the negative term $c''(r_t)$ large enough in magnitude generates this result, specifically, greater than the threshold $\underline{c}''$ stated in footnote 10.

Part b. Solving Equation 6 yields:

$$V_h^G(r_h)=\frac{\left[1-H\left(\underline{\epsilon}_h^*(r_h)\right)\right]\cdot(1-\phi_a)-r_h}{1-\delta\cdot\left[1-H\left(\underline{\epsilon}_h^*(r_h)\right)\right]}+\frac{\delta\cdot H\left(\underline{\epsilon}_h^*(r_h)\right)\cdot(1-p)}{1-\delta\cdot\left[1-H\left(\underline{\epsilon}_h^*(r_h)\right)\right]}\cdot V_l^G$$

Assumption A.3 implies that within the set $(\hat{r},1-\phi_a]$, 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 $[\hat{r}+\alpha,1-\phi_a]$ contains the maximizer. G's optimization problem with inequality constraints is:

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

The KKT conditions characterize the solution:

$$\frac{\partial\mathcal{L}}{\partial r_h}=\underbrace{\delta\cdot(1-\delta)\cdot h(\underline{\epsilon}_h^*)\cdot\frac{(1-\phi_a-r_h^*)-(1-\delta)\cdot(1-p)\cdot V_l^G}{\left[1-\delta\cdot\left[1-H(\underline{\epsilon}_h^*)\right]\right]^3}\cdot c'(r_h^*)}_{\text{MB: Increase expected time until revolution}}$$

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

$$r_h\geq\hat{r},\ \ 1-\phi_a\geq r_h,\ \ \lambda_1\geq 0,\ \ \lambda_2\geq 0,\ \ \lambda_1\cdot(r_h-\hat{r})=0,\ \ \lambda_2\cdot(1-\phi_a-r_h)=0 \tag{A.13}$$

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

Lemma A.4 (Comparing mobilization thresholds)**.** *S mobilizes less frequently if G chooses the*

optimal high repression level instead of the optimal low repression level. Formally, $H(\underline{\epsilon}_h^*) \leq H(\underline{\epsilon}_l^*)$.

Proof. Because $H(\cdot)$ is a smooth cumulative distribution function, it follows that it strictly increases in its arguments. Therefore, it is sufficient to demonstrate that $\underline{\epsilon}_h^* \leq \underline{\epsilon}_l^*$. The opposing premise that $\underline{\epsilon}_h^* > \underline{\epsilon}_l^*$ will generate a contradiction. By construction, $r_h^* > r_l^*$, and therefore $c(r_h^*) > c(r_l^*)$. This implies that the right-hand side of Equation A.6 strictly exceeds the right-hand side of Equation A.5, and therefore a necessary condition for both equalities to be true is $V_l^S > V_h^S$. Showing that the right-hand side of either Equation A.9 or A.10 strictly increases in the mobilization threshold yields a contradiction by showing that $\underline{\epsilon}_h^* > \underline{\epsilon}_l^*$ implies $V_h^S > V_l^S$:

$$\frac{d}{d\underline{\epsilon}^*}\left[H(\underline{\epsilon}^*)\cdot\underline{\epsilon}^* - \int_{-F}^{\underline{\epsilon}^*}\epsilon_t dH(\epsilon_t)\right] = \frac{d}{d\underline{\epsilon}^*}\left[\int_{-F}^{\underline{\epsilon}^*}\left(\underline{\epsilon}^* - \epsilon_t\right)dH(\epsilon_t)\right] =$$

$$\left(\underline{\epsilon}^* - \underline{\epsilon}^*\right)\cdot h\left(\underline{\epsilon}^*\right) + \int_{-F}^{\underline{\epsilon}^*} dH(\epsilon_t) = H(\underline{\epsilon}^*) > 0$$

■

Proof of Lemma 4, part a.

$$\frac{d\Omega_{l,h}}{dq} = -\frac{\left[1-\phi_a - r_l^* - H(\underline{\epsilon}_l^*)\cdot x^*\right]\cdot\delta\cdot H(\underline{\epsilon}_l^*)}{\left[1-\delta\cdot\left[1-H(\underline{\epsilon}_l^*)\cdot q\right]\right]^2} < 0$$

Proof of part b. Applying the envelope theorem yields:

$$-\frac{\partial\Omega_{l,h}}{\partial\phi_a} < 0 \implies$$

$$\frac{1+H(\underline{\epsilon}_l^*)\cdot\frac{dx^*}{d\phi_a}}{1-\delta\cdot\left[1-H(\underline{\epsilon}_l^*)\cdot q\right]} - \frac{1}{1-\delta\cdot\left[1-H(\underline{\epsilon}_h^*)\cdot p\right]} < 0 \implies$$

$$\underbrace{\frac{1-\delta}{1-\delta\cdot\left[1-H(\underline{\epsilon}_l^*)\cdot q\right]}}_{\equiv Z}\cdot\frac{1}{1-\delta\cdot\left[1-H(\underline{\epsilon}_l^*)\cdot p\right]} - \frac{1}{1-\delta\cdot\left[1-H(\underline{\epsilon}_h^*)\cdot p\right]} < 0 \implies$$

$$(1-\delta)\cdot\left(\frac{1}{Z}-1\right) + \delta\cdot p\cdot\left[\frac{1}{Z}\cdot H(\underline{\epsilon}_l^*) - H(\underline{\epsilon}_h^*)\right] > 0$$

The result follows from $Z < 1$ and $H(\underline{\epsilon}_l^*) \geq H(\underline{\epsilon}_h^*)$. ■

Proof of Proposition 1.

1a. Follows by construction from $q < \tilde{q}$ and $q < \hat{q}$.

1b. Follows by construction from $q > \hat{q}$ and $1-\phi_d > 1-\tilde{\phi}_d$.

1c. The existence of $r_t > \hat{r}$ in $\mathbb{P}_t$ implies the actions in 2.c and 3.c. By construction, $r_t = r_h^*$ maximizes G's utility in that subgame.

2a. The strategy profile states that $r_t = r_l^*$ in all future periods. By construction of $\underline{\epsilon}_l^*$, generically, S cannot profitably deviate from the stated mobilization threshold.

2b. The strategy profile states that $r_t = r_d^*$ in all future periods. By construction of $\underline{\epsilon}_d^*$, generically, S cannot profitably deviate from the stated mobilization threshold.

2c. The strategy profile states that $r_t = r_h^*$ in all future periods until the next revolution. By construction of $\underline{\epsilon}_h^*$, generically, S cannot profitably deviate from the stated mobilization threshold.

3a. 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 $B^* \geq 0$. Additionally, because $r_t \leq \hat{r}$ in period t and in every period in the set $\mathbb{P}_t$, S strictly prefers democracy to revolution. G cannot profitably deviate to $x_t < x^*$ because revolution induces weakly lower consumption for G in period t and 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 $t > s$. G cannot profitably deviate to proposing to democratize because $q < \hat{q}$.

3b. The strategy profile states that $r_t = r_d^*$ in all future periods. By construction of x_d^*, S cannot profitably deviate from accepting any offer such that $x_t \geq x_d^*$. Because $r_d^* < \hat{r}$, by definition of $\hat{r}$, x_d^* satisfies $B^* \geq 0$. Additionally, because $r_t \leq \hat{r}$ in period t and in every period in the set $\mathbb{P}_t$, S strictly prefers democracy to revolution. G cannot profitably deviate to making a proposal that does not include democratization because $q > \hat{q}$.

3c. 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. ■