

# Political Succession: A Model of Coups, Revolution, Purges, and Everyday Politics

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## Abstract

In addition to everyday political threats, leaders risk removal from office through coups and mass movements such as rebellion. Further, all leaders face threats from shocks such as downturns in their health, their country's economy, or their government's revenue. By integrating these risks into the selectorate theory, we characterize the conditions under which each threat is pertinent and the counter-moves (purges, democratization, expansion of public goods, and expansion of private benefits) that best enable the leader to survive in office. The model identifies new insights into the nature of assassins; the relative risk of different types of leader removal as a function of the extant institutions of government; and the endogenous factors driving better or worse public policy and decisions to democratize or become more autocratic. Importantly, the results highlight how an increase in the risk of deposition via one means intensifies other removal risks.

## Keywords

rebellion, domestic politics, game theory, political survival, selectorate theory

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Mohammad Reza Pahlavi, the Shah of Iran, died on July 27, 1980, after having sought treatment for cancer in at least four countries (Robins and Post 1995). His death came more than a year after he fled Iran (January 16, 1979) and after the collapse of his monarchic regime (February 11, 1979) under pressure from the Islamic revolution that brought Ayatollah Khomeini to power. We argue that despite the intervening eighteen months between his flight from Iran and his death, his health and the occurrence of the revolution were intimately connected. More generally, we explain how and why political threats from one source intensify the risk of deposition via other means and how leaders act to try to dissipate these threats. In doing so, we identify the actions leaders can take to preserve their hold on power and the circumstances in which they cannot.

No leader can commit to reward supporters from beyond the grave, so as the Shah's health declined, the regime's supporters increasingly doubted whether their flow of rewards would continue for long. Such doubts undermine loyalty. With the army's and security forces' willingness to suppress dissent diminished, regime opponents became increasingly willing to take to the streets to topple the government. Russia's last Czar similarly lost the support of his army but in his case it was not declining health, but rather declining revenue, that diminished the army's willingness to defend him zealously, contributing to the emergence of the short-lived Kerensky regime and then the Bolshevik Revolution. Various combinations of health, revenue, and other concerns contributed to the timing of the Arab Spring, the Colored Revolutions in Eastern Europe and numerous other episodes of political instability and regime change. The various means by which a leader might be deposed, and the actions leaders can take to thwart such threats, are strategically interconnected. Hence, thinking about them as if they were independent events is likely to result in misleading or incomplete explanations of the sources of political instability and regime change.

Political succession, or rather its avoidance, is at the heart of the decisions leaders make. Except for the rare incumbent who voluntarily steps down, leaders overwhelmingly act as if they want to hold on to power as long as they possibly can. Unfortunately, for them, they face numerous threats to their tenure. In addition to the normal give and take of everyday politics, leaders risk deposition by coups d'état or mass uprisings such as revolutions and civil wars. Leaders are also mortal and so face additional threats to their hold on power from sickness and assassination. Although they may also face threats to their power from foreign adversaries, we ignore such threats here and focus only on domestic considerations. We design a model that integrates each of the domestic threats to political power and the available countermoves by incumbents, placing each threat within an equilibrium setting that while compatible with prior theorizing within the selectorate framework, expands on it and uncovers novel testable propositions.

Previous selectorate models have examined normal political transitions as well as revolutionary threats (B. Bueno de Mesquita et al. 2003; B. Bueno de Mesquita and Smith 2010, 2009; Smith 2008). Additionally, the selectorate framework has provided a basis for speculation about coups d'état and the risk of purges, a key

countermove by leaders (B. Bueno de Mesquita and Smith 2011), but these conditions have not been carefully modeled. Nor have these factors been considered within a framework in which leaders can actually lose office. Here we propose a model that examines within a single theoretical framework the conditions that are conducive to coups, revolutions, purges, democratization, and ordinary leader removal. And, unlike previous selectorate models, here we include possible exogenous shocks that can and sometimes do result in the ouster of an incumbent leader. Furthermore, we allow the sizes of the winning coalition and the selectorate to change in response to outcomes across the range of possible sources of deposition and countermoves designed to avoid deposition.

## Literature Review

Our approach is based on the selectorate theory (B. Bueno de Mesquita et al. 2003, 2002). In that approach, the primary goal of leaders is to retain office. To do so, they need to maintain the support of a coalition of supporters. The types of policies best suited to retaining power depend upon the number of supporters needed. In addition to deposition within the existing institutions, leaders risk being removed in coups or revolutions, or by the mundane, but unavoidable, risk of mortality. Although, as we review below, there are nuanced examinations of each of these risks, the value added of our approach is that it places these different forms of regime change within a common institutional framework and emphasizes how each deposition risk influences the others. By evaluating the strategic interaction among these threats, we derive a general understanding of the causes of political instability and the circumstances under which such instability may lead to democratization or to a more illiberal response.

There is a strong tradition in examining how various forms of democracy differ (for instance, Persson and Tabellini 2003). There are parallels in the study of autocracy. Wintrobe (1998) was among the first scholars to systematically differentiate among autocracies. He emphasized differences generated according to whether leaders focus on personal power or accumulating wealth. Geddes (2003) categorizes nondemocratic regimes into personalist, one party, and military (and also hybrids of these groupings) according to the means through which leaders exercise power. Like others, she finds that parties and elections provide stability (Cheibub, Gandhi, and Vreeland 2010; Gandhi 2008; Gandhi and Lust-Okar 2009; Wright and Escobar-Folch 2012). Organizational features of autocracies affect policy performance (Besley and Kudamatsu 2007). However, despite the recognition that regimes differ, most studies of democratization (or its reverse) fail to incorporate variations within either democracies or nondemocracies (Przeworski et al. 2000; Boix and Stokes 2003; see Geddes 1999 for a review of the democratization literature). Our focus is on selectorate theory which examines all governance in terms of the number of supporters a leader needs and the size of the pool of potential supporters from which essential backers are drawn. This framework allows the modeling of regimes as continuous, rather than discrete, types.

Our primary theoretical assumption is that leaders want to survive in office. B. Bueno de Mesquita and Siverson's (1995) analysis of the effects of war outcomes on leader survival provided the impetus for many subsequent leader-based perspectives (Chiozza and Goemans 2011; McGillivray and Smith 2008, for instance). Leaders face numerous threats to their hold on power. All leaders, for instance, face the threats of infirmity and mortality. Although leader health is a regular topic of media speculation, to our knowledge there are no game theoretic models or large *N* statistical studies of the impact that leader health has on political outcomes. McDermott (2008) and Robins and Post (1995) use a series of cases to explore how leaders handle declining health and how those around them cover up decrepitude. Jones and Olken (2005, 2009) study sudden accidental leader death to measure the impact of individual leaders on growth and the impact of the success or failure of assassination attempts on the intensity of internal violence. Our analysis examines how the prospect of a leader being removed because of ill-health affects that leader's ability to manage political threats to tenure.

There is a vast literature on revolutions and mass protests against incumbent regimes. Much of this work focuses on the incentives to rebel, such as Gurr's (1970) relative deprivation argument. Scholars also point to the ability of the people to organize and coordinate their actions (Goldstone 1994; Kuran 1989; Lohmann 1993). Global games are a common means of modeling such coordination (Angeletos, Hellwig, and Pavan 2007; E. Bueno de Mesquita 2010; Morris and Shin 2000; Shadmehr 2014). Although coordinating resistance to the regime is important, revolutions often succeed because the backers of the regime choose not to stop the masses (B. Bueno de Mesquita and Smith 2011; Myerson 2008; Tyson and Smith 2014). Robins and Post (1995), for instance, illustrate how ill-health can often be the trigger for such desertion (as illustrated by the Iranian example with which we began). Casper and Tyson (2014) model coup risks and revolutions simultaneously in a global game setting.

Most analyses of coups focus on the involvement of the military in this process (Finer 1962; Feaver 2003). Coups occur when military elites receive relatively few rewards, which the literature conceptualizes in terms of low military spending, the absence of graft for the military, or economic shocks (Belkin and Schofer 2003; Besley and Robinson 2010; Collier and Hoeffler 2007; Gallego and Pitchik 2004; Londregan and Poole 1990; J. Powell 2012). Acemoglu and Robinson (2001) provide an influential class-based model of sequential coups and revolutions in which income inequality drives institutional change. According to Meltzer and Richard's (1981) model, in democracies, the more numerous poor tax the rich. Should shocks provide the rich with an opportunity for a coup, they are most incentivized to do so when there is large income inequality. Similarly, inequality leads the poor to want to rebel against autocracy should they get the opportunity. Acemoglu and Robinson's model has some limitations in that it fails to differentiate between alternative forms of nondemocratic institutions. Additionally, their model does not permit institutional transitions to alter the underlying ownership of wealth (although transitions affect

the taxation of that wealth). That said, their work highlights an essential commitment problem that is also a theme of our model. Although the ruling class might be willing to compensate others to ameliorate their demand for institutional change, leaders cannot provide enough additional rewards in a single period to compensate for giving up the opportunity for institutional change (see R. Powell 2004 for a general statement of the commitment problem). Leaders can commit to future rewards through appropriate institutional reforms that tie their hands. Our model examines expansions or contractions of the winning coalition, which can be thought of as democratization or purges. In contrast to the standard approach to democratization, in which nations pass some arbitrary threshold, our approach considers partial progress to more inclusive or less inclusive institutions.

Purges involve reducing the number of essential supporters, concentrating political power in the remaining (smaller) group of supporters. Purges often entail the execution, imprisonment, or exile of those purged. While there are many studies of specific instances of purges, for example, Conquest's (1969) analysis of Stalin's Great Purges, systematic studies, in terms of large  $N$  empirical or theoretical approaches are lacking. Perhaps most relevant here are studies by Egorov and Sonin (2011) and Svolik (2009). Both examine the choice of leaders with respect to their supporters in the face of other survival threats. Egorov and Sonin examine the vulnerability created by the necessity to reward and promote supporters for their assistance in suppressing rivals knowing that these same supporters can turn on the leader. In Svolik's model, leaders want to cut down on the number of supporters to whom they are beholden, but supporters use the threat of a coup to deter purges.

## A Preview of Results

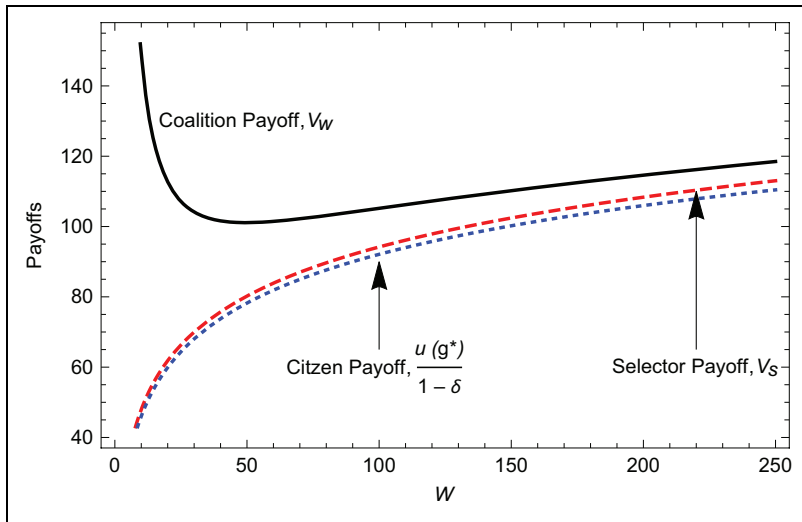
As we have noted, political leaders face both ongoing threats to their hold on power from political rivals as well as punctuated moments when they are at heightened risk of revolution or coup d'état. Here we provide an informal assessment of the various responses that different actors can take to different political threats and internal conditions, as well as offering an equilibrium explanation of the choices they are expected to make. Following this informal assessment, we provide a model with formal proofs. As we summarize the intuition and highlights of the model, we also emphasize testable hypotheses that follow from the theory by reporting them in bold.

A useful starting place is to summarize the intuition that follows from the selectorate theory in terms of what drives the welfare of leaders, coalition members, the selectorate, and the masses. In the basic selectorate framework, leaders want first to survive in office and, conditional on ensuring their political survival, they then want to maximize their discretionary control over revenue. To stay in power, a leader needs the support of a coalition of backers of size  $W$ , referred to as their winning coalition. That coalition is drawn from a pool of people who are potential members of  $W$  and who are referred to as the selectorate,  $S$ . They, in turn, are the "enfranchised" subset of the total population,  $N$ , with  $N - S$  people being the disenfranchised masses.

Within the selectorate framework, leaders use taxes or, when available, other means such as foreign aid to raise revenue and they allocate revenue between public goods that benefit everyone in society and private goods that benefit only members of the winning coalition. Anything left over is for the discretionary use of the incumbent leader. How much a leader must spend to maintain coalition loyalty, and therefore how much is left for the leader's discretionary use, depends on the credible threats she faces to her political survival. In the basic case, there is always a political rival who wants to replace the incumbent and who promises to reward his prospective coalition handsomely if they back him instead of the incumbent. Any such foe needs to persuade at least one member of the incumbent's winning coalition to defect and must also have assembled a coalition of size  $W$  that is prepared to back him. Unfortunately, for political challengers, they can promise everything, but they cannot commit to deliver everything to their prospective backers in the future. Instead, should the foe come to power, he learns the innate prospective loyalty of the selectorate's members and forges a winning coalition of those who have the highest affinity for him prior to their receipt of private goods. This means that the odds of being in the long-term winning coalition if the challenger comes to power is equal to the ratio  $W/S$ . Indeed, this ratio is an excellent indicator of an incumbent's survival prospects under normal political threats.

For any individual, the advantage of being a member of the winning coalition is the receipt of private goods. In the selectorate framework, the total expenditure of a leader on her coalition depends on the ratio  $W/S$ . The larger the coalition is as a percentage of the selectorate, the more the leader has to spend in order to defeat any regular political challenge and so the less the discretionary resources that remain for the incumbent. Furthermore, the smaller  $W$  is the more efficient it is for a survival-oriented leader to focus on private goods rather than public goods as the main component of her resource expenditures aimed at keeping the coalition's loyalty. Since how much a foe can credibly commit to pay a defector from the winning coalition depends on  $W/S$ ; that is, the odds of being in the long-term winning coalition of the would-be new leader, all an incumbent must do to defeat a standard everyday political challenge is to pay coalition members an amount equal to the expected value that the foe can credibly offer. Hence, when  $W/S$  is small, incumbents need not spend a great deal to maintain coalition loyalty compared to when  $W/S$  is large.

The selectorate framework allows us to characterize the institutional preferences of different components of any society, as seen in Figure 1. Leaders, for example, prefer that they have a large selectorate and that they depend on a small coalition (so  $W/S$  is small). That yields the greatest returns for them. Members of the masses, that is, the disenfranchised  $N - S$  in society, prefer that the winning coalition is a large segment of the selectorate. That way, although they are excluded from any future winning coalition, being so excluded is not terribly consequential because as  $W$  increases relative to  $S$  the government spends more of its revenue and it increasingly emphasizes public goods expenditures. Those benefits, of course, go to everyone including all the masses in  $N - S$ . Selectorate members also prefer that the



**Figure 1.** Preferences over institutions: Continuation values and  $W$ .

winning coalition is large. The larger it is, the better their chances of getting into a future coalition, in which case they would benefit from private goods. Further, as  $W$  increases they benefit from the increased provision of public goods even if they remain outside of the coalition.

Those in the winning coalition have the most complex institutional preferences. They value a high ratio of  $W/S$  because that improves their prospects of being in any future winning coalition and compels the incumbent to spend more of her revenue on maintaining the coalition's loyalty. Members of the winning coalition like the idea of  $W$  being small and  $S$  being small because these conditions ensure that the incumbent keeps little discretionary revenue for herself and the members of the coalition receive lots of private goods. That is, coalition members particularly like the idea of juntas and monarchies. However, they must also consider the risk of purges and other events that might turn them out of the coalition and might alter the institutional structure they support. Consequently, they prefer a large  $W$  political system to a small one if  $S$  is large. Their preferences are nonmonotonic with respect to  $W$  as seen in Figure 1. With the basic selectorate framework in mind, we turn now to a detailed, intuitive account of the modeling to follow and its main results.

### Political Threats

The basic selectorate model characterizes the policies leaders adopt to survive normal everyday challenges by rivals under the existing institutions. Other threats seek both to remove the incumbent and simultaneously to recast political institutions, that is, the sizes of  $W$  and  $S$ . In particular, the masses, through revolution, hope to create a

large  $W$  system and/or become part of a new winning coalition. Coups are perpetrated by members of a subset of the winning coalition who hope to benefit from the heightened private benefits associated with a contraction in  $W$ . Here we discuss these threats and provide informal intuitions for the argument to follow.

**Coups.** Coup threats come from within the winning coalition. A successful coup means that a subset of the elites who before the coup were part of the incumbent's winning coalition have seized power and have deposed the incumbent leader. There are two incentives for supporting a coup in the logic of the expanded selectorate model. First, coup plotters propose a contraction in coalition size and as drastic a contraction in selectorate size as is politically feasible. Such institutional shifts provide concentrated private goods for those who support the coup (as a result of the contraction in  $W$ ) and reduce the risk that those who initially support the coup are subsequently replaced (contracting  $S$  as much as possible to maximize  $W/S$ , the probability of long-term retention in the coalition). To mitigate this incentive for a coup, leaders need to reward their supporters sufficiently well that they prefer to remain within the leader's coalition of loyal backers rather than gamble on receiving greater private goods but with the risk of subsequently being replaced by the coup plotter. *Coup threats can force incumbents to provide their supporters with greater rewards than selectorate competition alone dictates. Successful coups can be expected to increase  $W/S$  while decreasing  $S$ .*

When an incumbent is in trouble, her backers have a second incentive to support a coup. In a small coalition system, the high provision of private goods means that coalition members are highly privileged relative to the rest of society and consequently have a vested interest in preserving the current system. Under normal circumstances, this interest in the status quo makes supporters loyal. However, if supporters perceive that the incumbent can no longer sustain the current system, then their loyalty diminishes as they seek alternative means to preserve the privilege they currently enjoy. Expectations of a successful revolution or a decline in the leader's health provide the impetus for otherwise content backers to support a coup. Supporting a coup is risky, but as the current system crumbles, the incumbent can no longer reliably promise private goods. The threat of a coup is heightened when other deposition risks mean the incumbent is unlikely to be able to sustain the current system. *Ill-health, revenue failures, and revolutionary threats undermine coalition loyalty and make coups more likely.*

**Revolutions.** Revolutions are defined as efforts by the masses ( $N - S$ ) to depose the incumbent leader and alter the governance institutions. In large coalition systems, the masses get the policies they want and so have little incentive to rebel. In contrast, small coalition systems provide few public goods and so the masses desire change. However, simply wanting change is not the same as being able to enact change. In small coalition systems, coalition members are highly privileged and have a vested interest in preserving the system. So under normal circumstances, elites are prepared



to suppress any uprising and, under the expectation of such suppression, the masses remain passive.

Coalition loyalty ensures rebellion is suppressed and the masses don't take to the streets. Things unravel for the leader if she allows the people to coordinate by providing those public goods that facilitate public assembly, free speech, and free press or if coalition loyalty slips due to an external shock such as declining health. As illustrated by the opening case of the Shah, when the leader is no longer a reliable source of graft, supporters will no longer protect the leader from the people, and the people, no longer fearing suppression, rebel. *Hence, the probability of rebellion increases as the health of the leader declines or revenue declines or repression declines or when coordination goods increase.*

In the absence of a mistake by the leader, such as not paying supporters enough or allowing the masses to coordinate, an autocrat can generally survive. The willingness of her supporters to suppress rebels stymies revolution and her ability to credibly deliver private goods gives her an incumbency advantage over internal rivals and coup plotters. Yet, shocks can undermine her ability to survive.

## Shocks

We consider three forms of shocks. (1) Policy shocks make a leader unpopular relative to challengers. Economic decline is one such example. (2) Revenue shocks, such as economic recession or sanctions, diminish the resources available for rewards. (3) Health shocks, such as illness or assassination attempts, reduce the incumbency advantage. Large coalition leaders are sensitive to all three forms of shocks. In contrast, small coalition autocratic leaders are relatively immune to the first two shocks, but they are particularly sensitive to health shocks.

In large coalition systems, leaders have only a small incumbency advantage. As a result, the budget is tight. If leaders need to compensate large numbers of supporters for policy failure or there is a budget shortfall, democratic leaders cannot match the offers of rivals and are deposed. Autocrats survive policy and revenue shocks more easily as fewer supporters need to be compensated for policy failure and there is considerable slack in their budget constraint. But small coalition leaders are particularly sensitive to health shocks. Autocrats generate their incumbency advantage over rivals via their ability to credibly commit to deliver future private goods, but such a commitment evaporates once they are expected to die.

## Survival

Simply considering the effects of shocks, coup or revolutionary threats in isolation is insufficient to understand the challenge they present to leaders. As eluded to above, shocks that reduce coalition loyalty increase the risk of revolution. Similarly, if supporters suspect that a leader is in trouble because of a health shock, severe budget shock, or revolutionary threat, then they may preemptively depose the leader or plot

a coup. To model these interactions, we will assume that in the initial period of punctuated threats, the leader and the various components of society compete to alter their role and to modify institutions in expectation of the long-run rewards each group receives under different institutional configurations.

The game theoretic analysis is straightforward but tedious, as it involves many steps. Combating political threats from within the coalition and from the masses requires the leader to adapt her policies to satisfy a series of constraints. The analysis characterizes how a leader best meets these constraints under different institutional conditions. Shocks and threats require a leader to modify her policies from those described in the basic selectorate game that will be described in Proposition 1. The analysis applies to all institutional configurations. However, here it is useful to focus on a relatively small coalition system where the masses, if given the chance, would like to rise up. The analysis starts by characterizing the best threats that coup plotters and revolutionaries can offer and conditions under which supporters will suppress a rebellion. Lemma 1 and Proposition 2 characterize optimal policies for a leader in the absence of a revolutionary threat. Such policies have the same mix of private and public goods as seen in the basic selectorate model; however, *the risk of coups and the impact of shocks mean that leaders need to provide an overall higher level of rewards. That is to say, leaders provide more of the same in response to shocks and coup. Revolutionary threats, however, cause leaders to shift both the amount and the mix of rewards.*

Although revolutions can arise when the masses are prepared to take on the regime's supporters (see the online Appendix), we focus on the case where revolution arises because coalition members are not prepared to suppress the masses. As will be characterized in Proposition 4, two strategies are open to a leader who face such revolutionary threats. A leader can expand the provision of public goods as a means of giving the masses what they want so that they no longer wish to rebel. Alternatively, a leader can contract the provision of public goods (making it harder for the masses to coordinate their revolt) and increase private rewards for coalition members such that the coalition has a greater vested interest in the regime and is therefore willing to suppress the masses, thereby forestalling the willingness of masses to take to the streets. All else equal, the former response is more attractive to leaders with initially relatively large coalitions and the latter strategy is preferred by initially more autocratic leaders. *Hence, a credible revolutionary threat implies public goods expansion and increase in  $W$ , if  $W$  is already relatively large. If  $W$  is initially relatively small, then the incumbent prefers to reduce public goods, increase her relative focus on private goods, and purge members of  $W$  to create a smaller coalition.*

*If shocks are large or the revolutionary threat is intense, then leaders cannot survive simply by shifting policy.* Budget constraints place a limit on the amount of benefits a leader can provide the masses or their supporters in a single period. *If benefits are insufficient to ameliorate the desire of masses for change or to buy coalition loyalty, then the leader will be deposed.* This deposition is as likely to be preemptive

either through selectorate competition or a coup as it is through revolution (Lemma 2). Under such circumstances, a leader may promise additional rewards in the future, but she is unable to commit to delivering them. Once the revolutionary threat diminishes, she will revert to providing no more than the minimal rewards required to survive in office. Any promise of extra rewards in the future simply is not credible. To commit to additional rewards in the future, leaders need to change institutions during the time of a political crisis that has been induced by a revolutionary threat, coup threat, or significant exogenous shock.

Propositions 5 and 6 will examine the choices leaders are expected to make in shifting governance institutions. In particular, the model examines contraction of the winning coalition through purges and expansion through democratization. Contraction of public goods solves the revolutionary problem by ensuring that the coalition is vested in the system and so is willing to suppress the masses. Public goods expansion ameliorates the desire of the masses for revolutionary change. Yet, neither institutional change is possible unless the coalition is willing to go along with it. Coalition members will defect to a rival unless the specific institutional changes adopted by a leader are in their interest. Hence, leaders are constrained not only to make institutional changes when faced with credible challenges but also to select those changes in such a way that their essential supporters go along with them.

Health shocks play a fascinating role in the desirability of purges and democratization. Obviously, those purged from the coalition never support a purge. Those retained following a purge can expect concentrated private benefits, but these rewards must be offset against the unpleasantness of participating in a purge of some of their fellow coalition members and the risk they incur of being out of the coalition in the future. Generally, purges are attractive to leaders because shrinking  $W$  improves their odds of future political survival. However, sickly leaders are more concerned with their immediate welfare than they are with future benefits and so are much less likely to engage in purges. Further, it is hard for leaders in ill-health to get their supporters to go along with a purge. Supporters naturally fear that after their leader dies, a new incumbent will reshuffle the coalition's membership, possibly excluding them. This risk is heightened when a leader is thought to be unlikely to survive for long. Hence, *sickly leaders are especially likely to be vulnerable to a coup d'état*. Conversely, purges are attractive to healthy leaders because by contracting  $W$  they make future survival easier (by decreasing  $W/S$ ). In contrast, while democratization generally makes future political survival more challenging for leaders, for a sickly leader future political survival is unlikely to be a serious concern, especially as compared to immediate political survival. Hence, the model indicates that *healthy leaders purge, while sickly leaders democratize*.

Now that we have explained the intuition behind our model's results and highlighted some of the potentially more interesting testable hypotheses, we proceed to flesh out these intuitions by presenting a modified selectorate game.

## Basic Selectorate Competition

Under the normal circumstances of everyday politics in which there are no shocks and no threats of coup or revolution, we describe an infinitely repeated game in which players have a common discount factor  $\delta$  and play the following stage game in every period:

1. The leader,  $\mathcal{L}$ , and the leader's political foe,  $\mathcal{F}$ , offer to provide  $g$  public and  $x$  private goods subject to the budget constraint:  $R \geq qg_L + Wx_L$  and  $R \geq qg_F + Wx_F$ , where the subscripts indicate which actor makes the offer.  $R$  indicates the resources available to a leader and  $q$  is the price of a unit of public goods while  $W$ , the coalition's size, is the implicit price of private goods.
2.  $\mathcal{L}$  forms a coalition of the  $W$  highest members of her affinity ordering and  $\mathcal{F}$  forms a coalition of size  $W$  that includes at least one member of  $\mathcal{L}$ 's coalition. Affinity orders define preferences over whom to include in  $W$  for  $\mathcal{L}$  and  $\mathcal{F}$ . These affinities are independent of explicit rewards to coalition members. Selectors learn the affinity ordering of a leader after he comes to power. Prior to coming to power, then,  $\mathcal{F}$  is disadvantaged because selectors do not yet know his highest affinity ordering and hence who will be included in his long-term coalition.
3. Selectors support either  $\mathcal{L}$  or  $\mathcal{F}$ .  $\mathcal{L}$  retains power if all of her coalition supports her. If any member of her coalition supports  $\mathcal{F}$ , then she is deposed. The chosen leader,  $\mathcal{L}$  or  $\mathcal{F}$ , implements their policies.
4. The chosen leader faces a mortality risk. With probability  $h$  she survives. With probability  $(1 - h)$ , the leader dies. For convenience, we refer to  $h$  as health, but the mortality risk might equally well be an assassination risk or any other risk of removal that is exogenous to the modeled political competition. If the leader dies, then a new leader assumes office.<sup>1</sup>
5. The affinity ordering of the leader is revealed (be she the incumbent, challenger, or leader who inherits office).

Coalition members, selectors, and the masses receive a per period payoff of  $u(g)$  associated with the provision of  $g$  public goods. For analytical convenience, we utilize the logarithmic utility function  $u(g) = \ln(g)$ . We assume a linear utility function for private goods so members of the winning coalition receive benefits worth  $x$ . A leader receives a payoff of  $\Psi$  for holding office plus a linear benefit for any resources not spent on public or private goods.

We now characterize the stationary pure strategy symmetric subgame perfect equilibrium of the game in weakly undominated strategies.

**Proposition 1:** Under long-run selectorate competition, in every period the incumbent produces  $g_L = g^* = \frac{W}{q}$  public goods and offers  $x_L = x^* = \frac{(R-W)S(1-h\delta)}{W(S-h\delta W)}$

private goods to the  $W$  highest selectors in her affinity ordering. Foe  $\mathcal{F}$  offers  $g_F = \frac{W}{q}$  public goods and offers  $x_F = \frac{R}{W} - 1$  private goods to a coalition of size  $W$  that includes at least one member of the incumbent's coalition. Members of the incumbent's coalition support the incumbent if and only if,

$$u(g_L) + x_L + \delta \left( hV_w + (1-h) \frac{W}{S} V_w + (1-h) \frac{S-W}{S} V_s \right) \geq u(g_F) + x_F + \delta \left( \frac{W}{S} V_w + \frac{S-W}{S} V_s \right); \quad (1)$$

otherwise they support the alternative leader, where

$$V_w = \frac{1}{W} \frac{S(R-W)}{S-h\delta W} + \frac{\delta}{1-\delta} \frac{R-W}{S-h\delta W} (1-h) + \frac{1}{(1-\delta)} \ln \frac{W}{q} \quad (2)$$

is the continuation value for members of the winning coalition and

$$V_s = \frac{\delta}{1-\delta} \frac{R-W}{S-h\delta W} (1-h) + \frac{1}{(1-\delta)} \ln \frac{W}{q} \quad (3)$$

is the continuation value for selectors outside of the winning coalition. The net present value of the private goods received by coalition members relative to selectors is  $Z = V_w - V_s = \frac{1}{W} \frac{S(R-W)}{S-h\delta W}$ . The incumbent's continuation value is

$$V_L = \left( \frac{\Psi + R - W}{1 - \delta h} - S \frac{R - W}{S - h\delta W} \right) \quad (4)$$

where  $\Psi$  denotes the value the incumbent attaches to remaining in office.

**Proof.** Suppose there exists a subgame perfect equilibrium in which the incumbent plays  $g^*$  and  $x^*$  in every period and is reselected by her coalition.

Given these policies the continuation value for anyone who starts the game in the winning coalition is

$$V_w = u(g^*) + x^* + \delta \left( hV_w + (1-h) \frac{W}{S} V_w + (1-h) \frac{S-W}{S} V_s \right). \quad (5)$$

The rewards  $u(g^*) + x^*$  correspond to the payoffs in the immediate period; the three components in  $\delta(hV_w + (1-h) \frac{W}{S} V_w + (1-h) \frac{S-W}{S} V_s)$  correspond, respectively, to the situation in which (1) the leader survives (in which case the coalition member get  $V_w$  next period); (2) the leader dies, but her replacement retains the previous leader's supporter; and (3) the leader dies, and the new leader excludes the deceased leader's supporter (which has a continuation value of  $V_s$ ).

Analogously, the continuation value for a selector outside of the coalition is

$$V_s = u(g^*) + \delta \left( hV_s + (1-h) \frac{W}{S} V_w + (1-h) \frac{S-W}{S} V_s \right). \quad (6)$$

The continuation value of incumbent,  $V_L$ , is the value of office holding  $\Psi$  plus revenues  $R$  less expenditures  $qg^* + Wx^*$  plus the discounted value of continuing into the next period (factoring in the health risk):

$$V_L = \Psi + R - qg^* - Wx^* + \delta hV_L. \quad (7)$$

The best offer the challenger can make is to spend all possible resources:  $\max u(g_F) + x_F$  subject to the budget constraint  $qg_F + Wx_F \leq R$ . This optimization can be rewritten as  $\max u(g_F) + \frac{R - qg_F}{W}$  since the challenger can do no better than spend everything. Standard optimization implies  $g_F^* = \frac{W}{q}$  and  $x_F^* = \frac{R-W}{W}$ .

Should the political foe come to power his affinity profile will be revealed and in the next period he will select the  $W$  highest affinity selectors. Hence, any selector in the current coalition who is offered private goods by the challenger has an expected value for backing  $\mathcal{F}$  that is equal to

$$u(g_F^*) + x_F^* + \delta \left( \frac{W}{S} V_w + \frac{S-W}{S} V_s \right). \quad (8)$$

If in the immediate period the incumbent offers policies  $g_L$  and  $x_L$ , then the value to her coalition of retaining her is

$$u(g_L) + x_L + \delta \left( hV_w + (1-h) \frac{W}{S} V_w + (1-h) \frac{S-W}{S} V_s \right). \quad (9)$$

To survive the incumbent ensures that expression (9) is at least as large as expression (8), hence the incumbency constraint vis-à-vis  $\mathcal{F}$ 's challenge is

$$\begin{aligned} u(g_L) + x_L &\geq u(g_F^*) + x_F^* + \delta \left( \frac{W}{S} V_w + \frac{S-W}{S} V_s \right) \\ &\quad - \delta \left( hV_w + (1-h) \frac{W}{S} V_w + (1-h) \frac{S-W}{S} V_s \right). \end{aligned} \quad (10)$$

The first order conditions (FOC) for minimizing expenditure implies that if  $\mathcal{L}$  spends  $M$  resources, then  $g_L = \frac{W}{q}$  and  $x_L = \frac{M}{W} - 1$ . By the assumption  $R > W$ , there is spending on both private and public goods. By stationarity, if  $g_L = \frac{W}{q}$  and  $x_L = \frac{M}{W} - 1$  are optimal policies in the current period given optimal policies  $g^*$  and  $x^*$  in future periods, then  $g_L = g^* = \frac{W}{q}$  and  $x_L = x^* = \frac{M}{W} - 1$ . Hence, solving equations (5), (6), and (10) yields that the incumbent spends  $M = \frac{(1-h\delta)SR + h\delta W(S-W)}{S-h\delta W} < R$ , offers policies and continuation values given in the proposition. ■

Proposition 1 characterizes policy choice and hence the welfare of actors under different institutional configurations. Actors can improve their well-being by either shifting their role in society—by for example joining the winning coalition—or by causing a shift in institutions. As a background to understanding the political changes people want to enact, we next characterize the welfare of each group in society.

Each component of society, that is, leaders, coalition members, selectorate members, and the disenfranchised, must choose their actions by comparing their payoffs under alternative actions. As a first step in developing how these choices are made, we must consider the expected flow of benefits each member of society gets from normal selectorate competition under different institutional arrangements. We now characterize these continuation values, that is, their long-term expected flow of benefits in the absence of institutional change.

The continuation value for selectors outside of the winning coalition is  $V_s = V_s(W, S) = \frac{1}{(1-\delta)} \ln \frac{W}{q} + \frac{\delta}{1-\delta} \frac{R-W}{S-h\delta W} (1-h)$ . We introduce the notation  $V_s(W, S)$  to indicate the dependence on institutions. This expected value has two components, namely, public goods and the prospects of gaining private goods in a future coalition. Although the level of private goods declines as  $W$  increases, access to future private goods depends upon the ratio  $W/S$  and the risk of leader death  $(1-h)$ . Like the masses, selectors prefer large  $W$  and small  $S$  systems. Further, they are unlikely to toast the King's health, as their welfare decreases in  $h$ . They prefer leaders who face a high risk of dying; *assassins are generally drawn from the selectorate*.

The institutional preferences of the incumbent's supporters are  $V_w = V_w(W, S) = \frac{1}{W} \frac{S(R-W)}{S-h\delta W} + \frac{\delta}{1-\delta} \frac{R-W}{S-h\delta W} (1-h) + \frac{1}{(1-\delta)} \ln \frac{W}{q}$ . The winning coalition's welfare differs from that of selectors by  $Z = Z(W, S) = V_w - V_s$ , which is the net present value of immediate access to private goods. The value of these private goods increases as the coalition contracts, so coalition members value small coalition systems. As  $W$  expands these concentrated benefits are diluted as resources become shared by more people. However, as Figure 1 shows, the coalition's payoff is non-monotonic in  $W$ . The sources of this nonmonotonicity play a key role in institutional change. In particular, two elements shape the welfare for members of  $W$  as the size of  $W$  increases.

Finally the incumbent's continuation payoffs are  $V_L = V_L(W, S) = \left( \frac{R+W}{1-\delta h} - S \frac{R-W}{S-h\delta W} \right)$ . Leaders prefer small coalition, large selectorate systems. When the ratio  $W/S$  is small, the leader's incumbency constraint can be met at a lower cost relative to total revenue. Leaders prefer small  $W$ , large  $S$  rigged electoral systems in which competitors for power are strongly disadvantaged.

## Selectorate Competition With Coups and Revolutions

The modified game in period  $t = 0$  is:

- (a) Players learn the policy shock  $\Delta \varepsilon$ , budget shock  $R_0$ , and health shock  $h_0$ .

- (b) Subject to the budget constraint, the incumbent, foe, and coup plotters offer policies consisting of allocations of public and private goods. In particular, the incumbent leader,  $\mathcal{L}$ , offers public policy  $g_L$  and private goods  $x_L$  to a coalition of  $W$  selectors drawn from the highest affinity selectors. Foe,  $\mathcal{F}$ , offers public goods  $g_F$  and private goods  $x_F$  to a coalition of size  $W$  that includes at least one member of the incumbent's coalition. The coup plotter,  $\mathcal{C}$ , offers public goods  $g_c$  and private goods  $x_c$  to a subset of  $W_c$  members of the winning coalition.
- (c) Selectors decide whether to support the incumbent  $\mathcal{L}$  or foe  $\mathcal{F}$ . If all members of the incumbent's coalition support  $\mathcal{L}$ , then the incumbent survives; otherwise  $\mathcal{F}$  becomes the new leader, and the period ends with the revelation of  $\mathcal{F}$ 's affinities (see step [h]).
- (d) If the incumbent survives the selectorate threat, then the members of  $W_c$  decide whether to initiate a coup. If all members of  $W_c$  support the coup, then the coup succeeds, members of  $W_c$  pay a cost  $c$ ,  $\mathcal{C}$  becomes the new leader, institutions become  $W_c$  and  $S_c$ , and the period ends with the revelation of  $\mathcal{C}$ 's affinities (see step [h]).
- (e) The masses ( $N-S$ ) decide whether to rebel.
- (f) If the masses rebel, then members of the coalition decide whether to suppress the revolution at a cost of  $\sigma$ . If all coalition members suppress, then the masses pay the cost  $2k$ , and the revolution succeeds with probability  $\rho$ , which, as described more fully below, depends upon public goods. If the revolution is not suppressed, then the masses pay a lower cost of  $k$ , and the revolution succeeds.<sup>2</sup> The payoff for a successful revolution is  $\theta$  for all the people and the game ends.
- (g) If the incumbent leader is in power, then she dies with probability  $(1 - h_0)$ . If the leader dies, then a replacement leader is picked.
- (h) The affinity ordering of the leader in power is revealed and long-run selectorate competition proceeds under the then current institutions, as described by Proposition 1.

The basic description of the modified game form does not yet specify all the details. Below, we provide these details and derive the nature of different political depositions. Given the large number of moving parts, we place some restrictions on conditions, and we present each form of deposition separately and derive constraints that shape behavior in the overall game. We start by considering selectorate competition.

### Selectorate Competition

Subject to ensuring her survival, the incumbent's objective is to maximize her budget surplus, which given policies  $g_L$  and  $x_L$  and coalition size  $W$  is

$$\Lambda(g_L, x_L, W) = R_0 - qg_L - Wx_L.$$



Supposing for the moment that the incumbent does not attempt to alter coalition size and she is retained, the payoff to her supporters is

$$u(g_L) + x_L + \Delta\epsilon + \delta \left( V_s + \left( h_0 + (1 - h_0) \frac{W}{S} \right) Z \right). \quad (11)$$

This payoff is comprised of the immediate rewards of  $g_L$  and  $x_L$  and the economic shock  $\Delta\epsilon$  and future payoffs that depend upon the health risk,  $h_0$ . Supporters compare this level of rewards with what they anticipate they will receive from an alternative leader.

Borrowing extensively on the technology developed in the infinitely repeated game, the greatest credible offers a foe  $\mathcal{F}$  can make is

$$F = u(g_F^*) + x_F^* + \delta \left( \frac{W}{S} V_w + \frac{S - W}{S} V_s \right) = u \left( \frac{W}{q} \right) + \frac{R - W}{W} + \delta \left( V_s + \frac{W}{S} Z \right) \quad (12)$$

where  $g_F^* = \frac{W}{q}$  and  $x_F^* = \frac{R - W}{W}$  maximize  $u(g_F) + x_F$  subject to the budget constraint.

Comparing (11) with (12) provides a constraint on the incumbent. If she intends to survive selectorate competition, then

$$\text{select}(g_L, x_L, W) = u(g_L) + x_L + \Delta\epsilon - u \left( \frac{W}{q} \right) - \frac{R - W}{W} + \delta h_0 \frac{S - W}{S} Z \geq 0. \quad (13)$$

## Coup

Coup plotters also seek to come to power. They propose new leadership and a new coalition and selectorate sizes  $W_c$  and  $S_c$ , with each being a subset of the current winning coalition and selectorate. Given the budget constraint, the maximum rewards that plotters can offer in the immediate period is  $u(\frac{W_c}{q}) + \frac{R - W_c}{W_c}$  and perpetrating a coup costs its supporters  $c$ . Following a successful coup, institutions shift and the coup plotter's affinities are revealed. Under the coup's proposed institutions, supporters of the initial coup have a  $W_c/S_c$  chance of being retained in the postcoup coalition, which has a net present value of  $V_w(W_c, S_c)$ . With probability  $(1 - W_c/S_c)$ , initial supporters are reshuffled out of the long-run postcoup coalition. Hence, the largest expected reward a plotter can offer a potential supporter is

$$C = u \left( \frac{W_c}{q} \right) + \frac{R - W_c}{W_c} - c + \delta \left( \frac{W_c}{S_c} V_w(W_c, S_c) + \frac{S_c - W_c}{S_c} V_s(W_c, S_c) \right). \quad (14)$$

In order to attract supporters, a coup leader needs to pick institutions to maximize the expected benefits given by expression (14). This expression is decreasing in  $S_c$ ; hence, for any sized  $W_c$ , a coup leader should minimize  $S_c$ , which functionally means setting  $S_c = 2W_c$ . With  $S_c = 2W_c$ , the derivative of expression (14) with respect to  $W$  is  $\frac{-(2 - \delta - h\delta)R + W_c(2 - h\delta)}{W_c^2(1 - \delta)(2 - h\delta)}$ , so expression (14) has a nonmonotonic shape reminiscent of the  $U$ -shaped curve for  $V_w$  seen in Figure 1 with a minimum at

$W_c = \frac{R(2-\delta-\delta h)}{2-h\delta}$ . A coup plotter maximizes the attractiveness of a coup by minimizing the winning coalition size of the postcoup institutions and setting  $S_c = 2W_c$ . Obviously, a coup cannot succeed unless the combined strength of its supporters is sufficient to overcome resistance by the rest of the regime. Lacking an organizational theory of precisely how many supporters are needed for a coup to succeed we assume there is a minimum size for  $W_c$ . For simplicity, we assume that at this number of supporters, a coup succeeds if supported by all those in  $W_c$ . To minimize notation, let  $V_{w_c} = V_w(W_c, S_c)$ ,  $V_{s_c} = V_s(W_c, S_c)$ , and  $Z_c = V_{w_c} - V_{s_c}$ .

To survive against the threat of coup, the incumbent must offer her supporters at least as much as they anticipate under a coup. A comparison of (11) with (14) yields

$$\begin{aligned} \text{coup}(g_L, x_L, W) = & u(g_L) + x_L + \Delta\epsilon + \delta V_s + \delta \left( h_0 + (1 - h_0) \frac{W}{S} \right) Z \\ & - u\left(\frac{W_c}{q}\right) - \frac{R - W_c}{W_c} + c - \delta V_{s_c} - \delta \frac{W_c}{S_c} Z_c \geq 0. \end{aligned} \quad (15)$$

A necessary condition for internal leader survival is that, under institutions  $W$ , the incumbent's offer (11) is at least as large as the offer of the challenger (12) and of the coup plotter (14):

$$\begin{aligned} \text{Internal}(g_L, x_L, W) = & u(g_L) + x_L + \Delta\epsilon + \delta V_s + \delta \left( h_0 + (1 - h_0) \frac{W}{S} \right) Z \\ & - \max\{C, F\} \geq 0 \end{aligned} \quad (16)$$

where  $C = u\left(\frac{W_c}{q}\right) + \frac{R - W_c}{W_c} - c + \delta(V_{s_c} + \frac{W_c}{S_c} Z_c)$  and  $F = u\left(\frac{W}{q}\right) + \frac{R - W}{W} + \delta(V_s + \frac{W}{S} Z)$ . However, satisfying the selectorate and coup constraints is only a necessary condition for avoiding political deposition. Other threats, such as rebellion, cause supporters to reevaluate their support of  $\mathcal{L}$ .

## Rebellion

Consistent with the institutional preferences characterized earlier, the stated goal of revolution is to create an inclusive political system—that is, create a large  $W$  system—that provides the public goods-oriented policies that benefit everyone. However, rebels also have a private motivation. They want membership in the winning coalition. Some revolutions, such as the American Revolution, succeed in their stated goal of inclusiveness. Yet many others, such as the French and Russian Revolutions, result in changed, but still autocratic, institutions. Given the great social and economic upheavals associated with revolutions and their great variety of outcomes, we treat the value of a successful revolution as  $\theta$  for all members of society, whether they were previously coalition members, selectors, or disenfranchised.

While the romantic version of a revolution involves the people storming the barricades, in reality, many revolutions succeed because elites (and military elites in particular) desert the regime (Myerson, 2008). When the masses rebel, coalition members choose whether to suppress the rebellion or sit on their hands. If coalition members desert the regime, then the revolution succeeds and the masses, selectors, and former coalition members all receive payoff  $\theta$ . If coalition members suppress the revolution (at cost  $\sigma$ ), then the probability that the revolution succeeds is reduced to  $\rho(g_L)$ . With probability  $(1 - \rho(g_L))$ , the regime survives and the coalition members receive payoffs associated with the incumbent less the cost of suppression,  $\sigma$ . Comparing this payoff with  $\theta$  indicates that coalition members suppress rebellion if and only if

$$\text{suppress}(g_L, x_L, W) = -\sigma + (1 - \rho) \left( -\theta + u(g_L) + x_L + \Delta\varepsilon + \delta V_S + \delta \left( h_0 + (1 - h_0) \frac{W}{S} \right) Z \right) \geq 0. \quad (17)$$

We assume the probability of revolutionary success,  $\rho(g_L)$ , depends upon the level of public goods. Many public goods facilitate communication and coordination between potential revolutionaries (B. Bueno de Mesquita and Downs 2006). In their absence, it is hard for would-be rebels to coordinate their actions against the government. We assume  $\rho$  is a monotonic continuous, twice differentiable function of public goods.

The decision by the masses to rebel depends upon the coalition's willingness to suppress. If  $\text{suppress}(g_L, x_L, W) \geq 0$ , such that the coalition will suppress the rebellion, then the rebels decision depends upon a comparison of the expected value of revolution  $-2k + \rho(g_L)\theta + (1 - (\rho(g_L))(u(g_L) + \Delta\varepsilon + \frac{\delta}{1-\delta}u(g^*)))$  and the payoff to the masses under the incumbent's rule  $u(g_L) + \Delta\varepsilon + \frac{\delta}{1-\delta}u(g^*)$ . The masses rebel only if  $\text{rebelS}(g_L, W) < 0$ , where

$$\text{rebelS}(g_L, W) = 2k + \rho(g_L) \left( u(g_L) + \Delta\varepsilon + \frac{\delta}{1-\delta}u(g^*) - \theta \right) \quad (18)$$

The constraint  $\text{rebelS}(g_L, W)$  depends upon institutions, as these shape the rewards the masses can expect in the future (through  $g^*(W) = W/q$ ) and the current level of public goods,  $g_L$ .

In circumstances where the coalition would not suppress the revolution,  $\text{suppress}(g_L, x_L, W) < 0$ , rebellion succeeds and gives the masses a payoff of  $\theta - k$ . Comparing this payoff with their rewards under the incumbent's rule implies that when  $\text{suppress}(g_L, x_L, W) < 0$ , the masses rebel if  $\text{rebelNS}(g_L, W) < 0$ , where

$$\text{rebelNS}(g_L, W) = k + u(g_L) + \Delta\varepsilon + \frac{\delta}{1-\delta}u(g^*) - \theta \quad (19)$$

Again this constraint depends on the long-run policies under institution  $W$  and the current rewards,  $g_L$ .

## Politics Absent Rebellion

Here we characterize politics when there is no threat of rebellion and when leaders do not attempt to change institutions. In particular, we characterize the subgame perfect equilibrium in weakly undominated strategies, given that play in subsequent periods is characterized by Proposition 1. Our first result examines the politically optimal mix of public and private goods to satisfy internal coalition constraints.

**Lemma 1.** The policies that maximize the budget surplus and satisfy (16) are

$$g_0 = \frac{W}{q} \text{ and } x_0 = -u\left(\frac{W}{q}\right) - \Delta\varepsilon - \delta V_s - \delta \left( h_0 + (1 - h_0) \frac{W}{S} \right) Z + \max\{C, F\}. \quad (20)$$

**Proof.** The incumbent's program is  $\min_{g,x} qg + Wx$  subject to  $u(g) + x + Y = 0$ , where  $Y = \Delta\varepsilon + \delta(V_s + (1 - (1 - h_0)\frac{S-W}{S})Z) - \max\{C, F\}$ . The result follows from standard constrained maximization techniques, in a manner akin to those in Proposition 1. ■

The policies  $g_0$  and  $x_0$  are just enough to buy the support of coalition members against foes and coup plotters.

**Definition 1.** Given policies  $g_0$  and  $x_0$ , we define the institutions in which revolutionary threats exist as

$$\mathcal{W}^{RT} = \{W : \text{either } (\text{suppress}(g_0, x_0, W) < 0 \text{ and } \text{rebelS}(g_0, W) < 0) \\ \text{or } \text{rebelNS}(g_0, W) < 0\}. \quad (21)$$

Given coalition size  $W$  and policies  $g$  and  $x$ , the leader's budget surplus in the immediate period is  $\Lambda(g, x, W) = R_0 - qg - Wx$ .

**Proposition 2:** If  $W \notin \mathcal{W}^{RT}$  and  $\Lambda(g_0, x_0, W) \geq 0$ , then in the immediate period the incumbent  $\mathcal{L}$  proposes  $g_L = g_0$  and  $x_L = x_0$ , the incumbent survives political deposition (although they could die) and no revolution occurs.

If  $\Lambda(g_0, x_0, W) < 0$ , then the incumbent cannot survive in office.

**Proof.** The leader's programming problem is  $\max_{g_L, x_L} (R - qg_L - Wx_L)$  subject to  $\text{select}(g_L, x_L) \geq 0$  and  $\text{coup}(g_L, x_L) \geq 0$ . From Lemma 1,  $g_0$  and  $x_0$  solve this problem. Given that  $W \notin \mathcal{W}^{RT}$ , at these policies no revolution occurs. Provided these policies are feasible ( $\Lambda(g_0, x_0, W) \geq 0$ ), the incumbent survives. If  $\Lambda(g_0, x_0, W) < 0$ , then the leader has insufficient resources to match the best possible offer of a coup plotter or foe and is deposed. ■

Next, we examine how institutions shape a leader's ability to withstand shocks.

### Political Impact of Shocks

Suppose there is no revolutionary threat and the selectorate constraint binds. The incumbent's budget surplus in the initial period is  $\Lambda(g_0, x_0, W) = R_0 - qg_L - Wx_L = R_0 - R + W\Delta\epsilon + h_0\delta \frac{(R-W)(S-W)}{(S-h\delta W)}$ . Standard calculus yields:

**Proposition 3:**  $\frac{d\Lambda(g_0, x_0, W)}{dW} = \Delta\epsilon - h_0\delta \frac{RS(1-\delta h) + S(S-2W) + h\delta W^2}{(S-h\delta W)^2}$ ;  $\frac{d\Lambda(g_0, x_0, W)}{d\Delta\epsilon} = W$ ;  
 $\frac{d\Lambda}{dR_0} = 1$ ;  $\frac{d\Lambda(g_0, x_0, W)}{dh_0} = \delta \frac{(R-W)(S-W)}{(S-h\delta W)}$ ; and  $\frac{d^2\Lambda(g_0, x_0, W)}{dWdh_0} =$   
 $-\delta \frac{RS(1-\delta h) + S(S-2W) + h\delta W^2}{(S-h\delta W)^2} < 0$ .

When the coup constraint binds, the results are more complicated, but the intuitions are similar. The budget surplus is smaller in large coalition systems so leaders in such systems are more vulnerable to shocks. Although the impact of a budget shock ( $R_0 < R$ ) is the same for all leaders, large coalition leaders have less slack with which to compensate and so face a greater risk of being removed than their more autocratic counterparts. Policy shocks ( $\Delta\epsilon < 0$ ), such as economic loss due to a recession, are worse for large coalition leaders. Incumbents need to compensate each supporter for the policy loss, and more supporters means more overall compensation. As the number of supporters rises, the cost of this compensation can overwhelm an already tight budget for a large coalition leader. Only with respect to health shocks do large coalition leaders fare well compared to small coalition counterparts. As her health declines, the ability of an incumbent to promise future private goods diminishes. In large coalition systems, private goods are relatively less important than in small coalition systems. The credible assurance of future private goods is the basis of the autocrat's incumbency advantage and ill-health undermines this advantage.

Zimbabwe's Robert Mugabe exemplifies the relative resilience of small coalitions to shocks. Since becoming leader in 1980, he has run the economy into the ground with seeming impunity. According to the World Bank's World Development Indicators, between independence in 1980 and 2013, gross domestic product has fallen from US\$633 per head to US\$430. He survives because he credibly delivers private goods to his supporters. However, he is aging and his supporters must know he cannot last forever. So far, however, he appears to defy his age. At his ninetieth birthday celebration, perhaps conscious of keeping  $h$  high, he appeared spritely and stated that "I feel as youthful and energetic as a boy of nine (<http://www.bbc.com/news/world-africa-26314918>)."

Health concerns are also particularly important in triggering revolutionary threats in small coalition systems because they diminish the coalition's willingness to suppress rebellion. It is to the topic of rebellion that we now turn.

## Politics in the Face of Rebellion

Rebellion requires both that those outside the winning coalition desire a change and that there is a means to implement such change. Shocks increase revolutionary pressures in several ways. Policy shocks reduce the masses' satisfaction with the regime, making revolutionary change relatively more attractive. Budget shocks harm a leader's ability to pay supporters to put down rebellion. However, for small coalition leaders, health shocks are perhaps the greatest danger in terms of triggering rebellion. In 1979, the Shah of Iran fell because the military was no longer willing to suppress the masses. Similar fates befell Ferdinand Marcos in the Philippines in 1986 and Mobutu Sese Seko in Zaire in 1997. Each had the same political problem; they were mortally ill and their supporters deserted them, refusing to put down rebellion. Supporters are only prepared to suppress the masses when their interests are served by preserving the current regime. When the leader is sick, she can no longer promise access to future private goods.<sup>3</sup>

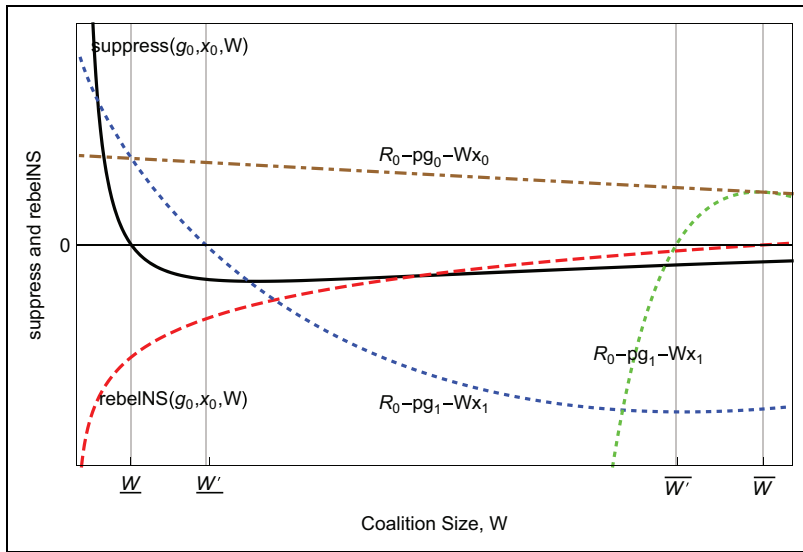
### *Revolutionary Threats and Coalition Concerns*

For pedagogical purposes, it is useful to examine the out of equilibrium policies  $g_0$  and  $x_0$  characterized in Proposition 2. These policies are just sufficient to buy off selectorate and coup threats. When faced with a revolutionary threat, however, more rewards are required to retain support from coalition members; otherwise they depose the incumbent.

**Lemma 2.** Suppose coalition members value extant institutions ( $V_w > \theta$ ) and a revolutionary threat exists,  $W \in \mathcal{W}^{RT}$ ; if the incumbent leader provides policies  $x_0$  and  $g_0$ , then either coalition members defect to  $\mathcal{F}$  or a coup occurs.

**Proof.** If the incumbent sets  $g_L = g_0$  and  $x_L = x_0$  then  $\text{select}(g_L, x_L, W) \geq 0$  and  $\text{coup}(g_L, x_L, W) \geq 0$  and one of these constraints binds with equality. Suppose the former constraint binds, so  $\text{select}(g_0, x_0, W) = 0$  implies that the value of retaining  $\mathcal{L}$  is the same as the value of choosing  $\mathcal{F}$ , which is greater than  $\theta$ :  $u(g_0) + x_0 + \Delta\epsilon + \delta V_s + \delta Z(h_0 + (1 - h_0)\frac{W}{S}) = u(\frac{W}{q}) + \frac{R-W}{W} + \delta V_s + \delta \frac{W}{S}Z = V_w > \theta$ . Supporters guarantee themselves at least  $V_w$  rewards (and more if the coup constraint binds) by deposing their leader. If they keep the leader, then, given the revolutionary threat, supporters' payoffs are either  $\theta$ —if the revolution is not suppressed—or less than  $V_w - \sigma$  (the latter payoff corresponds to the successful suppression of the revolt). Since revolution results in a lower payoff than deposition, the leader is deposed. ■

Absent a revolutionary threat,  $\mathcal{L}$  pays supporters just enough to prevent their defection to a coup plotter or foe. Such rewards are insufficient to keep their supporters loyal when a rebellion arises because supporters will be required to suppress the masses to ensure the regime's survival. Unless  $\mathcal{L}$  pays the coalition more or removes the revolutionary threat, the incumbent's supporters are better off dumping her.



**Figure 2.** Unsuppressed revolutionary threats.

### Policy Responses to Revolutionary Threats

Rebellion arises under two contingencies: (1) The masses rebel when they anticipate that coalition members will not stop them:  $\text{rebelNS}(g_0, W) < 0$  and  $\text{suppress}(g_0, x_0, W) < 0$  or (2) The masses can rebel even though they anticipate the coalition will suppress them:  $\text{rebelS}(g_0, W) < 0$ . Due to space considerations, we focus here mainly on the former case and derive  $\mathcal{L}$ 's policy response. We consign the analysis of suppressed revolutions to the Appendix.

**Unsuppressed revolutions.** Figure 2 illustrates the onset of a revolution that is not suppressed. When we say a revolution is not suppressed we mean that the revolution only occurs because the coalition is unwilling to suppress:  $\text{rebelNS}(g_0, W) < 0 \leq \text{rebelS}(g_0, W)$  and  $\text{suppress}(g_0, x_0, W) < 0$ . The thick solid line plots  $\text{suppress}(g_0, x_0, W)$  against coalition size. It is reminiscent of the U-shaped  $V_w$  curve seen in Figure 1. This similarity is unsurprising since  $\text{suppress}$  is effectively  $V_w - \theta$  multiplied by  $(1 - \rho)$  and minus  $\sigma$ . The  $(1 - \rho)$  term flattens the right tail of  $V_w - \theta$  because public goods increase as  $W$  increases. Provided that  $\text{suppress} \geq 0$  (and  $\text{rebelS}(g_0, x_0, W) \geq 0$ ), the masses do not rebel as they anticipate suppression. In Figure 2, when the coalition is smaller than  $W$ , there is no revolutionary threat. In such small coalitions, supporters strongly value the regimes continuance, and, once suppressed, the rebellion is unlikely to succeed.

The thick dashed line plots the increasing curve  $\text{rebelNS}(g_0, x_0, W)$ , which is the value of rewards from the incumbent minus the value of revolution ( $\theta$ ) and the cost

of revolution ( $k$ ). Leaders in large coalition systems generate lots of the public goods that the masses value: the people have no desire to rebel even if they are certain to succeed. In Figure 2, once coalition size is above  $\overline{W}$ , there is no revolutionary threat as the masses do not want to rebel even though they would certainly succeed. At intermediate values of  $W$  between  $\underline{W}$  and  $\overline{W}$ , if the leader simply provided the policies that satisfy the internal coalitional constraints  $(g_0, x_0)$ , then the masses would rebel and so the coalition would preemptively depose  $\mathcal{L}$ .

Revolutionary threats force leaders to either work harder to provide their supporters with additional rewards such that they value the continuance of the regime sufficiently that they are willing to suppress the revolution or leaders try to buy off the masses such that they no longer wish to pursue revolutionary change. That is to say, to survive the incumbent needs to shift policy such that either  $\text{suppress}(g_L, x_L, W) \geq 0$  or  $\text{rebelNS}(g_0, W) \geq 0$ .

Given  $\text{suppress}(g_0, x_0, W) < 0$ ,  $\text{rebelNS}(g_0, W) < 0$ , and  $\text{rebelS}(g_0, W) > 0$ , let  $g_1, x_1, g_2$  and  $x_2$  solve  $g_1 = \frac{W}{q + \frac{p_g(g_1)W\sigma}{(1-p(g_1))^2}}$  and  $x_1 = \frac{\sigma}{1-p(g_1)} + \theta - u(g_1) - \Delta\varepsilon - \delta V_S -$

$$\delta Z \left( h_0 + (1 - h_0) \frac{W}{S} \right)$$

and

$$g_2 = e^{(\theta - k - \Delta\varepsilon - \frac{\delta}{1-\sigma}u(g^*))} > g_0 \text{ and } x_2 = \max\{C, F\} - u(g_2) - \Delta\varepsilon - \delta V_S - \delta Z \left( h_0 + (1 - h_0) \frac{W}{S} \right),$$

where  $C$  and  $F$  are given by equations (14) and (12).

**Proposition 4:** Consider the revolutionary threat where  $\text{suppress}(g_0, x_0, W) < 0$ ,  $\text{rebelNS}(g_0, W) < 0$  and  $\text{rebelS}(g_0, W) > 0$ , and  $\text{rebelS}(g_1, W) \geq 0$ . The incumbent leader sets policy to either  $(g_1, x_1)$  or  $(g_2, x_2)$ .

**Corollary 1.**  $g_1 < g_0$  and  $x_1 > x_0$  and  $g_2 > g_0$ . If  $\max\{\Lambda(g_1, x_1, W), \Lambda(g_2, x_2, W)\} < 0$ , then there are no policies that enable leader survival at coalition size  $W$ . The policies  $(g_1, x_1)$  and  $(g_2, x_2)$  reduce the budget surplus relative to  $(g_0, x_0)$ :  $\Lambda(g_0, x_0, W) > \Lambda(g_1, x_1, W), \Lambda(g_2, x_2, W)$ .

**Proof.** To guarantee survival in office, the incumbent needs to pick policies  $x_L, g_L$  such that, in addition to  $\text{select}(g_L, x_L, W) \geq 0$  and  $\text{coup}(x_L, g_L, W) \geq 0$ , she must satisfy either  $\text{suppress}(g_L, x_L, W) \geq 0$  and  $\text{rebelS}(g_L, W) \geq 0$  or  $\text{rebelNS}(g_L, W) \geq 0$ . There are two solutions to this problem. First, satisfy  $\text{suppress}(g_L, x_L, W) \geq 0$  such that the coalition suppress any rebellion, and, second, satisfy  $\text{rebelNS}(g_L, W) \geq 0$  such that the masses no longer want to rebel. We consider each in turn:

Case 1: The incumbent's programming problem is  $\max_{x_L, g_L} R_0 - qg_L - Wx_L$  subject to  $\text{suppress}(g_L, x_L, W) \geq 0$ . Using standard constrained maximization



techniques, we form a Lagrangian and find FOCs (throughout we omit the Second Order Condition [SOC]):

$$L = R_0 - qg_L - Wx_L + \zeta_1 \left( -\sigma + (1 - \rho(g_L)) \left( -\theta + u(g_L) + x_L + \Delta\varepsilon + \delta V_S + \delta Z \left( h_0 + (1 - h_0) \frac{W}{S} \right) \right) \right)$$

FOCs:  $L_{\zeta_1} = 0$  implies  $-\sigma + (1 - \rho(g_L))(-\theta + u(g_L) + x_L + \Delta\varepsilon + \delta V_S + \delta Z(h_0 + (1 - h_0) \frac{W}{S})) = 0$ ,  $L_{g_L} = -q + \zeta_1((1 - \rho(g_L))u'(g_L) - \zeta_1 \rho_g(g_L)(-\theta + u(g_L) + x_L + \Delta\varepsilon + \delta V_S + \delta Z(h_0 + (1 - h_0) \frac{W}{S}))) = 0$ , and  $L_{x_L} = -W + \zeta_1((1 - \rho(g_L)) = 0$ . From  $L_{x_L}$ ,  $\zeta_1 = \frac{W}{1 - \rho(g_L)}$ , and from  $L_{\zeta_1}$ ,  $(-\theta + u(g_L) + x_L + \Delta\varepsilon + \delta V_S + \delta(1 - (1 - h_0) \frac{S - W}{S})Z) = \frac{\sigma}{1 - \rho(g_L)}$ . Therefore, we write  $L_{g_L}$  as

$$L_{g_L} = -q + \frac{W}{g_L} - \frac{\rho_g(g_L)W\sigma}{(1 - \rho(g_L))^2} = 0$$

which implies  $g_L = \frac{W}{q + \frac{\rho_g(g_L)W\sigma}{(1 - \rho(g_L))^2}}$  and  $x_L = \frac{\sigma}{1 - \rho(g_L)} + \theta - u(g_L) - \Delta\varepsilon - \delta V_S - \delta Z(h_0 + (1 - h_0) \frac{W}{S})$ . These are the solutions labeled  $g_1, x_1$ .

Case 2: Suppose instead the incumbent improves the masses' payoffs so they do not rebel ( $\text{rebelNS}(g_L, W) \geq 0$ ) and pays the coalition enough to maintain its loyalty ( $\text{select}(g_L, x_L, W) \geq 0$  and  $\text{coup}(x_L, g_L, W) \geq 0$ ). Again we form a Lagrangian and show the FOC:  $L = R_0 - qg_L - Wx_L + \zeta_2(k + u(g_L) + \Delta\varepsilon + \frac{\delta}{1 - \delta}u(g^*) - \theta) + \zeta_3(x_L + u(g_L) + X)$ , where  $X = -\max\{C, F\} + \Delta\varepsilon + \delta V_S + \delta Z(h_0 + (1 - h_0) \frac{W}{S})$  with FOC  $L_{\zeta_2} = (k + u(g_L) + \Delta\varepsilon + \frac{\delta}{1 - \delta}u(g^*) - \theta) = 0$ ,  $L_{\zeta_3} = (x_L + u(g_L) + X) = 0$ ,  $L_{g_L} = -q + \zeta_2(u'(g_L)) + \zeta_3(u'(g_L)) = -q + \frac{\zeta_2}{g_L} + \frac{\zeta_3}{g_L} = 0$ , and  $L_{x_L} = -W + \zeta_3 = 0$ . From  $L_{x_L}$ ,  $\zeta_3 = W$  and from  $L_{\zeta_2}$ ,  $g_L = e^{(\theta - k - \Delta\varepsilon - \frac{\delta}{1 - \delta}u(g^*))}$  and  $x_L = -X - u(g_L)$ . We label these solutions  $g_2$  and  $x_2$ . ■

An incumbent has two approaches to ameliorating revolutionary threats. First, she can incentivize supporters to suppress the revolution (so the masses do not want to rise up in the first place) by increasing private rewards and contracting public goods. The logic for contracting public goods as part of this response is that it reduces the ability of the masses to coordinate and, since this enhances the coalition's chance of success, it incentivizes coalition members to suppress rebellion. Second, the incumbent can expand public goods such that even though the masses could succeed in a rebellion their demands are satiated without it.

Figure 2 indicates the expenditures associated with each response to rebellion. The relatively flat dot-dashed line labeled  $R_0 - qg_0 - Wx_0$  shows the incumbent's budget surplus absent a revolutionary threat. The decreasing dotted line labeled  $R_0 - qg_1 - Wx_1$  plots the budget surplus associated with enriching the coalition to incentivize them to suppress revolt. When  $W < \underline{W}$  no revolutionary threat exists because the coalition puts down any rebellion. As coalition size increases above  $\underline{W}$ , the incumbent deters revolt by a contraction of public goods and an increase in private rewards such that coalition members suppress revolt. However, if  $W$  increases beyond  $\underline{W}'$ ,  $R_0 - qg_1 - Wx_1$  is negative, indicating that the incumbent needs to provide more goods than she can afford in order to sustain herself in office. At this point, deposition becomes unavoidable.

The second response to an unsuppressed revolutionary threat is to buy off the masses with additional public goods that reduces their desire for institutional change. On the right-hand side of Figure 2, the increasing dotted line labeled  $R_0 - qg_2 - Wx_2$  illustrates the budget surplus associated with this approach. When  $W$  is greater than  $\overline{W}$ , the incumbent's policies for paying off the coalition already provide enough public goods to buy off the citizens. However, as  $W$  shrinks below  $\overline{W}$ , the incumbent needs to increase the public goods supply to reduce the desire of masses for revolutionary change. Unfortunately for her, once coalition size is below  $\overline{W}'$ , the incumbent needs to provide more public goods to buy off the revolutionary threat than she can afford and she cannot avoid deposition.

Thus far, we have considered revolutions that take place because the coalition is unwilling to suppress rebellion. However, revolutions can occur even if the coalition is willing to suppress rebels:  $\text{rebelS}(g_0, W) < 0$  and  $\text{suppress}(g_0, W) \geq 0$ . As above, the incumbent has two basic strategies. First, she can contract the public goods supply. Such actions further intensify the desire of masses for change but undermines their ability to enact change as the probability of revolutionary success is reduced by the contraction of  $g$ . Second, a leader can buy off the demands of masses by providing them with more public goods. We provide more detail in the Appendix.

Policy responses to both forms of revolutionary threat face a credibility problem similar to that identified by Acemoglu and Robinson (2001). The incumbent might be willing to offer her supporters more to buy their support or improve public goods provision to satisfy the demands of the masses. However, the budget constraint means that she can only do so much in a single period, and often this is insufficient to avert revolt. Without an ability to commit to a long-term shift in policy priorities, leaders may be unable to quash a revolutionary threat. Institutional changes enable leaders to commit to long-run shifts in policy and may provide leaders a way out of their predicament.

## Counter maneuvers: Leader-initiated Institutional Change

Besides altering policy allocations to thwart threats, leaders can also initiate shifts in political institutions. Such shifts may induce new long-term changes in allocations

of public and private goods. Leader-inspired institutional shifts are motivated by a desire to ameliorate political threats and enhance leader welfare. Any improvement in societal or coalition welfare is purely coincidental. In particular, in stage (b) of the immediate period, instead of simply proposing public and private policies, the incumbent can also propose a purge to create a coalition of size  $W_p$  or an expansion of the coalition to size  $W_E$ . For brevity, we assume the selectorate size remains fixed but note that given their druthers leaders want to increase  $S$  and that, by contracting  $S$  relative to  $W$ , leaders can commit to work harder for their supporters and deliver larger private goods in the future.

Whether  $\mathcal{L}$ 's proposed changes are adopted depends upon the choices of supporters, as we detail below. The new institutions are only adopted if the new coalition (with either fewer or more supporters) backs the incumbent rather than backing foe or coup plotter. In principle, a leader might propose any institutions. However, guided by what has proceeded, we focus on simple changes to  $W$ .

1. Purge:  $\mathcal{L}$  proposes a purge, such that  $W_p = jW$ , where  $j < 1$ . If the purge takes place, then the incumbent pays an organizational cost  $o$ , and the retained coalition members pay a cost  $v$  associated with the effort, and no doubt unpleasantness, of purging former colleagues and friends. We assume supporters of the purge are retained in the leader's post-purge long-term coalition with probability  $J$ .
2. Expansion:  $\mathcal{L}$  proposes a coalition increase:  $W_E = \phi W$ , where  $\phi > 1$ . In the extreme, expansions in coalition size result in democratization. Given the expansion of the coalition, we assume all supporters in the initial coalition expect to be retained in the larger coalition (in the terminology developed for purges, we might refer to this as  $J = 1$ ). Again we assume the organizational cost of  $o$  for leaders.

In order to construct illustrative examples, we use  $j = .5$  and  $\phi = 2$ , that is a halving or doubling of winning coalition size.

### *When Leader-led Institutional Changes Are Likely and Feasible*

In addition to basic institutional preference considerations, a major factor in determining support for institutional change is the prospect of inclusion or exclusion in future coalitions, and on this dimension the leader is advantaged over challengers. Following selectorate deposition, selectors have a  $W/S$  chance of inclusion in the new leader's long-term coalition. The comparable probability following a coup is  $W_c/S_c = 1/2$ . A purge involves a subset of the incumbent's highest affinity supporters. Therefore, those supporters invited to join the purge have a high probability of being retained in the long-run coalition, probability  $J$  in the model. Of course, some subsequent reshuffles might occur. For instance, Nikolai Yezhov, the architect of Stalin's Great Purge, was eventually replaced. However, for Yezhov, the prospect of being a core

supporter under alternative leadership was probably extremely remote, so he probably could do no better than stick with Stalin. This ability to commit to retain supporters is a key advantage the incumbent has over outside bids to contract the winning coalition such as arise with coups. Expansion of the coalition increases the number of supporters, making retention of initial coalition members highly likely.

First, we examine purges and expansions in the absence of revolutionary threats before showing how the prospects of rebellion enhance a leader's desire for institutional change. As in the basic model the maximum that a foe can offer is  $F = u(\frac{W}{q}) + \frac{R-W}{W} + \delta(\frac{W}{S}Z + V_s)$ , and the maximum a coup plotter can offer is  $C = u(\frac{W_c}{q}) + \frac{R-W_c}{W_c} - c + \delta(\frac{W_c}{S}Z_c + V_{sc})$ .

If the incumbent proposes a purge and policies  $g_P$  and  $x_P$ , then her reduced coalition will only retain her if

$$u(g_P) + x_P - v + \Delta\varepsilon + \delta \left( h_0 J Z_P + (1 - h_0) \frac{W_j}{S} Z_P + V_{s_P} \right) - \max\{F, C\} \geq 0 \quad (22)$$

where  $V_{s_P} = V_s(W_j, S) = \frac{\delta}{1-\delta} \frac{R-W_j}{S-h\delta W_j} (1-h) + \frac{1}{(1-\delta)} \ln \frac{W_j}{q}$  and  $Z_P = Z(W_j, S) = \frac{1}{W_j} \frac{S(R-W_j)}{S-h\delta W_j}$ . If the incumbent proposes an expansion and policies  $g_E$  and  $x_E$ , then her coalition will only retain her if

$$u(g_E) + x_E + \Delta\varepsilon + \delta \left( h_0 Z_E + (1 - h_0) \frac{W\varphi}{S} Z_E + V_{s_E} \right) - \max\{F, C\} \geq 0, \quad (23)$$

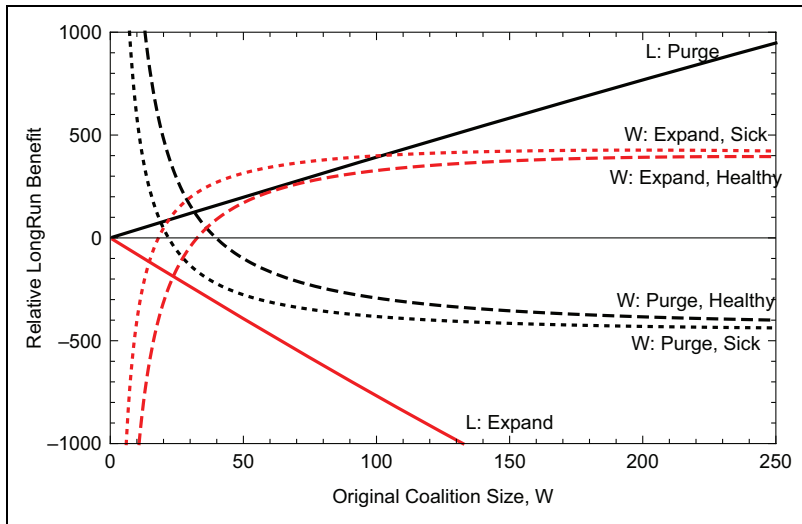
where  $V_{s_E} = V_s(W\varphi, S) = \frac{\delta}{1-\delta} \frac{R-W\varphi}{S-h\delta W\varphi} (1-h) + \frac{1}{(1-\delta)} \ln \frac{W\varphi}{q}$  and  $Z_E = Z(W\varphi, S) = \frac{1}{W\varphi} \frac{S(R-W\varphi)}{S-h\delta W\varphi}$ .

In the absence of revolutionary threats, the following policies accompany the leader's institutional choice (the proof is analogous to that in Proposition 2).

**Proposition 5:** Suppose there are no revolutionary threats. If the incumbent retains the extant institutions, then she proposes  $g_L = g_0$  and  $x_L = x_0$ . Provided that  $qg_0 + Wx_0 \leq R_0$ , she survives politically and her expected payoff is  $\Psi + R_0 - qg_0 - Wx_0 + \delta h_0 V_L(W, S)$ .

If the incumbent proposes a purge, then she proposes  $\hat{g}_P = \frac{W_P}{q}$ , and  $\hat{x}_P$  is the lowest level of private goods that solves equation (22). Provided that  $q\hat{g}_P + W_P\hat{x}_P \leq R_0$ , she survives politically and her expected payoff is  $\Psi + R_0 - q\hat{g}_P - W_P\hat{x}_P - o + \delta h_0 V_L(W_P, S_P)$ .

If the incumbent proposes an expansion, then she proposes  $\hat{g}_E = \frac{W_E}{q}$ , and  $\hat{x}_E$  is the smallest value that solves equation (23). Provided that  $q\hat{g}_E + W_E\hat{x}_E \leq R_0$ , she survives politically and her expected payoff is  $\Psi + R_0 - q\hat{g}_E - W_E\hat{x}_E - o + \delta h_0 V_L(W_E, S_E)$ .



**Figure 3.** Long-run incentives for purges and expansion.

*The incumbent proposes the institutions that maximize her expected payoff.* As seen in Figure 1, leaders prefer small coalition to large coalition systems. Figure 3 shows the long-run rewards of purges and of expansions relative to extant institutions for leaders and coalition members. The horizontal axis of the graph examines existing coalition size  $W$ , and the vertical axis plots the long-run rewards of a purge relative to extant institutions and an expansion relative to extant institutions. The purge considers a halving of current  $W$ , and the expansion considered is a doubling of current  $W$  (assuming  $S$  remains fixed). Hence, the solid line labeled *L: Purge* shows  $V_L(W/2, S) - V_L(W, S)$ , and the solid line labeled *L: Expand* shows  $V_L(2W, S) - V_L(W, S)$ . As the figure clearly shows, in the long run a purge improves the leader's welfare while an expansion in coalition size harms the leader's long-term interests.

A leader cannot just impose her desired institutions; she requires supporters to go along with her proposal. If her supporters do not like her proposed institutional changes, then they can back an alternative and depose the leader. Whether supporters go along with the purge depends upon how much the leader pays them in the current period and their long-run benefits from the leader-induced institutional change.

Figure 3 also shows the long-run benefits of purge and expansion for supporters (although the scale is different to that for leaders). Consider a purge that retains  $jW$  of the original supporters and expels the other  $(1 - j)W$  initial supporters. Obviously, coalition members expelled do not support such a purge. Whether those supporters who are retained continue to support the incumbent depends upon whether the rewards in the immediate period,  $u(g_P) + x_P + \Delta\varepsilon - v$ , and expected long-run rewards,  $\delta(h_0 J Z_P + (1 - h_0) \frac{W_j}{S} Z_P + V_{s_P})$ , are greater than they could expect from

foe or coup plotter,  $\max\{F, C\}$ . The downward sloping lines labeled  $W$ : Purge in Figure 3 show the differences in the expected long-run rewards for a coalition member from supporting the purge ( $j = 1/2$ ) versus supporting the incumbent under the extant institutions:  $\delta(h_0 J Z_P + (1 - h_0) \frac{W_j}{S} Z_P + V_{sp}) - \delta(h_0 Z + (1 - h_0) \frac{W}{S} Z + V_s)$ . The dashed lines correspond to instances where the leader is healthy (high  $h_0$ ), while the dotted lines indicate sick leaders (low  $h_0$ ). The upward sloping dotted and dashed curves labeled  $W$ : Expand plot the corresponding comparisons for the relative long-run value of coalition expansion  $(\delta(h_0 Z_E + (1 - h_0) \frac{W}{S} Z_E + V_{SE}) - \delta(h_0 Z + (1 - h_0) \frac{W}{S} Z + V_s))$ .

If a purge occurs, then in future periods, leaders focus on private goods. It is the prospect of these concentrated private benefits that make purges attractive to supporters, especially when  $W$  is already reasonably small. However, supporters fear reshuffles and leader death. After a purge, there are few public benefits and supporters have a reduced chance of being included in future coalitions ( $\frac{W_p}{S} < \frac{W}{S}$ ). If the leader is sickly (low  $h_0$ ) or likely to reshuffle the coalition after the purge (low  $J$ ), then supporters are likely to lose future access to private goods. Therefore, they oppose a purge. Figure 3 shows the impact of health. The dashed line,  $W$ : Purge, Healthy, shows that when coalition size is initially relatively small, a purge increases a supporter's long-run benefits. However, if the leader is sickly or expected to reshuffle, then purges are less attractive, shown by the dotted line. It therefore follows that vibrant healthy leaders who are well established in office (i.e., affinity revealed and  $J$  close to 1) can most effectively purge. This was certainly the case in Uganda under Idi Amin, in Zimbabwe under Robert Mugabe, the Great Purges in Russia under Stalin, and in China under Mao. In each case, the leader waited several years before initiating the purge and all the purges petered out as the leaders aged.

When the initial coalition is large, purges are highly attractive to leaders as they make subsequent survival easier, but they are unattractive to supporters. The resulting institutions have not contracted  $W$  enough to generate concentrated private benefits and serve mainly to reduce the leader's future effort on behalf of the coalition while also reducing the prospects of public benefits in the future. To induce enough supporters in a large  $W$  system to go along with a purge requires the leader to greatly increase payoffs in the immediate period. Since there are many supporters who need additional immediate rewards, it is unlikely that a leader has sufficient resources or incentive to do so.

Comparing equations (20) and (22), to gain support for a purge the incumbent must increase private spending on each of the  $jW$  coalition members who have been retained by

$$x_P - x_0 \geq u\left(\frac{W}{q}\right) - u\left(\frac{jW}{q}\right) + v - \delta\left(h_0 J Z_P + (1 - h_0) \frac{jW}{S} Z_P + V_{sp}\right) + \delta\left(h_0 Z + (1 - h_0) \frac{W}{S} Z + V_s\right).$$

The final two terms represent the difference in long-run rewards,  $v$  reflects the unpleasantness of purging colleagues for which supporters require compensation and  $u\left(\frac{W}{q}\right) - u\left(\frac{iW}{q}\right)$  is the level of extra private goods required to compensate for the decline in public goods. The incumbent can enact a purge only if  $jWx_p + jW \leq R_0$  and she only wants to enact such a purge if  $R_0 - jWx_p - Wj - o + \delta h_0 V_L(jW, S) \geq R_0 - Wx_L - W + \delta h_0 V_L(W, S)$ . Healthy leaders can more readily elicit support for a purge than sickly leaders. They also have the greater interest in implementing a purge. For a sickly leader, expansions are more feasible and more desirable.

## Leader-inspired Institutional Change under Revolutionary Threats

Revolutionary threats reinforce the incentives for purge and expansion. We start by comparing the impact of purges and expansions with the policy shifts required to address revolutionary threats. As described in Proposition 4, leaders have two responses to revolutionary threats. Leaders can contract public goods, making revolution harder, and pay their supporters enough that they remain loyal and suppress any revolution. Alternatively, leaders can expand public goods to satiate the desires of masses. Unfortunately, for leaders, taking these actions reduces their payoff in the immediate period and, because they can only shift so many rewards in a single period, they cannot always remove the revolutionary threat. Institutional change can help solve this problem.

The logic of how revolutions can encourage leaders to implement institutional change is readily seen graphically by referring back to Figure 2. Faced with the revolutionary threat characterized in Figure 2, and absent institutional change, leaders of coalition systems between  $\underline{W}'$  and  $\overline{W}'$  cannot survive and are deposed. By contracting the coalition,  $\mathcal{L}$  commits to enrich her remaining coalition in future periods. By expanding the coalition,  $\mathcal{L}$  commits to greater public goods in the future. Such commitments to future policy allow her to either buy the support she needs from her coalition or to satiate the desires of masses. Although in the absence of a revolutionary threat, a purge or an expansion might be an inferior choice compared to existing institutions, if a revolutionary threat develops, then the leader will be removed if she does not change institutions.

Suppose  $\hat{x}_p$  and  $\hat{x}_E$  are as defined in Proposition 5 and let  $\hat{x}_p$  solve  $\text{suppress}(\frac{W_p}{q}, \hat{x}_p, W_p) = 0$ . We examine the case where  $\underline{W}' < W < \overline{W}'$  (i.e.,  $\text{suppress}(g_L, x_L, W) < 0$ ,  $\text{rebelS}(g_0, W) \geq 0 > \text{rebelNS}(g_0, W)$ ,  $R_0 < qg_1 + Wx_1$ , and  $R_0 < qg_2 + Wx_2$ , and so the leader is removed under the extant institutions). Consider a purge,  $W_p \leq \underline{W}$  such that  $\text{rebelS}(\frac{W_p}{q}, W_p) \geq 0$ , and an expansion  $W_E \geq \overline{W}$  such that  $\text{rebelNS}(\frac{W_E}{q}, W_E) \geq 0$ .

**Proposition 6:** If  $R_0 \geq W_p + W_p x_p^\dagger$ , where  $x_p^\dagger = \max\{\hat{x}_p, \hat{x}_p\}$ , then having proposed a purge, the incumbent offers policy  $g_p = W_p/q$  and  $x_p^\dagger$  and survives politically. If  $R_0 \geq W_E + W_E \hat{x}_E$ , then having proposed an expansion, the incumbent offers policy  $g_E = W_E/q$  and  $\hat{x}_E$  and survives politically. If both policies permit political survival, then the leader proposes purge if  $R_0 - W_p x_p^\dagger - W_p - o + \delta h_0 V_L(W_p, S) > R_0 - W_E \hat{x}_E - W_E - o + \delta h_0 V_L(W_E, S)$  and she proposes an expansion if the inequality is reversed.

**Proof.** Consider the purge case. If a rebellion occurs, then the reduced coalition suppresses only if  $\text{suppress}(g_p, x_p, W_p) \geq 0$ . Given the coalition will suppress, the masses do not rebel by  $\text{rebelS}(\frac{W_p}{q}, W_p) \geq 0$ . If  $\text{suppress}(g_p, x_p, W_p) < 0$ , then the coalition will not suppress and the rebellion occurs and succeeds. Hence, unless  $\text{suppress}(g_p, x_p, W_p) \geq 0$ , the leader is removed. A retained coalition member defects to an alternative leader or a coup plotter unless equation (22) holds. The incumbent's programming problem is  $\max_{g_p, x_p} R_0 - qg_p - W_p x_p$  subject to  $\text{suppress}(g_p, x_p, W_p) \geq 0$  and equation (22). Using the standard constrained maximization techniques used earlier, efficient spending ensures  $g_p = \frac{W_p}{q}$ , and the leader provides just enough private rewards to satisfy both constraints.

In the case of an expansion, satisfying equation (23) and minimizing expenditure implies  $g_E = W_E/q$  and  $\hat{x}_E$ . These policies dissipate the revolutionary threat by  $\text{rebelNS}(\frac{W_E}{q}, W_E) \geq 0$ . ■

The logic behind Proposition 6 is shown in Figure 2. With respect to a purge, consider a system with  $W$  such that  $jW < \underline{W} < \underline{W}' < W < \overline{W}'$ . Without institutional change, the leader in such a system is removed. However, if the purge shifts coalition size sufficiently, then the concentration of private benefits motivates the retained supporters to suppress any rebellion, and therefore the rebellion is deterred. Absent a revolutionary threat, such a shift might well necessitate the leader to spend more in the immediate period which is not in the leader's interest. However, once the threat arises, the leader is sunk without institutional change. The logic is similar for expansions. If  $W$  is less than  $\overline{W}'$  (and  $W > \underline{W}'$ ), then  $\mathcal{L}$  cannot provide enough public goods in the immediate period to buy off the masses. However, expanding the coalition commits her to future public goods provisions. If expansion pushes the coalition size beyond  $\overline{W}$ , then the revolutionary threat dissipates because the masses no longer want to rebel even though they would succeed if they did.<sup>4</sup> The logic behind purges and expansions for leaders facing a suppressed revolutionary threat is similar and explored in the Appendix.

In the long run,  $\mathcal{L}$  prefers small coalitions to large. However, for a sickly leader, the future is relatively less important than the present and the leader might prefer to



increase her budget surplus today even though it makes survival harder tomorrow. Further, when leaders are sickly, expansions become relatively more attractive for supporters than purges since an expansion reduces the risk and costs of being outside the coalition. By expanding the coalition,  $\mathcal{L}$  commits herself and future leaders to increased public goods, something that is highly salient to coalition members when the leader is sick.

Leader health shapes the likely direction of leader-led institutional shifts. Healthy, vibrant leaders are likely to purge. Supporters who expect the leader to be around and to retain them in the long run go along with the purge. Although leaders might have to give up resources in the short term to retain support, in the long run a purge makes survival easier. Sickly leaders have different incentives, as they care relatively less about future rewards. In addition, their backers are reluctant to support a purge when they do not expect their leader to survive. Sickly and elderly leaders tend to liberalize. Taiwan's Chiang Kai-shek and Singapore's Lee Kuan Yew illustrate this pattern, as does our illustrative example of the Shah in Iran. In 1977 and 1978, the Shah introduced liberal reforms that included the release of political prisoners, an increased role for religious leaders, reduced censorship, and even discussion of future elections (Chehabi 2013; Bill 1978).

## Conclusions

We have proposed a selectorate model that demonstrates how each domestic threat to leadership survival interacts to prompt choices over government policies (i.e., provision of public and private goods) and also choices over governance institutions (i.e., whether to democratize or become more autocratic through purges). Additionally, we have identified theoretically how these choices are shaped by shocks to a leader's health, economic performance, and available budget. The model captures many intuitive results but also identifies a large number of previously unidentified hypotheses. For instance, the model indicates that healthy leaders who face a credible revolutionary threat are particularly likely to purge members of their winning coalition, shrink public goods provision, and increase dependence on private goods expenditures while sickly or elderly (age being a terminal illness) leaders facing the same threat of rebellion are expected to liberalize by expanding their winning coalition and improve public goods provision. Similarly, the model indicates that assassins are expected to be disproportionately drawn from the selectorate rather than from the disenfranchised or from members of the winning coalition. This turns out to mean that the risk of assassination efforts is greater in small selectorate systems, such as military dictatorships and monarchies, than in democracies or rigged-election autocracies such as exist in China or North Korea. Indeed, there is also a significant risk, within the modeling logic, that observers such as journalists may misidentify assassinations as coups d'état.

The model identifies the conditions that are expected to lead to coups, to mass rebellion, and to the suppression of such rebellions. It also highlights the

circumstances under which incumbent leaders can thwart these threats and when they cannot. The model instructs us, unsurprisingly, that all leaders are harmed by declines in their health, by economic downturns, and by unexpectedly limited revenue streams. Less obviously, the model also demonstrates that economic shocks are much more dangerous for democratic leaders than for autocratic incumbents while health shocks disproportionately increase the risk of coups and rebellions for autocrats compared to democrats. Indeed, the model indicates that democracies are, as others have observed empirically, almost immune to threats of revolution and coup. This finding poses a challenge to Marxist theory in which market economies (which are often found in large coalition, democratic environments) are expected inevitably to face a revolution.

Much remains to be done in devising careful empirical tests of the model's implications. That will be the work to which we, and we hope others, will now turn.

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The online appendices are available at <http://jcr.sagepub.com/supplemental>.

### Notes

1. We assume an infinite pool of potential replacement politicians and once removed leaders do not reenter the pool.
2. The consequential assumption is that suppressed rebellion is costlier than unsuppressed rebellion. The factor 2 is readily generalized to any value greater than 1
3.  $\frac{d\text{suppress}(g_0, x_0, W)}{dh_0} = (1 - \rho) \frac{\delta}{W} \frac{(S-W)(R-W)}{S-h\delta W}$  and  $\frac{d^2\text{suppress}(g_0, x_0, W)}{dh_0 dW} = -(1 - \rho) \frac{\delta (S^2 - 2h\delta SW + h\delta W^2)R - SW^2(1-h\delta)}{W^2(S-h\delta W)^2}$ .
4. The proposition examines the case where institutional shifts fully remove the revolutionary threat. However, we might imagine cases where a purge to  $W_p \in (\underline{W}, \underline{W}')$ , combined with a

distortion in policies, as per Proposition 4, enables the leader to survive. Similarly, if an expansion leaves  $W_E$  between  $\overline{W}'$  and  $\overline{W}$ , then the leader might be able to satiate the masses, partly by the commitment to a long-run increase in public goods through coalition expansion and partly by the offer of more immediate public goods. Such institutional shifts might not have been in the leader's interests without a revolutionary threat but in the presence of rising mass discontent they become essential to survival.

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