Leader Survival, Revolutions, and the Nature of Government Finance

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Leaders face multiple threats to their political survival. In addition to surviving the threats to tenure from within the existing political systems, which is modeled using Bueno de Mesquita and colleagues' (2003) selectorate theory, leaders risk being deposed through revolutions and coups. To ameliorate the threat of revolution, leaders can either increase public goods provisions to buy off potential revolutionaries or contract the provision of those public goods, such as freedom of assembly, transparency, and free press, which enable revolutionaries to coordinate. Which response a leader chooses depends upon existing institutions and the structure of government finances. These factors also affect the likelihood and direction of institutional change. Tests of leader survival indicate that revolutionary threats increase the likelihood of deposition for nondemocratic leaders. Leaders with access to resources such as foreign aid or natural resource rents are best equipped to survive these threats and avoid the occurrence of these threats in the first place.

Survival is the primary objective of political leaders. This study examines how political institutions and the structure of government finances allow leaders to contend with risks to their hold on power. Leaders can be removed by forces within the extant political system. Alternatively, they can be removed by mass political movements, such as revolutions, which seek to sweep away the existing system and replace it with a more inclusive one. Leaders choose policies, and possibly institutional changes, to mitigate these risks. We demonstrate that incumbents are most likely to survive when they are beholden to only a small coalition of supporters and when they have access to resources—such as oil and aid—that do not require significant economic participation by the citizens.

Consistent with a growing theme in the literature, we consider individual leaders as the unit of analysis (see, for instance, Bueno de Mesquita and Siverson 1995; Goemans 2000; McGillivray and Smith 2008). Leaders want to retain political power and choose policies that shape the provision of private goods and public goods as the basis for doing so. We extend Bueno de Mesquita and colleagues' (2003) analysis of selectorate politics to include revolutionary threats. In addition to maintaining the loyalty of members of their coalition, as in the original selectorate theory, leaders here also need to dissuade the citizenry from joining mass political movements and rebelling. Leaders can dissipate revolutionary threats via two mechanisms. They can increase the provision of public goods, thereby improving the welfare of the citizens and diminishing their desire for revolutionary change. Alternatively, leaders can suppress the provision of public goods, particularly such goods as a free press, transparency, and easy communication that help people coordinate and organize. Suppressing these goods reduces the probability of revolutionary success. We refer to these latter forms of public goods as coordination goods (Bueno de Mesquita and Downs 2006).

Which response leaders adopt to the threat of revolution depends, in part, on the structure of government finance. While the suppression of coordination goods reduces the ability of people to organize politically, it also reduces their ability to coordinate economically, resulting in reduced productivity and diminished economic activity.

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Leaders who rely on taxing productive economic activity to generate the resources needed to reward their coalition find suppressing public goods to be unattractive. However, leaders with access to abundant, essentially labor-free resources (hereafter free resources) such as natural resource rents or foreign aid can suppress coordination goods with little if any damage to their revenue. Thus, like Besley and Persson (2009), the theory relates the nature of government revenue to policy choice and the trajectory of development. In doing so, it provides a political explanation for the so-called resource curse, the observation that resource-rich nondemocratic nations underperform their impoverished counterparts (Ross 1999; Sachs and Warner 2001).

By incorporating revolutionary threats into the selectorate theory, we assess how institutions, free resources, and revolutionary threats interact to shape the policies leaders pursue, the prospects for institutional change, and whether leaders succeed in their survival objectives. The theory explored here is formally developed in Bueno de Mesquita and Smith (2009) and Smith (2008). The focus of the current article is an empirical assessment of two aspects of the theory. First, we assess how institutions, free resources, and mass political movements impact the survival of leaders. Second, we explore how survival-driven policy choices influence the likelihood of institutional change and the level of mass political movements, factors that affect future survival prospects. If, as we believe, a leader's primary concern is survival, then the theory offers important policy advice with respect to promoting democratization and economic development.

A Theory of Selectorate Politics and Revolutionary Change

The selectorate model, which we use as the basis of domestic political competition, characterizes political institutions according to the number of supporters a leader needs in order to maintain power, the winning coalition (W), and the size of the pool from which these supporters are drawn, the selectorate (S). Democratic systems tend to have large selectorates and large coalitions. For instance, in a directly elected presidential system, S is effectively all adults. Support from half of the selectorate in such a system ensures political survival (i.e., $W = S/2$). In contrast, in a Westminster-type parliamentary system, the leader needs to secure the support of half the people in half the districts (i.e., $W = S/4$). Military juntas or monarchies typically have much smaller selectorates and winning coalitions composed of military elites or aristocrats. Likewise autocratic systems have small winning coalitions, although this can vary markedly, as can selectorate size. In addition to allowing comparison across categorical classification of regimes, this framework encapsulates the considerable variance in institutional arrangements within categories.

To survive in office, leaders need to maintain the support of members of their winning coalition. To obtain and retain this support, they provide both private and public goods. Public goods, such as national defense and environmental protection, benefit all members of society. In contrast, leaders limit access to private goods to their coalition members. Although all public policies have both public and private components, an implication of selectorate theory is that the relative focus of public policy varies with coalition size. As coalition size increases, it becomes increasingly expensive and difficult for leaders to reward their coalition through private rewards since more people need to be rewarded. Therefore, leaders shift toward providing public goods. Hence in democratic systems, while some, such as defense contractors, benefit privately from the provision of security, the focus of defense spending is to protect the nation from a foreign threat. In contrast, in small winning-coalition systems, the policy focus is skewed toward private goods–bloated procurement contracts for cronies, and luxuries for officers are more important than an effective fighting force.

Scholars, such as Baum and Lake (2001), have assessed differences in the provision of public goods between democracies and nondemocracies. Others, such as Persson, Roland, and Tabellini (2000; see also Persson and Tabellini 2001), assess differences between democratic institutions. For instance, they compare parliamentary and presidential systems. As Geddes (1999; 2003, chap. 2) recognizes, nondemocratic regimes vary greatly. Her work examines differences between different categorical classifications of authoritarian regimes. One of the advantages of selectorate theory is that its inherently continuous conceptualization of institutions allows comparisons across all regimes, rather than between categorizations.

In addition to determining the mix of goods leaders use, institutions determine how much policy leaders produce and how easy it is for them to survive. While in the short term political rivals might offer to spend all available resources in order to optimally reward potential supporters, compared to long-term incumbents, challengers are disadvantaged by their inability to promise private goods in the future. Suppose a challenger succeeds in convincing some members of the incumbent's coalition to defect and support him. The incumbent is defeated and the challenger becomes the new leader. Although these defectors were essential in order for the challenger to come

to power, once in power the new leader might revise his coalition and replace these defectors with other selectors with whom he has greater affinity. The possibility of coalition reorganization makes it harder for a challenger to attract support since he cannot credibly promise long-term access to private goods. Since the incumbent has already had the opportunity to reorganize her coalition, she can credibly promise her coalition private goods and this creates a loyalty norm.

The strength of the loyalty norm depends upon institutions and the length of time in office. In large coalition systems, leaders rely predominately upon public goods which do not generate much loyalty, as they reward everyone whether they are coalition members or not. The cost and risk of exclusion from private goods is greatest in a small coalition, large selectorate system, and it is the supporters of established leaders in such systems who exhibit the greatest loyalty. However, it takes time for this loyalty to develop because initially coalition members are concerned that they might be reorganized out of the coalition. As the new leader finishes reorganizing his coalition, loyalty grows. The diminution in the risk of the leader removal over time in small coalition systems complicates hazard analysis and invalidates the use of standard Cox proportionate hazard (Box-Steffensmeier and Zorn 2001).

Mass Political Movements and Revolution

We extend the selectorate model to explore the actions leaders can take to ameliorate the risk of revolutionary deposition. To do so, we examine the broader role of certain public goods within society. In addition to being direct rewards, public goods influence economic productivity and the ability of citizens to organize. People can more productively deploy their labor in the presence of public goods than in their absence. For instance, educated people with access to transport and knowledge of the market are more productive than ignorant and isolated people. By increasing the provision of public goods which facilitate coordination, the government induces people to work harder and be more productive. In turn this increases economic activity and revenues for the government. Certain public goods, such as the freedom of information and assembly, which we call coordination goods, determine the ability of citizens to coordinate and organize. The provision of these coordination goods influences the likelihood that a mass political movement succeeds. A person might well be keen to join an antigovernment demonstration in a neighboring town. However, if she does not know about the event and has no means of getting there, then her willingness to rebel comes to naught. Revolutions require a critical mass and widespread support in order to gain momentum (Granovetter 1978; Kuran 1989; Lohmann 1994; Oliver, Marwell, and Teixeira 1985; Tilly 1978). It is hard to get the movement started without the ability to organize and coordinate. The provision of coordination goods affects the threat which leaders face from mass political movements.

When deciding whether to support mass movements, citizens consider the benefits of revolutionary success—that is, what are the likely benefits they would receive if the movement succeeded relative to what they receive now—and the likelihood of success. Leaders have two potential ways to deal with revolutionary threats. First, leaders can increase the provision of public goods. This improves the welfare of the citizens and diminishes their desire for revolutionary change. Second, leaders can contract the provision of coordination goods. This deters rebellion by reducing the probability of success. Which strategy leaders pursue to diminish a revolutionary threat depends upon existing political institutions and the structure of government finances.

Leaders face two constraints. They need to prevent revolutions and they need to maintain the support of members in their winning coalition. Above we discussed how coalition size determines the optimal provision of goods to ensure coalition loyalty. Revolutionary threats cause leaders to modify these provisions. Whether leaders expand the provision of public goods to buy off revolutionaries or contract coordination goods provisions to prevent them from organizing depends upon existing institutions and the extent to which the government relies upon taxing productive economic activities for its finances or whether it has access to free resources, such as natural resource rents and foreign aid, that are largely independent of the economic efforts made by the citizens.

Expansion of public goods is a leader's best option when she already has a reasonably large coalition and when she relies on taxing productive economic activity for revenues. It can also be an attractive response for small-coalition leaders who lack access to revenue from free resources. In contrast, leaders of smaller coalition systems with access to free resources typically enhance their survival prospects most by contracting coordination goods.

Public goods improve economic productivity, which increases government revenues. However, the shift toward more public goods weakens the loyalty norm, compelling leaders to work harder to retain their coalition's support. In general this response to revolutionary threats grows more attractive when coalition size is already reasonably large, when the government relies on taxing the citizens' economic activities to generate revenues, and grows

especially large when coalition size is large and free resources are scarce.

While expanding public goods in the short term ameliorates the risk of revolutionary deposition, in the long run it makes survival harder. To the extent that some public goods are coordination goods, an expansionary response improves the ability of revolutionaries to further coordinate and demand greater concession in the future. Buying off potential revolutionaries with public goods also creates inconsistencies within a small-coalition leader's policy provisions.

To survive, a small-coalition leader needs to buy the support of her coalition members, which is best done with private goods and also needs to ameliorate the public's demands, which can only be done with public goods. Effectively the leader has two constituencies that want different things. Democratization resolves this inconsistency. By enlarging coalition size, leaders shift the policy demands of the coalition so that the relative shift toward public goods buys the support of both the masses and the coalition members. In the absence of a revolutionary threat, one societal group always opposes another's desired shift in institutions. However, Bueno de Mesquita and Smith (2009) show that following an expansionary response to a revolutionary threat, increasing coalition size can be in the interests of leaders, coalition members, and political outsiders. The intuition behind this result is that enlarging the coalition (that is, democratizing) rationalizes the types of policies required to reward supporters and satiate potential revolutionaries. Without such democratization these groups want different goods. Unfortunately for the leader, an expansion of coalition size makes subsequent survival harder.

A contractionary response to a revolutionary threat is generally the preferred response by leaders who have access to free resources and whose coalition is relatively small. The suppression of coordination goods reduces economic productivity. For this reason it tends to be viable primarily for leaders with revenue sources other than direct taxation. The suppression of coordination goods diminishes the revolutionaries' ability to organize. However, coalition members need to be compensated for the loss of these goods. This shifts the focus of policy toward private goods. This has several consequences. First, leaders are more likely to prefer this response to a revolutionary threat when coalition size is small because this reduces the number of people who require additional private goods. Second, it increases loyalty toward the incumbent (among surviving coalition members) because it increases the cost of being excluded from the winning coalition. Third, it improves the willingness of the winning coalition to tolerate a contraction of coalition size (see Bueno de Mesquita and Smith 2009). Thus, a contraction in the provision of coordination goods is often followed by autocratization—a contraction in coalition size. The latter factor improves leader survival in the future.

The theory contributes to debate relating economic development and political development. Political institutions affect economic growth (Barro 1997). However, as Persson and Tabellini (2006) show, the devil is in the detail. For instance, they show that the type of democratic institutions, economic development at the time of democratization, and expectations about the stability of democracy all moderate the impact institutions have on growth. Scholars also debate the impact of economic development on regime change. Przeworski et al. (2000) claim income has little impact of the likelihood of democratization, but that once nations become democratic, income strongly reduces the likelihood of a reversion to autocracy. In contrast, Boix and Stokes (2003) find support for modernization theory: economic development promotes democratization. Acemoglu and Robinson (2005) contend that it is not the level of income that explains democratization, but rather its distribution. For them, regime change is moderated by income inequality. We argue that policies, institutional change, and economic development are shaped by the nature of government revenues (Besley and Persson 2009).

The theory relates how institutions and mass political movements incentivize leaders to provide different policies in order to survive. The theory predicts the consequences of these policy options in diminishing revolutionary threats, the prospects for institutional change, and ultimately the ability of leaders to survive. We now turn to an empirical assessment of leader survival.

Leader Survival, Institutional Change, and Mass Political Movements

We examine three empirical questions. First, we examine leader survival and show that institutions and the nature of government finance are key factors in determining whether leaders survive. Our analyses test how revolutionary threats—as distinct from revolutions per se—affect the survival of leaders and the extent to which institutions and free resources moderate the effects. We develop a measure of revolutionary threat based upon observations of mass political movements. We show that the direct effect of this threat measure on survival is conditioned by a leader's institutional context and her access to free resources.

Second, we consider institutional change. Free resources and institutions also have an indirect effect on leader survival. Consistent with the theoretical argument, we find that mass political movements increase the likelihood of institutional change and that the direction of that institutional change depends upon initial institutions and the level of free resources. Finally, we assess the determinants of revolutionary threats, looking at both factors within a leader's control, such as policy choice, and exogenous shocks, such as natural disasters, that are beyond the control of the leader.

Data

To test how institutions, free resources, and revolutionary threats affect leader survival, we need data on each of these factors. We use Goemans, Gleditsch, and Chiozza's (2008) Archigos data on leaders. These data describe the dates of entry and exit from office for the principal leader of each nation.

We measure institutions using Bueno de Mesquita and colleagues' (2003) measures of winning coalition size (W) and selectorate size (S). These variables are constructed using indices of variables contained within the Polity IV data (Marshall and Jaggers 2008) and Arthur Banks's (2007) cross-national time-series data. The index for coalition size relies on four variables. Two of these variables are concerned with executive recruitment. Bueno de Mesquita et al. (2003) argue that as executive recruitment is opened to all and as the process becomes competitive, leaders are more likely to become beholden to more people—a large coalition. Hence the polity variables reflecting open executive recruitment and competitive executive recruitment are used as indicators of a large coalition system. They also utilize the polity variable for a competitive party system as an indicator for large coalition size. Finally, they argue that military regimes tend to be supported by small groups. Hence, nonmilitary regime is used as a component of the index which indicates a large coalition size.

Bueno de Mesquita and colleagues' (2003) specific coding of W and S is as follows. They add one point to the index for each of the following conditions: if the Banks regime type variable is nonmilitary, if XRCOMP is greater than or equal to 2 (meaning the chief executive is not chosen by heredity or in rigged, unopposed elections), if XROPEN is greater than 2, and if PARCOMP equals 5 (indicating the presence of a competitive party system). This variable is normalized between 0 and 1 by dividing by 4. Selectorate size is created using Banks's legislative selection variable, which is coded zero if no legislature exists, one if selection is nonelective, such as by heredity or ascription, and two if the legislature is elected. This variable is standardized between 0 and 1 by dividing by 2. The presence of a legislature, and the extent to which it can be drawn from the general public rather than a narrow segment of society, indicates whether the recruitment of political supporters is confined to a small group or is inclusive of a broad range of the population. See Bueno de Mesquita et al. (2003) for details and a discussion of the justifications for these coding decisions.

Measures of population size, income (per capita GDP), economic growth, and the free resources oil and aid were obtained from the World Bank's (2007) World Development Indicators. Oil and aid are two important free resources. The variable Oil measures net fuel exports and is constructed using the measures of fuel exports and imports as a percentage of merchandise exports and imports. We report net Oil exports as a percentage of GDP for exporters and report Oil as zero for net importers. The free resource variable Aid is defined as Official Development Assistance, which we express in terms of percentage of GDP. Free resources are those resources which the government can spend without the need for tax revenue. Morrison (2009) provides a direct assessment of these resources by taking the difference between total government spending and government tax revenues. We use his data and analyze nontax revenue as a percentage of GDP.

Tests of the theory require a measure of the revolutionary threat which leaders face. We develop a measure based upon the occurrence of mass political movements such as antigovernment demonstrations, riots, general strikes, and revolutions using data drawn from Banks (2007). Scholars have assessed various aspects of political instability. For instance, Londregan and Poole (1990) examine the risk of coup. Alesina and Perotti (1996) and Alesina et al. (1996) assess the risk of government collapse from all sources, constitutional or not. Our approach necessitates a focus on mass political movements, rather than other forms of threat to tenure. We follow the measurement strategy advocated by Lenin (1912), who assessed the prospects of revolution using data on strike participation. In particular, we construct an index on the level of mass political events based on the Banks (2007) data coding of antigovernment demonstrations, riots, general strikes, and revolutions. We create an index of mass political movements as follows. First, for each of the measures (x = demonstrations, riots, strikes, revolutions), we created a standardized version of the variable: $z = (\ln(1 + x) - \text{mean}(\ln(1 + x)))/(\text{standard deviation}(\ln(1 + x)))$. Each of these standardized variables has mean zero and variance one. We then create an index, mass, by summing the four standardized variables and dividing by four.

The mass variable provides a measure of mass political events in each nation in each year. Unfortunately, we have concerns about reporting biases and societal norms. Banks's measures rely on media coverage. Differing levels of press penetration mean it is possible that events are more likely to be recorded in, for example, the United States than in Ghana. Different societies also have different norms about protest. For instance, French farmers protest regularly while such events are less common in Britain. This suggests a differing baseline for each nation in terms of both occurrence and reporting. To ameliorate these potential problems, we examine changes in the index rather than use the index of mass political events directly.

Specifically, we look at how the level of mass political events has changed over the previous three years: $\Delta\text{mass} = \text{mass}_t - \text{mass}_{t-3}$. The Δmass variable tells us whether a leader faces an increasing or decreasing level of mass political movements. The use of the three-year lag is arbitrary. We obtain similar substantive results whether we consider a one-, three-, or five-year difference in mass or if we examine the impact of mass directly.

As a measure of coordination good, we utilize Freedom House's (2007) measure of press freedoms. From 1989 through 2006, Freedom House reports press freedom on a 3-point scale (0 = "not free," 1 = "partially free," 2 = "free"). For the years 1980 through 1988, Freedom House reports separate scores for broadcast and print media. To create as long a time series as possible, we average the broadcast and print media and treat this average as comparable to the single, post-1988 score.

When examining leader survival, we control for repression, which is a potential substitute for a change in the provision of public goods, using Cingranelli and Richards's (1999) index of physical integrity. This variable, which we call Repression, scales nations between 0 and 8 based upon the level of torture, extrajudicial killing, political imprisonment, and disappearances, in which low numbers indicate no respect for human rights and a high score is associated with government respect for rights.

When assessing the determinants of mass political movements, we include a measure of unforeseen events beyond a leader's control using data on earthquakes. We use Brancati's (2007) compilation of the Centennial Earthquake Catalog (Engdahl and Villasenor 2002) of earthquakes beyond 5.5 on the Richter scale. From 1975 to 2000 these data provide an ordinal scale for the magnitude of the earthquake activity in each nation in each year, from 0 for no major earthquake to 3 for the most devastating quakes. We use the magnitude of the quakes rather than their human impact since, to at least a certain extent, the latter depends upon the government willingness to prepare and respond to such eventualities and political systems shape this response (Cohen and Werker 2008; Quiroz and Smith 2010).

Leader Survival

Since selectorate theory predicts a decline in the hazard rate over time in office and that this decline in risk is greatest for small-coalition leaders, the workhorse model of survival analysis, the Cox proportionate hazard model, is inappropriate. We use a parametric Weibull model in which the hazard rate at time t is $h(t) = p\,\lambda\,t^{(p-1)}$, where $\lambda = \exp(X\beta)$. X is the vector of independent variables and p is an ancillary shape parameter which describes how the hazard changes over time. A value of p less than one indicates a declining hazard over time. Given the prediction that the hazard rate decreases more sharply over time for small coalition systems, we model the ancillary parameter as a function of coalition size, W.

The Weibull regressions in Table 1 assess how institutions, growth in mass political movements, and free resources affect political tenure. Model 1 provides a baseline that examines institutions, leader age, level of economic development, and economic growth. The estimates of the ancillary parameter support the hypothesis that hazard rates decline over time and do so more sharply for small coalition systems. In particular, the estimated value of p for the smallest and largest coalition systems are $p = .548$ and $p = .991$, such that while the hazard remains fairly constant for large coalition systems, the risk of removal declines rapidly for small-coalition leaders. To get an idea of the substantive impact of these effects, consider the hazard rate after one month in office compared with the hazard rate after five years. For a large-coalition leader the hazard rate drops by an insignificant 4% over this time. In contrast, for a small-coalition leader the risk of deposition after five years is less than a sixth of what it was in the first month. This pattern is robust throughout all the analyses.

In addition to affecting how the hazard rate changes over time, political institutions also influence the hazard through the standard $X\beta$ terms. In Model 1 the positive coefficient estimate on the coalition size variable indicates that moving from the smallest to largest coalition size increases the risk of deposition. However, the effect is statistically insignificant. Small coalition systems do not confer an immediate advantage on leaders; rather their incumbency advantage grows over time as anticipated by the theory. Selectorate size also influences survival. As predicted by the theory, when the leader can choose supporters from a larger pool, this improves survival.

Table 1 Revolutionary Threats, Free Resources, and Leader Survival

		Weibull Regression				
		Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Xβ	Winning Coalition size (W)	1.267	0.737	1.121	1.117	1.505
		(1.071)	(1.473)	(1.224)	(1.579)	(2.177)
	Selectorate size (S)	−0.899***	−1.381***	−0.777***	−0.842***	−1.509***
		(0.173)	(0.337)	(0.181)	(0.184)	(0.509)
	Age	0.0406***	0.0311**	0.0289**	0.0425***	0.0145
		(0.00890)	(0.0158)	(0.0113)	(0.0121)	(0.0225)
	W*age	−0.0431***	−0.00920	−0.0273*	−0.0576***	0.000907
		(0.0126)	(0.0194)	(0.0151)	(0.0178)	(0.0292)
	Growing Threat: Δmass		0.262**	0.280***	0.297**	0.138
			(0.123)	(0.107)	(0.121)	(0.188)
	W* Δmass		−0.231	−0.242*	−0.346*	−0.183
			(0.157)	(0.137)	(0.184)	(0.215)
	Nontax revenue (%GDP)		−0.0601**			−0.0918**
			(0.0266)			(0.0396)
	W* Nontax revenue		0.0808**			0.131**
			(0.0405)			(0.0532)
	Oil (exports as %GDP)			−0.0201*	−0.0107	
				(0.0103)	(0.00932)	
	W*Oil			0.0141	−0.0134	
				(0.0161)	(0.0162)	
	Aid (%GDP)				−0.00427	
					(0.0265)	
	W*Aid				−0.0135	
					(0.0396)	
	Ln(GDPpc)	−0.0848	−0.00562	−0.0188	−0.160	0.121
		(0.0915)	(0.137)	(0.104)	(0.121)	(0.180)
	W*Ln(GDPpc)	0.168	0.0152	0.0652	0.329*	−0.123
		(0.128)	(0.194)	(0.147)	(0.179)	(0.246)
	Growth	−0.0271***	−0.0498**	−0.0327**	−0.0380***	−0.0759**
		(0.00610)	(0.0220)	(0.0134)	(0.0147)	(0.0373)
	W*Growth	0.0156	0.00297	0.0254	0.0283	0.0419
		(0.0153)	(0.0359)	(0.0228)	(0.0284)	(0.0547)
	Repression					0.00105
						(0.118)
	W*Repression					−0.120
						(0.147)
	Constant	−2.086***	−2.022**	−1.967**	−1.760*	−1.708
		(0.615)	(0.817)	(0.797)	(1.028)	(1.344)
Ancillary parameter, ln(p)	W	0.592***	0.475***	0.528***	0.602***	0.608***
		(0.103)	(0.170)	(0.114)	(0.189)	(0.182)
	Constant	−0.601***	−0.470***	−0.531***	−0.526***	−0.535***
		(0.0762)	(0.141)	(0.0933)	(0.116)	(0.150)
	Observations	5831	2105	4086	3003	1452

Robust standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Age is an important determinant of leader survival in small coalition systems, but not in large coalition systems. The positive coefficient estimate of .041 on the age variable indicates that the risk of deposition increases by about 4% for each additional year of a small-coalition leader's age. For a large-coalition leader (W = 1), the effect of age is the sum of the coefficients on age and its interaction with W. This aggregate effect is indistinguishable from zero. Age matters in nondemocratic systems but not in democratic ones. This is perhaps not surprising since an autocrat's tenure depends upon her ability to promise private goods in the future and ill health and decrepitude diminish this capacity. The ability to promise future private goods is less important in public goods–oriented large coalition systems. This pattern remains robust throughout all the analyses.

Model 1 also contains controls for the level of economic development, measured as the logarithm of per capita GDP, and economic growth. The model also includes the interactions of these variables with coalition size so that we can assess whether income and growth have differential effects on leader survival in small and large coalition systems. Of these four coefficients, only the coefficient on economic growth is significant, indicating that an increase in economic growth of 1% reduces the risk of deposition by about 4% for a small-coalition leader. The joint hypothesis test that Growth + W * Growth = 0 fails to reject the null hypothesis (chi2 = .88, Pr = .35). Economic growth has no discernible effect on the survival of leaders in the largest coalition systems.

The patterns revealed in this base case are repeated throughout the analyses. Age and economic growth affect survival in small coalition systems. However, in large coalition systems the effects are muted and indistinguishable from zero. Selectorate size increases the ease of survival. The effect of coalition size is seen over time. In small coalition systems the risk of deposition diminishes as tenure increases. The diminution of risk over time is less as coalition size increases. Having established these baselines, we now examine the effects of free resources and mass political movements.

Model 2 examines the effect of a growing revolutionary threat and free resources by including variables for the change in the level of mass political movements over the previous three years (Δmass), measures of nontax revenues (as a % of GDP), and the interaction of these variables with coalition size. Models 3 and 4 repeat this specification but rather than consider all nontax revenue, they consider specific free resources: Oil (as a % of GDP) in Model 3 and Oil and Aid (as a % of GDP) in Model 4. Model 5 returns to the impact of nontax revenues and adds controls for the level of repression.

An increase in the level of mass political events increases the risk of deposition for small-coalition leaders, but not large-coalition leaders. Across Models 2 through 5, a one standard deviation increase in the level of mass movements over the previous three years increases the risk of deposition for a small-coalition leader by about 20–30% (although the effect is not statistically significant in Model 5). However, a rising level of mass political activities has no effect on the tenure of large-coalition leaders: the sum of the coefficient estimates for Δmass and its interaction with W is indistinguishable from zero. As the theory predicts, mass political events do not greatly increase the danger faced by large-coalition leaders. The citizens in such nations generally enjoy the right of assembly and have little incentive to rebel since they already enjoy the large coalition institutions which they might hope to create via revolution. In contrast, autocrats are placed in jeopardy if their citizens engage in mass political events. Protests demonstrate the ability of opponents to coordinate and organize, enhancing the likelihood of revolutionary success. The citizens in small coalition systems have incentives to rebel, and mass political movements indicate that they can. This revolutionary threat endangers a leader's survival.

How leaders respond to revolutionary threats depends in part on the structure of government finances. Leaders who rely on taxing productive economic activity cannot easily suppress coordination goods because this harms the economy and, therefore, the revenues they need to buy political support. Such leaders are likely to liberalize in response to revolutionary pressures. Enlargement of the coalition often accompanies such reforms. These developments make survival harder.

In contrast, leaders whose revenues are buoyed by such free resources as oil or foreign aid can more easily ameliorate revolutionary threats by suppressing coordination goods. This response enhances the salience of private goods as political rewards and promotes contraction of the winning coalition, both of which augment leader survival.

Models 2, 3, 4, and 5 include free resources measured as either nontax revenues or Oil and Aid. Each of these models reveals a similar pattern. There is a negative coefficient on the free resources variable, be it measured as nontax revenue, Oil, or Aid. This indicates that if small-coalition leaders gain access to additional free resources then their risk of deposition is reduced. An increase in nontax revenues worth 10% of GDP reduces a small-coalition leader's deposition risk by around a half. Model 3 suggests increasing oil by about 10% of GDP reduces a small-coalition leader's deposition risk by about 20%. Model 4 includes variables for the level of aid. The

estimates on the free resource variables in this equation are insignificant. Model 5 includes controls for the level of repression within a society. These repression variables do not affect leader survival. Neither do they appear to disrupt the pattern of how mass political threats and free resources determine survival. Free resources also help individual small-coalition leaders retain power. Scholars such as Ulfelder (2007), Smith (2004), Morrison (2009), and Ross (2001) report that oil bolsters regime survival. Our results indicate that these results also carry over to individual small-coalition leaders. In contrast, in large coalition systems, free resources do not enhance leader survival: the sum of the estimates for the free resources variable and its interaction with W is indistinguishable from zero.

In addition to the direct effect of free resources on leader survival, there are substantial indirect effects that help keep resource-rich small-coalition leaders in power. The presence of free resources enables small-coalition leaders to avoid circumstances, like mass movements, that threaten their survival. In particular, free resources enable leaders to avoid increasing the provision of coordination goods and to resist demands for democratization. The former allows them to avoid mass political movements in the first place, and the latter helps leaders avoid institutional settings in which survival is harder.

The Provision of Coordination Goods and Democratization

Whether a leader faces a revolutionary threat and whether she has access to free resources shapes the provision of coordination goods and the prospects for subsequent democratization. Bueno de Mesquita and Smith (2009) construct an index of coordination goods using variables which reflect civil liberties, communications, freedom of assembly, and government transparency. Consistent with theoretical predictions made here, they find that leaders in small coalition systems with access to free resources suppress coordination goods in response to a growing revolutionary threat but that this contraction does not occur for small-coalition leaders lacking free resources. Others find similar results. For instance, Egorov, Guriev, and Sonin (2007) examine Freedom House's press freedom scores. In a series of careful empirical tests, they show that increases in oil revenues, known oil reserves, and oil prices reduce press freedom in nondemocratic systems. Yet, oil has little effect on press freedoms in democracies. Given the establishment of these results, we do not reassess the provision of coordination goods. We focus instead on institutional changes and the occurrence of mass political movements.

Table 2 uses nation-years as the unit of analysis and assesses how revolutionary threats and free resources interact to affect institutional change over three years. Model 6 uses nontax revenues as a measure of free resources. Model 7 looks at free resources measured as Oil, and Models 8 and 9 examine the effects of both Oil and Aid. Models 6, 7, and 8 control for temporal and regional differences using region-year fixed effects. In contrast, Model 9 considers country fixed effects.

The analyses in Models 6 through 9 support the theoretical predictions that the impact of revolutionary threats and free resources on institutions is conditional. Consider Model 7. The coefficient estimates on Δmass, Oil, and Oil* Δmass are .0211, -0.0014, and $-.0033$, respectively. Free resources have a pernicious effect on political development. As the level of oil or aid increases, future coalition size is likely to decline. Oil revenue worth 10% of GDP means coalition size is expected to decline by about .014, on the zero-to-one scale of coalition size, over a three-year period. Free resources have a second pernicious effect in that they modify the effects of revolutionary threats. The positive coefficient estimate on Δmass indicates that, absent free resources, coalition size is likely to increase in response to a growth in mass political events; that is, smaller coalition systems are likely to evolve into larger coalition systems in response to a credible mass threat when they lack free resources, including not receiving significant foreign aid. However, the negative coefficient on the interaction variable, Δmass*Oil, indicates that when a leader has access to free resources, increases in mass political movements are likely to result in contractions rather than expansions of the winning coalition. These results are consistent with earlier findings that oil wealth (Jensen and Wantchekon 2004; Ross 2001; Smith 2004; Ulfelder 2007) and aid (Knack 2004; Morrison 2007) enhance regime survival.

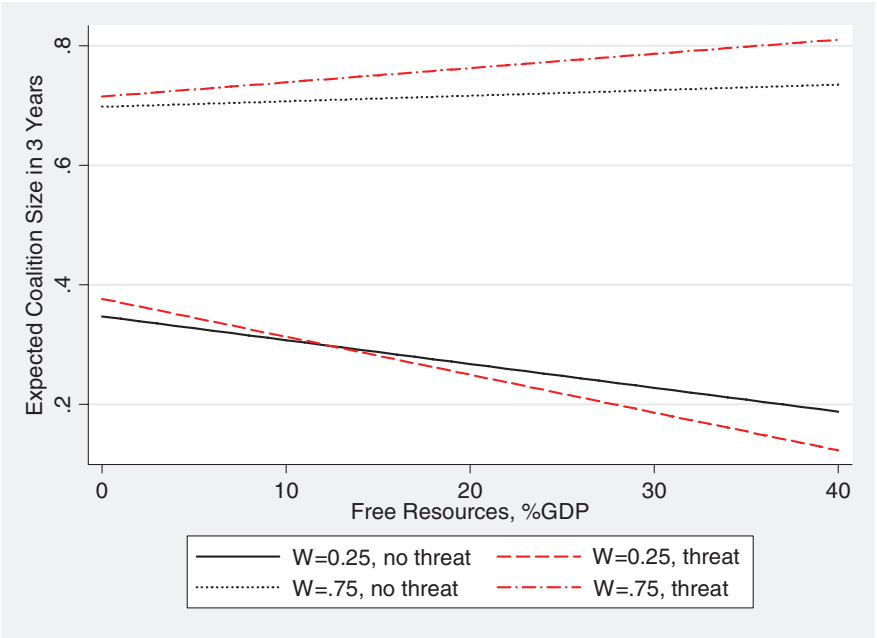
In large coalition systems, free resources and mass political movements have relatively little effect on future political institutions. For each of the models in Table 2, the sum of the coefficients on the free resource variables and their interaction with W is indistinguishable from zero. This means free resources have relatively little effect on future coalition size in systems which already have fairly large coalitions. Similarly, the sums Δmass + W*Δmass and free resources*Δmass + W*free resources$*\Delta$mass are indistinguishable from zero. Indeed, it is almost uncanny how the estimates of the interactions with W terms nearly perfectly cancel out the effects seen in small winning-coalition systems.

TABLE 2 The Determinants of Institutional Change

	Future Coalition Size, W (3 years)			
VARIABLES	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Winning Coalition size W	0.892***	0.840***	0.587***	0.995***
	(0.143)	(0.115)	(0.227)	(0.263)
Growing Threat: Δmass	0.0225	0.0211***	0.0118	0.0120
	(0.0150)	(0.00783)	(0.0128)	(0.0117)
W * Δmass	−0.0180	−0.0205*	−0.00814	−0.0108
	(0.0217)	(0.0108)	(0.0196)	(0.0178)
Nontax revenue (%GDP)	−0.00343***			
	(0.000938)			
W* Nontax revenue	0.00324**			
	(0.00159)			
Nontax Rev* Δmass	−0.000232			
	(0.00145)			
W* Nontax Rev* Δmass	−5.79e-05			
	(0.00221)			
Oil (exports as %GDP)		−0.00144**	−0.00201***	0.000370
		(0.000593)	(0.000713)	(0.000905)
W*Oil		0.000320	0.00159	−0.000465
		(0.00121)	(0.00149)	(0.00187)
Oil *Δmass		−0.00329***	−0.00291***	−0.00282***
		(0.000838)	(0.000978)	(0.000893)
W* Oil* Δmass		0.00481***	0.00433**	0.00429***
		(0.00154)	(0.00182)	(0.00166)
Aid			−0.00585***	0.00127
			(0.00187)	(0.00220)
W*Aid			0.0108***	0.00188
			(0.00282)	(0.00342)
Aid* Δmass			0.00148	−0.000476
			(0.00263)	(0.00244)
W*Aid*Δmass			−0.00178	0.00126
			(0.00401)	(0.00371)
Ln(GDPpc)	0.0166**	−0.000870	−0.0128	−0.00288
	(0.00679)	(0.00625)	(0.00937)	(0.0175)
W*Ln(GDPpc)	0.00347	0.0313***	0.0538***	0.0350**
	(0.00822)	(0.00705)	(0.0138)	(0.0172)
Ln(Population)	0.00727	0.0134***	0.0108*	0.147***
	(0.00627)	(0.00453)	(0.00637)	(0.0145)
W*Ln(Population)	−0.0111	−0.0208***	−0.0188*	−0.0441***
	(0.00800)	(0.00604)	(0.00978)	(0.0123)
Constant	−0.0489	−0.0440	0.106	−2.094***
	(0.121)	(0.0951)	(0.150)	(0.251)
Observations	1753	3305	2440	2440
R-squared	0.716	0.649	0.584	0.396
Fixed effects	170 region-years	275 region-years	254 region-years	120 countries

Standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

FIGURE 1 Predicted Future Coalition Size, Free Resources, and the Presence or Absence of Revolutionary Threats



Predictions based on an ordered probit estimate using the specification in Model 8. No threat indicates Δmass $= -1$; threat indicates Δmass $= 2$. Free resources refer to oil export and aid receipts. The estimates are for a nation of 10 million people with $2,000 per capita income.

Figure 1 plots predicted coalition size three years into the future for initially fairly small (W = .25) and fairly large (W = .75) coalition sizes under conditions of a mildly declining revolutionary threat (Δmass $= -1$) and an increasing revolutionary threat (Δmass $= 2$) against level of free resources using the estimates for Model 8. The figure provides a clear picture of the pernicious effects of free resources in retarding democratization. Absent any free resources, small coalition nations are likely to experience an increase in coalition size, and this tendency is enhanced if the nation experiences a growth in mass political movements. This is seen by comparing the two lower lines. On the left-hand side of the figure, at zero free resources, small coalition systems are likely to increase their coalition size, with the bigger increase being anticipated in nations experiencing mass political threats. However, as access to free resources increases, the expected future coalition size declines. That is, both the lower lines in Figure 1 slope downwards. Further, for a nation facing a revolutionary threat (dashed line) the decline is steeper. Free resources lead to autocratization, particularly when leaders face a rising level of mass political protest. Van de Walle (2001, 241–42) illustrates these effects in practice. He suggests that the withdrawal of support by international financial institutions at moments of crisis promoted democratization in Benin and Zambia. In contrast, France's financial support of the governments in Cameroon and Cote d'Ivoire enabled these regimes to survive crises without reform. The analysis provides important policy advice for those interested in promoting democratization.

The pernicious effect of free resources is not apparent for large coalition systems. Indeed, Figure 1 suggests that the presence of free resources and mass political threats in a nation which already possess a fairly large coalition may accelerate the expansion of coalition size. This is shown by the positive slopes of the top upper lines in Figure 1 and that the dash-dot line, which represents the mass political threat case, is above the dotted line (the no threat case).

The analyses of institutional change include controls for per capita income and its interaction with coalition size. There is contentious debate about the relationship between income and democratization. Przeworski et al. (2000) suggest that while wealth does not promote democracy, it helps ensure that it persists. Boix and Stokes (2003) argue that this result derives from a limited sample and that in a wider sample income drives democratization. In three of the four models there is a negative, although insignificant, coefficient on per capita income and a significant positive estimate for the

interaction between W and wealth. This would appear to support Przeworski's view. However, Model 7, with a significant positive coefficient on the wealth variable, supports the modernization view of democracy. Our sample suffers from many of the data coverage criticisms that Boix and Stokes level against Przeworski's analyses, so it is hard to be conclusive. However, our analysis suggests that both sets of authors miss the main point and that income effects are very much secondary when compared to the origins of this income and political pressures. The inclusion of the income variables improves the model fit by less than 1% (comparison of R-squared). It is political pressures in the form of mass political movements that drive institutional change, and free resources shape the direction of this change.

Revolutionary Threats and the Growth of Mass Political Movements

Mass political movements jeopardize a small-coalition leader's grasp on power. In this final empirical section we assess what determines whether or not leaders face mass political movements. Models 10 through 13, in Table 3, assess the growth of revolutionary threats using a fixed-effects regression model. The dependent variable is the level of mass political movements (mass). The right-hand-side variables include the lagged level of mass movements ($mass_{t-1}$), institutions, free resources, policy, and shock. In particular, we use Freedom House's Free Press variable as a measure of a leader's provision of coordination goods and the occurrence and scale of earthquakes as a measure of exogenous shock.

Natural disasters are beyond the control of leaders. Although certain areas are more at risk than others, leaders cannot anticipate when an earthquake will strike. As such, natural disasters provide an exogenous shock that can create revolutionary threats because they often displace and congregate large numbers of disgruntled people's and reduce the capacity of the state. For instance, Preston and Dillon (2005) describe how the aftermath of an earthquake in Mexico City in 1985 led to the formation of a protest movement and subsequent democratization. Likewise, Bommer (1985) discusses how earthquakes and floods promoted protest in Nicaragua and how these contributed to the downfall of President Somoza. In both cases, disasters forced large numbers of displaced people gathered together into shelters and refugee camps, which facilitated coordination.

We examine the impact of earthquakes on mass movements (Quiroz and Smith [2010] examine the political implications of other forms of disasters). Although certain countries are more vulnerable than others, leaders cannot anticipate particular quakes. If leaders anticipate the emergence of a revolutionary threat, then they can act to forestall it. However, leaders can do little to prevent people's being concentrated together in the aftermath of a disaster. That is why, within the logic of a strategic perspective such as selectorate theory, earthquakes or other natural disasters provide a useful natural experiment for challenges to leader survival.

Not surprisingly, Models 10 through 13 indicate that the best predictor of mass political activity is the level of activity in the previous year, as indicated by the highly significant coefficient estimate for lagged mass. Once previous levels of mass protest are controlled for, neither institutions nor free resources appear significant, indicating that leaders have taken appropriate steps to mediate the growth of threats to their continuation in office. Economic growth reduces mass political movements, as evidenced by the negative coefficient on the growth variable, although the effect is only significant in Models 11 and 13. Within large coalition systems, economic growth has no effect on the level of mass political protest.

Earthquakes lead to an increase in mass political movements in small coalition systems, but not in large coalition systems. A serious earthquake increases the level of protest by about a fifth of a standard deviation in the smallest coalition systems. This is a risk beyond the control of political leaders. In contrast, leaders control the provision of coordination goods, such as freedom of the press. These factors have a magnitude of effect similar to that of an earthquake. In particular, in a small coalition system, the change from "not free" to "partially free" or from "partially free" to "free" leads to slightly greater growth in mass movements than the occurrence of a serious earthquake. Press freedom has no significant impact in large coalition systems.

Models 14 and 15 provide further support for these conclusions by assessing the likelihood that a nation experiences a high level of mass political movements: BigThreat, defined as mass>2 (around 3% of the data). Both the provision of coordination goods and unforeseen events such as earthquakes make mass protest likely in small coalition systems.

Mass political movements create opportunities for democratization. When confronted by a rising protest movement, leaders without access to free resources typically increase public goods provisions to satiate potential revolutionaries. This response encourages future reform. First, the shift to a public goods focus encourages leaders to enlarge coalition size. Second, to the extent that public goods are also coordination goods, buying off protestors today strengthens their ability to coordinate and protest

Table 3 The Determinants of Mass Political Movements

	Level of Mass Political Movements: Mass				BigThreat: Is mass>2, Y/N?	
VARIABLES	**Model 10**	**Model 11**	**Model 12**	**Model 13**	**Model 14**	**Model 15**
Lagged mass	0.461***	0.455***	0.203***	0.257***		
	(0.0255)	(0.0254)	(0.0282)	(0.0279)		
Winning Coalition size (W)	−0.509	−2.813*	0.576	−3.747	−3.101	−13.27
	(1.010)	(1.605)	(2.394)	(2.311)	(7.775)	(10.81)
Nontax revenue	−0.00547		−0.00729		−0.0418	
	(0.00600)		(0.00986)		(0.0628)	
W*Nontax revenue	0.0125		0.0119		0.106	
	(0.00978)		(0.0143)		(0.117)	
Oil (exports as %GDP)		−0.00503		−0.00532		−0.155
		(0.00494)		(0.00628)		(0.163)
W*Oil		0.00697		0.00752		0.138
		(0.00987)		(0.0124)		(0.216)
Aid (%GDP)		−0.00789		0.00483		−0.251*
		(0.0114)		(0.0153)		(0.142)
W*Aid		0.0157		0.00774		0.346*
		(0.0169)		(0.0227)		(0.188)
Ln(GDPpc)	0.0480	−0.0781	−0.198	−0.243	0.334	−0.725
	(0.0533)	(0.0641)	(0.179)	(0.165)	(0.438)	(0.510)
W* Ln(GDPpc)	−0.109	0.116	−0.0364	0.222	−0.657	0.998
	(0.0688)	(0.0960)	(0.160)	(0.154)	(0.562)	(0.772)
Growth	−0.00778	−0.0185**	−0.0130	−0.0161*	−0.0569	−0.0880
	(0.00912)	(0.00885)	(0.00913)	(0.00866)	(0.0742)	(0.0620)
W*Growth	−0.00501	0.00373	0.00242	0.00285	0.0172	0.0140
	(0.0150)	(0.0148)	(0.0150)	(0.0147)	(0.121)	(0.101)
Ln(population)	0.0326	−0.00827	0.361*	0.0958	0.231	0.238
	(0.0434)	(0.0437)	(0.217)	(0.146)	(0.337)	(0.256)
W* Ln(population)	0.0723	0.123*	−0.0148	0.149	0.578	0.424
	(0.0548)	(0.0658)	(0.114)	(0.0937)	(0.447)	(0.412)
Earthquake	0.197**	0.209***	0.246**	0.252**	1.063**	1.053**
	(0.0832)	(0.0789)	(0.101)	(0.0990)	(0.514)	(0.449)
W* Earthquake	−0.272**	−0.222**	−0.253*	−0.277**	−1.601**	−1.451**
	(0.112)	(0.110)	(0.131)	(0.138)	(0.763)	(0.673)
Free Press	0.295***	0.284***	0.134	0.309***	1.765*	1.909***
	(0.114)	(0.0862)	(0.143)	(0.116)	(0.989)	(0.692)
W * Free Press	−0.183	−0.270**	−0.218	−0.451**	−2.263	−2.143*
	(0.156)	(0.128)	(0.213)	(0.176)	(1.605)	(1.146)
Constant	−0.846	0.710	−4.123	0.157	−10.63*	−2.571
	(0.861)	(1.080)	(3.478)	(2.648)	(6.151)	(6.688)
Observations	1282	1297	1282	1297	1285	1299
Fixed effects	122 region-years	146 region-years	99 countries	113 countries		

Standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

in the future. Once leaders embark on the process of liberalization, their desire to survive the joint threats of selectorate politics and revolutionary threats is best achieved by more liberalization. Once the ball is rolling, it is difficult to stop without access to free resources.

Free resources enable small-coalition leaders to survive in office. Free resources also enable leaders to suppress coordination goods and resist calls for democratization. Retaining a small coalition system helps established incumbents survive, as does reducing revolutionary threats, which is achieved by suppressing coordination goods. Although some of the factors that lead to protest are beyond a leader's control, such as the occurrence of earthquakes, the ability of leaders to suppress coordination goods plays an important role in limiting mass political movements. The mechanism through which small-coalition leaders use free resources to survive has insidious effects on political and economic development.

Conclusions

Survival is the primary objective of political leaders. This study examines how political institutions and the structure of government finances allow leaders to contend with various deposition risks. Theoretically we extend the Bueno de Mesquita et al. (2003) analysis of leader removal and consider endogenous institutional change. Citizens outside the winning coalition want to create more inclusive political institutions. Leaders must contend with threats both from within the political system and from outside. Leaders can ameliorate revolutionary threats by either increasing the provision of public goods, such that citizens are satiated, or by suppressing their ability to organize. Access to free resources plays an important role in this decision. Without such revenues, leaders find it hard to embark on the suppression response to mass political movements because the economic contraction it causes makes it harder for leaders to continue buying their coalition's loyalty.

Rather than a modernization theory of development (Lipset 1959), these arguments suggest the important factor in democratization is not the wealth of a nation, but rather the source of this wealth. If leaders need to tax productive economic activities to generate revenues, then the prospects for democratization are much stronger than if leaders gather resources without having to generate policies that encourage people to work.

The underlying assumption of the theory is that leaders seek to survive in office. The empirical analysis focuses on how a leader's ability to do so depends upon institutions, access to free resources, and revolutionary threats. The evidence on leader survival supports the theoretical predictions. When combined with previous evidence (Bueno de Mesquita and Smith 2009) concerning policy provision and institutional change, there is a compelling case for the theory.

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