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# Evolution of Risk and Political Regimes

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## Abstract

This article contributes to the growing literature on intermediate regimes by presenting a model that incorporates key features of such regimes and generates several of the “stylized facts” that characterize their behavior: their political volatility, cross nationally and over time, and the variability of their economic performance – something that renders their economies among the fastest growing – and declining – in global samples. Using an instrumental variables approach, we test the model employing cross-national data.

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# 1 Introduction

The "Third Wave" refers to the process of democratization that began with the transition from authoritarian rule in Iberia, culminated in the fall of the Soviet Union, and inspired political reform in late-century Africa (Huntington 1991). As noted by Geddes (2003), what resulted was not the creation of democracies; it was the creation of intermediate or mixed regimes. As shown in Figure 1, in the mid-1970's, these regimes prevailed in less than 4% of the world's states; by the year 2000, they prevailed in more than one quarter.

In the decades that have followed the Third Wave, scholars have struggled to characterize these regimes. Their economic performance is erratic. While Easterly, Kremer et al. (1993) and Pritchett (2000) find that for all countries growth rates are unstable, Jerzmanowski (2006) demonstrates that the fluctuations between periods of high growth, stagnation, and steep decline are most frequent and more pronounced among intermediate regimes. So too their political performance: Focusing on political outcomes, Goldstone, Marshall et al. (2003) and Hegre (2003) and Gates, Hegre et al. (2003) demonstrate that intermediate regimes are less stable politically than are full democracies or autocracies (see also Fearon and Laitin, 2003). Kenyon and Naoi (2006) demonstrate that policy uncertainty is greater in such regimes. And Epstein et al (2006) find that while *pace* (Przeworski, Alvarez et al. 2000), a variety of modernization variables, including per capita income, systematically relate to the transition from authoritarian to democratic regimes, none bears a significant relationship to transitions into or out of the category of intermediate regimes. Intermediate regimes are thus as volatile politically as they are in their economic performance. Epstein, Bates et al.(2006) therefore appear to be speaking for the generation of scholars who first addressed this new category of political system when they wrote: "These are 'fragile' democracies, or perhaps 'unconsolidated democracies.' Whatever one wishes to call them,

they emerge .. as [m]ore volatile than either straight autocracies or democracies. Their [behavior] seems at the moment to be largely unpredictable" (p. 24).

Subsequent scholarship has begun to assemble a clearer picture of the properties of these regimes. While willing to repress and to jail political opponents, rulers in intermediate regimes, it has been found, often face institutional checks on their use of political power: legislatures, opposition parties, and elections (Gandhi 2008, Gandhi and Przeworski 2006 and 2007, Cox 2009, Collier and Levitsky 1997, Levitsky and Way 2002, Magaloni 2006 and others, such as Boix and Svoboda 2008, Pop-Eleches and Robinson 2009). That they do so appears to be significant for their economic performance. Researchers have long been disconcerted by their inability to find significant differences between the growth rates of democratic and authoritarian regimes. As noted by Besley and Kudamatsu 2008, a major reason is that while the mean rate of growth among autocracies may have been lower than that for democracies, "the distribution has fatter tails ... autocracies are more likely than democracies to be either very good or very bad" p. 453. The variety of political institutions that characterize intermediate regimes thus appears to render them economically heterogeneous as well.

This article represents an attempt to model the major characteristics of intermediate regimes so as to account for their economic behavior. The risk of predation provides the principal link between their political character and economic performance. Developed by North and Weingast (1989), Knack and Keefer (1995), and others (e.g. Rodrik 1991), the logic is something perhaps best communicated visually, as in Figure 2, which captures the relationship between property rights and economic prosperity.

<Figure 2 About Here>

The model <sup>1</sup> generates some of the patterns that emerge from the literature. That is: major "stylized facts.": That is:

For pure democracies: Their governments exhibit restraint and the risk of predation is low.

For pure autocracies: Their governments are unconstrained and there is a high level of political predation.

For intermediate regimes: The level of political restraint varies and with it, the threat of political predation. Given the link between the risk of predation, investment, and economic growth, the model thus provides insight into the variation in economic performance that has been reported for intermediate regimes. In addition, it yields additional implications, which open up possibilities for "out of sample" testing.<sup>2</sup>

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<sup>1</sup>Formally, we consider a standard political agency problem with moral hazard and unobserved types, but allow the citizens to differ in their ability to replace the government. We show that when the ability of citizens to punish politicians is high or low, only pooling equilibria are possible. For intermediate regimes, however, governments can form a separating equilibrium, i.e. different types of governments can behave differently. As a result, economic performance in these regimes helps to reveal a government's type. Our model is related to political agency models reviewed in Besley (2006). Political agency models apply principal-agent framework of Holmstrom (1979) to the relationship between the government and the citizens. Our model combines hidden action and unobserved types, as in Austen-Smith and Banks (1989) and Banks and Sundaram (1993).

<sup>2</sup>Empirically, we test the implications of our model, using panel cross-country data. We use different measures of country risk, such as "expropriation risk" variable of Knack and Keefer (1998), as proxies for the risk of predation. To identify the effect of economic downturns, we instrument them with an incidence of natural disasters and unexpected terms-of-trade shocks. We find that the level of risk increases after economic downturns, and this effect is stronger in intermediate regimes. To deal with unobserved heterogeneity, an important source of omitted variable bias in the empirical cross-country literature, we control for country fixed effects.

## Informal Argument

The polity is populated by a government, citizens, and a collection of homogenous, non-strategic private agents. The government derives utility from being in office and the benefits of political predation.<sup>3</sup> The citizens derive utility from an outcome,  $y$ , which we will interpret as economic growth. At the end of each period, citizens can seek to replace the government. They succeed in some probability, which depends on the nature of political institutions.

Governments differ in their type. Some are competent: they do no harm to their citizens and, upon occasion, deliver positive policy outcomes. Others are incompetent: they are incapable of doing good for their citizens and, upon occasion, do them harm. In addition, some governments are impatient and care only about current payoffs; others possess longer time horizons and care as well for future rents.

The behavior of the rulers thus depends upon their type and the incentives generated by political institutions. A government with a short time horizon always predated. But the behavior of a government with a long time horizon depends on the power of the citizens, i.e. their ability to change their government. If they can easily dismiss the government, both competent and incompetent governments with long time horizons will choose to refrain from predation. If it is

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<sup>3</sup>By predatory policies we mean the policies that may be profitable for the government, but that are harmful for the the long run welfare of citizens. Expropriation can be blatant, as in the case of Zimbabwe where the government seized the land of farmers, the assets of firms, and the foreign exchange deposited with banks. It can also result from the manipulation of the interest and exchange rates and the regulation of product or factor markets. The possibility of policy changes in the future increase uncertainty and risks for potential investors. And inflation offers a way in which governments can seize cash balances from private agents, even when not overtly endorsing policies of expropriation.

difficult for the citizens to do so, both competent and incompetent governments will adopt policies that maximize their per-period rents. The level of political constraints that makes a patient government indifferent between predation and restraint is higher for the competent government. Under intermediate level of constraints, then, competent governments that possess long time horizons will refrain from predation while incompetent governments may not.

The stylized facts that motivate this article thus emerge as implications of the model. The reasoning generates additional implications, however, particularly for the evolution of political risk. In consolidated democracies, governments, regardless of their preferences, are too constrained to behave in a predatory manner. In full autocracies, the absence of constraints leads even governments that value the social welfare to engage in predation. In intermediate regimes, by contrast, governments with different values "separate," thus revealing their type and generating a dispersion in the levels of investment and growth rates among intermediate regimes.

## 2 The Model

### *The Government*

The government receives utility  $B$  from being in office, gets a rent  $R$  if engaged in predation, and also cares about future periods if it possesses a long time horizon.

If not engaged in predation, the government's per-period utility is  $B$ ; if so engaged, its per-period utility is  $B + R$ . A government with a long-horizon government cares about future rents and discounts the future with factor  $\delta$ . One with a short time horizon cares only about the current period and therefore, has a discount factor of 0. If dismissed from office, a government receives 0 each period thereafter.

The utility of a competent government with a long time horizon is  $V^t = B + \delta \Pr(\textit{stays in}$

$office|y = 1)V^{t+1}$  if it does not predate and

$$V^t = B + R + \delta (p_H \Pr(stays\ in\ office|y = 1)V^{t+1} + (1 - p_H) \Pr(stays\ in\ office|y = 0)V^{t+1})$$

if it engages in predation. The comparable values for an incompetent government with a long time horizon are  $V^t = B + \delta (p_L \Pr(stays\ in\ office|y = 1)V^{t+1} + (1 - p_L) \Pr(stays\ in\ office|y = 0)V^{t+1})$  and  $V^t = B + R + \delta \Pr(stays\ in\ office|y = 0)V^{t+1}$ . respectively. For a government with a short time horizon government, 0 simply replaces the discount factor  $\delta$ , yielding  $V^t = B$  if the government does not predate and  $V^t = B + R$  should it do so.

The government can predate and consume rents, but also generate an outcome  $y$  for the citizens. Hereafter we assume that such an outcome takes the form of economic growth, but other interpretations are possible.

Treating the competence of the government,  $\theta \in \{\theta_H, \theta_L\}$ , and the incidence of predation,  $x \in \{0, 1\}$ , as binary, we can associate the likelihood of a positive outcome with its type and its decision to engage in predation:

$$\begin{aligned} \Pr(y = 1|\theta = \theta_H, x = 0) &= 1 \\ \Pr(y = 1|\theta = \theta_H, x = 1) &= p_H \\ \Pr(y = 1|\theta = \theta_L, x = 0) &= p_L \\ \Pr(y = 1|\theta = \theta_L, x = 1) &= 0 \end{aligned} \tag{1}$$

### *Citizenry*

$\gamma$  captures the level of constraint faced by a government when making decisions: it can be interpreted as the probability that citizens succeed should they seek to overturn the government. If the current government is overthrown, the next government is competent (i.e.  $\theta_H$ ) with probability  $\mu$ .



The people receive utility from  $y$ . Their per-period utility function is  $f(y)$ . The discounted long-term utility of citizens is given by  $U^t = f(y) + \delta U^{t+1}$  if citizens do not try to overthrow the current government and by  $U^t = f(y) + \delta (\gamma U^* + (1 - \gamma)U^{t+1})$  if they do. Here  $U^*$  is the expected utility from a new government drawn from the distribution of new governments, while  $U^{t+1}$  is the expected utility from retaining the current government. The discount factor for the citizens is the same as the discount factor for a government with a long time horizon.

#### *Risk of predation*

The risk of predation is the probability that the government is going to predate at any given time period. Formally,  $r_t$  denotes the probability of  $x = 1$  in period  $t$ , given the history of observed events in the past.

#### *Timing*

For simplicity, we consider a 3-period model. The structure of the game is common knowledge; in the last period, both the government and the people realize that the game is about to end.

The timing of events for each period is the following:

1. The current government decides whether or not to predate and chooses  $x \in \{0, 1\}$ .
2. The outcome variable  $y$  is realized, with probabilities which depend on the government's decision to predate and the government's competence, as described in (1).
3. Citizens observe the outcome variable  $y$  and decide whether to challenge the government; they succeed in overturning it with probability  $\gamma$ .
4. All agents get their per-period payoffs. Risk variables for the next period are calculated.
5. If in stage 3 people succeeded in overthrowing the government, the new government is drawn from the distribution of potential governments.

This sequence of events for one stage of this game is illustrated in Fig. 3 of the Appendix.

## 2.1 Solution

We are looking for Perfect Bayesian Equilibria. The game is solved by backward induction. First, we consider what happens at  $t = 3$ , then we look at  $t = 2$  and solve the continuation game between the people and the government given citizens' beliefs. Finally, we assign the continuation payoffs to all nodes in which the continuation game could start and solve the game at  $t = 1$ .

*In period  $t = 3$ :*

All types of government choose to predate. And as there is no next period, citizens are indifferent between overthrowing the government or not .

*In period  $t = 2$ :*

Citizens know that the government is going to predate in period 3. As they nonetheless prefer to have a competent government, they replace the current government whenever their posterior probability that the government is competent is less than the prior probability that the next government will be competent, i.e. if  $\widehat{\Pr}(\theta_H) < \mu$ .

In the beginning of the period, the government can infer the strategy of citizens at the end. A government with a long time horizon government wants to extract rents, but also to stay in power. At this point, the continuation value of staying in power is  $V^3 = B + R$  for both governments that are competent and those that are not. A competent government with a long time horizon compares  $B + \delta \Pr(\text{stays in office}|y = 1) [B + R]$  with  $B + R + \delta (p_H \Pr(\text{stays in office}|y = 1) [B + R] + (1 - p_H) \Pr(\text{stays in office}|y = 0) [B + R])$ . An incompetent government with a long time horizon compares

$$B + \delta (p_L \Pr(\text{stays in office}|y = 1) [B + R] + (1 - p_L) \Pr(\text{stays in office}|y = 0) [B + R])$$

with  $B + R + \delta \Pr(\text{stays in office} | y = 0) [B + R]$ . Note that all governments with a short time horizon compare  $B + R$  with  $B$ , and so always chooses to predate.

Assume for the moment that citizens adopt the following strategy: they seek to overthrow the government when  $y = 0$  and refrain from doing so when  $y = 1$ . Then a competent government with a long time horizon compares  $B + \delta [B + R]$  with  $B + R + \delta (p_H + (1 - p_H)(1 - \gamma)) [B + R]$ . Such a government chooses to predate if

$$R > \delta(1 - p_H)\gamma [B + R], \quad (2)$$

i.e. if  $B$  is sufficiently small as compared with  $R$ ; if  $\delta$  or  $\gamma$  are relatively small; or if  $p_H$  is sufficiently large. Note that  $1 - p_H$  characterizes the expected return to governmental restraint.

The incompetent government with a long time horizon compares  $B + \delta (p_L + (1 - p_L)(1 - \gamma)) [B + R]$  with  $B + R + \delta(1 - \gamma) [B + R]$  and chooses to predate if

$$R > \delta p_L \gamma [B + R]. \quad (3)$$

where  $p_L$  is the expected return to political restraint for the part of an incompetent government.

If the government has a short time horizon, it compares  $B + R$  and  $B$ , and always chooses to predate.

To find the optimal behavior of a government, it is necessary to make assumptions about the people's strategy conditional on the realization of  $y$  and to check if these assumptions make sense, i.e. they are rational given citizens' beliefs.<sup>4</sup> As replacing the government is costless for the citizens, such a strategy weakly dominates the strategy of doing nothing.

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<sup>4</sup>Note that the citizens have to replace the government in some states of the world (at least if they believe that the probability of a low-competent government is higher than 0), as otherwise governments of all types will choose to misbehave.

The next two lemmas describes the set of equilibria in a continuation game. Denote  $x_{ij}$  the decision of the government of type  $i$  to predate in period  $j$ , and denote  $y_j$  the policy outcome in period  $j$ . Denote also the people's strategy in period 2 as  $s|y_2 \in \{\textit{overthrow}, \textit{not overthrow}\}$ .

The first lemma describes the equilibria of a continuation game in which a new government comes in the beginning of the second period. For a new government, citizens' prior beliefs are  $\mu$  for a competent government and  $\lambda$  for a long-horizon government.

**Lemma 1** *At  $t = 2$ , in a continuation game with a new government, the set of equilibria is the following:*

1. *For  $R > \delta(B + R)(1 - p_H)\gamma$ , equilibrium strategies are  $x_{H2} = 1$ ,  $x_{L2} = 1$ , and  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$ ;*
2. *If  $\delta(B + R)p_L\gamma < R < \delta(B + R)(1 - p_H)\gamma$ , equilibrium strategies are  $x_{H2} = 0$ ,  $x_{L2} = 1$ , and  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$ ;*
3. *If  $\delta(B + R)p_L\gamma > R$ , equilibrium strategies are  $x_{H2} = 0$ ,  $x_{L2} = 0$ , and  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$ .*

**Proof.** In Appendix. ■

Here, the equilibrium strategy of people is simple: if they observe  $y = 0$ , they overthrow the government; otherwise, they do not. If  $y = 1$ , the posterior probability that the government is of type  $H$  goes up, as compared with  $\mu$ , the probability that a new government will be of that type. By contrast, when  $y = 0$ , then that probability declines. The optimal strategy of the government depends on  $\gamma$ : for low  $\gamma$ , all types of government predate; for intermediate values of  $\gamma$ , only the low-competent government predate; while for high values of  $\gamma$ , all types of government refrain from predation.

Now, consider the equilibria in the continuation game, i.e. if the government survives the first period. These equilibria are described in a lemma below (see Appendix for the full version).

**Lemma 2** *At  $t = 2$ , in a continuation game with the old government, the set of equilibria is the following:*

1. *For  $R > \delta(B + R)(1 - p_H)\gamma$ , equilibrium strategies are  $x_{H2} = 1$ ,  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  for some values of parameters;*
2. *If  $\delta(B + R)p_L\gamma < R < \delta(B + R)(1 - p_H)\gamma$ , equilibrium strategies are  $x_{H2} = 0$ ,  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  for some values of parameters;*
3. *If  $\delta(B + R)p_L\gamma > R$ , equilibrium strategies are  $x_{H2} = 0$ ,  $x_{L2} = 0$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  for some values of parameters;*
4. *For any  $\gamma$ , if  $y_1 = 1$  and  $\frac{\lambda p_L}{p_H(1-p_H)} > 1$ , then  $s_1|1 = s_1|0 = \text{not overthrow}$ ,  $x_{H2} = 1$ , and  $x_{L2} = 1$  constitute equilibrium in a continuation game.*

**Proof.** In Appendix. ■

The lemma shows that  $s|1 = s|0 = \text{not overthrow}$  can be an optimal strategy if the citizens' posterior beliefs are that the government is competent with 100% probability. If  $y_1 = 0$ , the equilibria in the continuation game are similar to those described in lemma 1 and citizens choose  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$ . If the citizens observe  $y_1 = 1$ , however, the situation changes: If  $\frac{\lambda p_L}{p_H(1-p_H)} > 1$ , there always exist equilibrium in which citizens refrain from overthrowing the government regardless of the value of  $y_2$ , as their posterior beliefs about the government's competence are high. In addition, for some subsets in parameter space, there are "standard" equilibria in which citizen's strategy is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$ , and the government's strategy is conditional on  $\gamma$ .

From now on, we assume that  $\frac{\lambda p_L}{p_H(1-p_H)} > 1$  and focus on equilibria which always exist.<sup>5</sup> Denote people's strategy in period 1 as  $s_1|y_1$ , in contrast to  $s|y_2$ , people's strategy in period 2. The following proposition describes equilibria that emerge in the original game for different values of  $R$  and  $\gamma$ .

**Proposition 1** *If  $R$  is sufficiently large, the equilibrium set of strategies is  $x_{L1} = 1$ ,  $x_{H1} = 1$ ,  $s_1|1 = \text{not overthrow}$ ,  $s_1|0 = \text{overthrow}$  if  $\gamma$  is sufficiently large; and  $x_{L1} = 1$ ,  $x_{H1} = 0$ ,  $s_1|1 = \text{not overthrow}$ ,  $s_1|0 = \text{overthrow}$  if  $\gamma$  is sufficiently small. If  $R$  is sufficiently small, the equilibrium set of strategies is  $x_{L1} = 1$ ,  $x_{H1} = 1$ ,  $s_1|1 = \text{not overthrow}$ ,  $s_1|0 = \text{overthrow}$  if  $\gamma$  is sufficiently large ;  $x_{L1} = 1$ ,  $x_{H1} = 0$ ,  $s_1|1 = \text{not overthrow}$ ,  $s_1|0 = \text{overthrow}$  if  $\gamma$  is in intermediate range; and  $x_{L1} = 0$ ,  $x_{H1} = 0$ ,  $s_1|1 = \text{not overthrow}$ ,  $s_1|0 = \text{overthrow}$  if  $\gamma$  is sufficiently small. The corresponding equilibria in a continuation game are described in lemmas 1 and 2.*

**Proof.** In Appendix. ■

Clearly, the size of  $\gamma$  matters. It is important in the first period and for a new government; for an old government after  $y_1 = 0$ ; and for an old government after  $y_1 = 1$  for some regions in parameter space.. For high values of  $\gamma$ , or, correspondingly, low values of  $R$ , no government predate; institutions perform their role of restricting the behavior of the government. For intermediate values of  $\gamma$  and  $R$  only a government with high competence refrains from predation, while a government with low competence predate. For small values of  $\gamma$ , or, correspondingly, high values of  $R$ , all types of government predate, and accountability mechanisms fail to constrain the use of power.

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<sup>5</sup>The equilibria which involve  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  after  $y_1 = 1$  and exist only for some regions in parameter space are similar to those described in the proposition below.

## 2.2 Empirical implications

The model thus recreates known characteristics of the data: political restraint and favorable prospects for investment and growth among democracies; political predation and few prospects for investment and growth among unconstrained dictatorships; and political and economic heterogeneity among intermediate cases. It is difficult to devise additional direct tests of the model, for we cannot observe the strategies and expectations of the actors, only the equilibrium outcomes. The logic that underlies it does, however, imply changes in the level of measurable risk – a factor that links the political characteristics of the state to their economic performance.

Consider the risk of predation in the second period, given by  $\Pr(x_2 = 1|y_1 = i, \hat{\mu}_1, \hat{\lambda}_1)$ ,  $i \in \{0, 1\}$ .

**Proposition 2** *After period 1, with the same government estimated risk of predation goes up after observing  $y_1 = 0$ , i.e. if the government is the same,  $\Pr(x_1 = 1) \geq \Pr(x_2 = 1|y_1 = 0)$ .*

**Proof.** In Appendix. ■

Moreover, the effect of predation should be most notable for countries with intermediate levels of political constraints.

**Proposition 3** *For intermediate values of  $\gamma$ , estimated risk of predation changes more significantly after observing  $y = 0$ , as compared with corresponding changes for high or low  $\gamma$ .*

**Proof.** In Appendix.

In addition, according to the model, governments should be replaced more often after bad economic outcomes. This prediction is consistent with the literature on retrospective voting, e.g. Kiewiet and Rivers (1984), and with the assumption of performance voting in accountability models, e.g. Barro (1973), Ferejohn (1991), Persson and Tabellini (2000), Humphreys and Bates

(2005).<sup>6</sup> These predictions do not constitute the full test of the model, of course; but they do offer regularities that we should observe if the model is correct. They also imply that we should expect the risk of predation to rise in periods of poor economic performance <sup>7</sup> ■

### 3 Empirical Results

To test the model, we gathered data for 123 countries for the years 1982-2003; the depth of the panel is dictated by the availability of measures of political risk. Using these data, we identify a set of growth downturns and investigate their impact on measures of risk under different regimes. We show that estimates of risk estimates increase after economic downturns. We also show that the sensitivity of risk to economic performance depends on the nature of political institutions. And we find that after negative economic shocks, the average changes in assessments of risk are greatest in "intermediate" regimes.

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<sup>6</sup>The empirical evidence suggests that citizens may in fact punish politicians for bad luck and reward them for good. Using historical U.S. data, Achen and Bartels (2002) find that voters regularly punish governments for droughts, floods, and shark attacks. Wolfers (2002) finds that voters in oil-producing states tend to re-elect incumbent governors during oil price rises and vote them out of office when the oil price drops.

<sup>7</sup>This prediction, if confirmed, allows an alternative interpretation. If the logic advanced by Johnson et al. (2000) applies to governments as well, then expropriation risk might go up when times are bad ; the incentives to expropriate may be greater the lower the marginal product of capital. In a similar vein, Paltseva (2008) argues that as the capital accumulation continues, the predation becomes more attractive for country's government, as the marginal product of investment goes down.



### 3.0.1 Dependent Variable

The data come from the IRIS-3 dataset constructed by Steve Knack and Philip Keefer for the Center for Institutional Reform and the Informal Sector (IRIS) at the University of Maryland. The IRIS Dataset is based on data obtained from ICRG and covers the period 1982-1997. The dataset includes scores for six political risk variables: corruption in government, rule of law, bureaucratic quality, ethnic tensions, repudiation of contracts by government, and risk of expropriation. We employ the IRIS measure of expropriation risk and the risk of the government's repudiation of contracts. In the original data set, each component is assigned a maximum numerical value, with the highest number of points indicating the lowest level of risk; i.e. the number (0) indicates the highest level. Each component is assigned a maximum numerical value, with a higher number of points indicating a lower assessment of risk/. For ease of interpretation, we transform the indices so that higher values imply greater risk. The variables range from 0 to 10.

We also employ data from the International Country Risk Guide (ICRG). We choose this data source since it yields a deep panel, therefore allowing us to analyze the evolution of risk over time. In the ICRG dataset, the risk measures range from 0 to 100.

Table 4 provides summary statistics for all variables. Iraq in 1991 recorded the highest level of expropriation risk and risk of repudiation of contracts. The highest level of economic risk was recorded in Nicaragua in 1987.

## 3.1 Independent Variables

As independent variables, we provide measures of  $\gamma$ , or the capacity of citizens to depose their government; a dummy variable to signify economic downturns; and dummies for external economic shocks. In addition, we use several control variables to capture time varying characteristics of

different countries.<sup>8</sup>

## Measures of Political Restraint:

To measure the ability of citizens to change the government, we focus on the institutional structure of the regime, and, in particular, on the degree to which it is democratic. We use the 21 point Polity scale, as described above, as a proxy for  $\gamma$ . Less skewed than the democracy or autocracy scale, (see figures 4-6), it enables us to group our observations into three groups of roughly equal size: autocracies, with  $\text{Polity} \leq -7$ ; democracies, with  $\text{Polity} \geq 7$ ; and intermediate regimes, with Polity scores in between. Such a division yields three comparable in size groups of points: 1138 observations of autocracies, 911 observations of intermediate regimes, and 1181 observations of democracies.

## Economic Shocks:

To identify negative shocks, we employ methodology similar to that used by Hausman et al. (2004). We create a “filter” based on yearly growth differences:  $\Delta g_{it} = g_{it} - g_{i,t-1}$ , where  $g_{it}$  is a growth rate of country  $i$  during the time period  $t$ . We label a short term change in the growth rate a negative growth shock when

(1) in the year of shock  $\Delta g_{it} < -2$  *ppa* (percentage points growth per annum)

(2) after a shock  $g_{it} < 2$  *ppa*. (percentage points growth per annum). This restriction prevents counting as a growth collapse a decline from, say, 8 to 5 percents per year.

We then create the variable  $shock_{t,t-2}$  which is equal to 1 if a negative economic shock took place in the years  $t$ ,  $t - 1$ , or  $t - 2$ , and which is equal to 0 otherwise.

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<sup>8</sup>Characteristics of countries which are constant over time are captured by country fixed effects.

Summary statistics appear in tables 1 and 2 in the Appendix. Countries in Sub-Saharan Africa and the region of Australia and Oceania exhibit the greatest frequency of negative growth shocks, while countries in Western Europe, North America and Asia exhibit the lowest. The average magnitudes are shown in table 2. Countries in Western Europe and North America have the lowest average magnitudes; the average decrease in their growth rates after a shock is 3.4 percentage points. Countries in Australia and Oceania yield the largest, with an average decrease of 8.4 percentage points.

The results are robust to small changes in the parameters of the filter.

### **Instrumental Variables:**

Regressions of risk indicators on growth shocks are subject to endogeneity bias: an increase in political risk can spur a growth shock.. Because of the persistence in the risk variables, lags of the shock dummies fail to address this problem. We therefore sought exogenous variables that could provide instruments for negative economic shocks and chose the number of natural disasters in a given country and the onset of an unexpected decline in the terms of trade .

Data about natural disasters come from Emergency Events Database (EM-DAT) prepared by World Health Organization Collaborating Centre for Research on the Epidemiology of Disasters (CRED). The relevant descriptive statistics appear in table 3 of the Appendix. The variable "natural disaster" is equal to the number of natural disasters that take place in a given country-year. It ranges from 0 to 12.

Data on unexpected terms of trade shocks are taken from the database composed by Dani Rodrik. To capture "unexpected" part of terms of trade volatility, Rodrik excludes the influence of long-term trends and some macroeconomic fundamentals from current country's terms of trade.

As do Hausman et al. (2005), we construct a dummy variable which takes the value 1 when there is a negative unexpected terms of trade shock that falls in the lowest quartile (25%) of unexpected shock distribution and 0 otherwise.

### **Control Variables:**

We include several control variables. Given the literature on the relationship between income and democracy (Lipset 1960, Epstein, Bates et al. 2006), we control for the level of GDP per capita using data from WDI. The size of a country's population could be related to the magnitude and likelihood of economic shocks. Smaller countries would be more vulnerable to external terms of trade shocks, and vulnerability might decline as population grows. But larger countries might be more likely to experience natural disasters. We therefore control for the population size, using variables from WDI. We also control for trade openness, as it can affect country's vulnerability to external terms of trade shocks. As a measure of trade openness, we use the ratio of exports and imports together to the country's GDP. The data source is again WDI. To control for country's time invariant characteristics, we include country fixed effects.

## **3.2 Preliminary observations**

Our theoretical argument implies that risk is more responsive to economic performance in intermediate regimes. It also implies that the evolution of risk in intermediate regimes differs from that in other types of governments. Taken together, the two implications suggest that intermediate regimes should exhibit higher variance in assessments of risk than would stable democracies or autocracies.

The descriptive statistics suggest that it is the case. Figure 7 captures the variance of expo-

priation risk by regime type. As can be seen, the middle group, corresponding to intermediate regimes, has the largest variance of risk. By implication, then, the variance of growth rates in the sample should be greater for intermediate regimes than for full democracies or full autocracies. Figure 8 lends support to this claim.

### 3.3 Statistical Tests

Proposition 2 predicts risk should increase after an economic shock. In addition, Bayes rule implies that the contemporary level of risk should depend on its previous value. We therefore estimate a model that includes the lagged value of the dependent variable plus a dummy for economic downturns, control variables, and country fixed effects.

$$Risk_{i,t+1} = \beta_0 + \beta_1 Risk_{i,t-3} + \beta_2 Shock_{i,t,t-2} + \beta_3 X_{i,t-3} + \eta_i + \varepsilon_{i,t+1} \quad (4)$$

Because the data on political risk are too noisy to enable us to isolate the relationship with negative shocks using annual data, we use 3-year periods:  $Shock_{t,t-2}$  is thus an indicator variable that is equal 1 if a negative economic shock occurs in the interval  $t$ ,  $t-1$ , or  $t-2$ .  $X_{t-3}$  is the vector of control variables, which are observed prior to economic shock (i.e. at  $t-3$ ).

As an economic decline,  $Shock_{i,t,t-2}$ , may be the consequence of a high risk  $Risk_{i,t-3}$  at  $t-3$ , there is the potential for endogeneity bias. In addition, because (4) includes both a lagged dependent variable and fixed effects, the estimates will be inconsistent, given the small  $T$  and large  $N$ . We therefore estimate (4) using 2SLS procedure, in which  $Shock_{i,t,t-2}$  is instrumented by  $Disasters_t$  – the number of natural disasters in years  $t$ ,  $t-1$ , and  $t-2$  – and terms of trade shocks  $TOT\_shock_t$  by the number of unexpected term of trade shocks in this period. By construction, the instruments are not correlated with either our control variables  $X_{t-3}$  or our measure of  $Risk_{t-3}$ . As we use a fixed effect estimator of (4), the possibility of a correlation between our instruments

and unobserved, country-specific effects does not arise. To the extent that we believe that natural disasters and terms of trade shocks are exogenous, our instruments are valid.<sup>9</sup> Note too that potential bias in  $\widehat{\beta}_2$ , which arises because of the autoregressive term in (4) and the presence of country effects, is negative; if the bias is present, then, it renders our results even stronger.<sup>10</sup>

Proposition 3 implies that perceptions of risk should depend on the level of  $\gamma$ , the ability of citizens to change their government. In particular, our theory predicts that the increase of risk after an economic shock should be greatest in intermediate regimes.

By using interaction terms, we can combine the tests of the two hypotheses into one model:

$$\begin{aligned} Risk_{i,t+1} = & \beta_0 + \beta_1 Risk_{i,t-3} + \beta_2 Shock_{i;t,t-2} * d_{i1,t-3} + \beta_3 Shock_{i;t,t-2} * d_{i2,t-3} + \\ & + \beta_4 Shock_{i;t,t-2} * d_{i3,t-3} + \beta_5 d_{i1,t-3} + \beta_5 d_{i2,t-3} + \beta_6 X_{i,t-3} + \eta_i + \varepsilon_{i,t+1} \end{aligned} \quad (5)$$

where dummy variables  $d_{ij,t-3}$  denote being in group  $j$  of political regimes at  $t - 3$  (group 1 is autocracies, group 2 is intermediate regimes, and group 3 democracies). The coefficients  $\beta_2$  through  $\beta_4$  provide a measure of the differential impact of growth collapses among the three

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<sup>9</sup>We test the validity of our instruments by using the Hausman's test of overidentifying restrictions. The null hypothesis that there is no overidentifying restrictions implies that instruments are not endogenous to each other. The results of our estimation after performing the test show that the null hypothesis can not be rejected at 5% significance level.

<sup>10</sup>Note that in this specification, the first difference estimator of (4) is not consistent (Bond 2002). We address the possibility of endogeneity by instrumenting  $shock_{i;t,t-2}$ , and by noting that the correlation of lagged dependent variable with the error term is negative (see Nickel 1981 for a formal proof). Arellano-Bond (1991) or Blundell-Bond(1998) offer an alternative way of addressing this problem and we applied them to estimate (4). We do not report the corresponding GMM estimates as they were generally not robust, as the corresponding regressor matrix was nearly singular, implying that small changes in assumed values of the estimators would result in large changes in estimated coefficients. Under some parameters of estimation technique, however, these results were consistent with those reported in the paper.

categories of regimes. The interactions between  $Shock_{i,t,t-2}$  and the dummies for political regime are instrumented by the interactions between these dummies and natural disasters  $Disasters_t$  and terms of trade shocks  $TOT\_shock_t$ . Our model takes  $d_{ij,t-3}$  are taken as given, so we do not seek instruments for this term. Proposition 3 implies that the coefficient  $\beta_3$  for the interaction with intermediate regime is positive and significant, while coefficients  $\beta_2$  and  $\beta_4$  are theoretically equal to 0.

### 3.4 Findings

Table 5 shows the results of an estimation of model (4) that incorporates fixed effects and instrumental variables. The estimates enable us to test the basic implication of the model: that following a growth downturn expectations decline. The dummy for a negative shock provides a test for this implication. We expect it to be negative and significant. We find that the coefficient is of the expected sign and of a level of significance sufficient to lend support to our model.

Table 6 reports estimates of the model (5). It confirms that changes in risk in intermediate regimes after an economic shock are of greater magnitude than those in other types of regimes. All coefficients for the interaction between economic shocks and regime type are significant for intermediate regimes, while none are significant for the interactions with autocracy or democracy. In addition, the coefficients for intermediate regimes are larger. Figure 9 illustrates the behavior of corresponding coefficients for different measures of risk. These evidence support the main prediction of the paper, summarized in Proposition 3.

## 4 Conclusion

The analysis suggests patterns of variability in risk of predation, and in particular, the existence of higher and more volatile levels of risk in intermediate regimes than in democracies and autocracies. In intermediate regimes, our model implies, chance events can lead to abrupt changes in expectations and thus in the political and economic choices that people make. Both within-country and cross-country variation will therefore be high. Our model thus helps to uncover systematic processes that underlie what previously appeared to be the unsystematic behavior of such regimes.

Upon reflection, an additional implication flows from our analysis. The argument suggests the existence of three kinds of countries. First come those in which  $\gamma$  is high. These are typically those in which risks are low and do not change. In such countries, the argument implies, political expectations can have little effect on growth. Investors are protected from government predation by the fact that should a government predate, it would be driven from office. Expectations are therefore already favorable. Secondly there are countries in which  $\gamma$  is low. Such countries are run by dictators whom the people cannot overthrow. In these countries expectations are bad, and governments do not try to modify them because the expectations will not improve if these governments choose to behave with restraint.

It is among countries in the middle range of  $\gamma$  where growth responds to changes in expectations. According to our model, should a government behave opportunistically, or the country be hit with an external shock, then the perceived level of risk will rise and the rate of growth decline. On the other hand, in this range of  $\gamma$ , there are economic payoffs for the exercise of political restraint. Among such countries, then, the behavior of governments makes a difference. They *can* induce economic growth. They can do so by shaping political expectations.<sup>11</sup>

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<sup>11</sup>Jones and Olken (2005).



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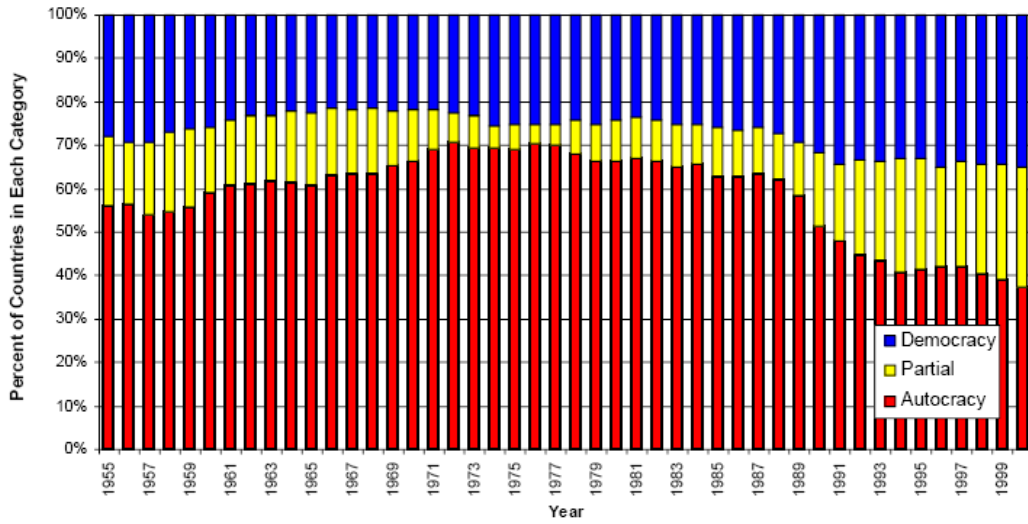


Figure 1. World Democratization Trends, 1955-2000. Reproduced from Epstein, Bates, et al. (2006)

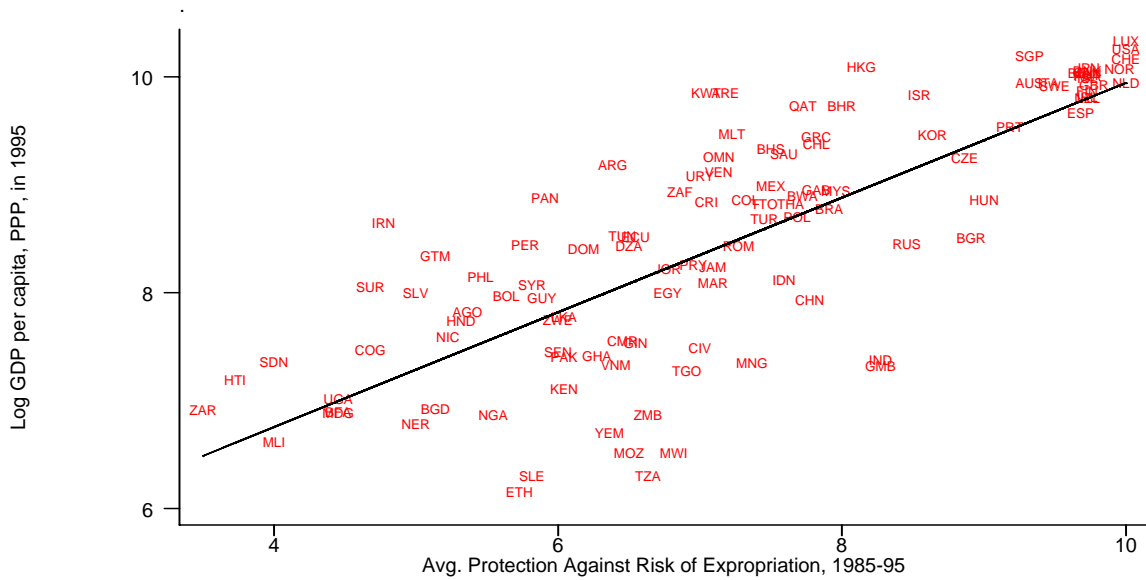


Figure 2. Reproduced from Acemoglu, Daron, Simon Johnson and James A. Robinson (2001) "The Colonial Origins of Comparative Development: An Empirical Investigation" American Economic Review, 91, 1369-1401.

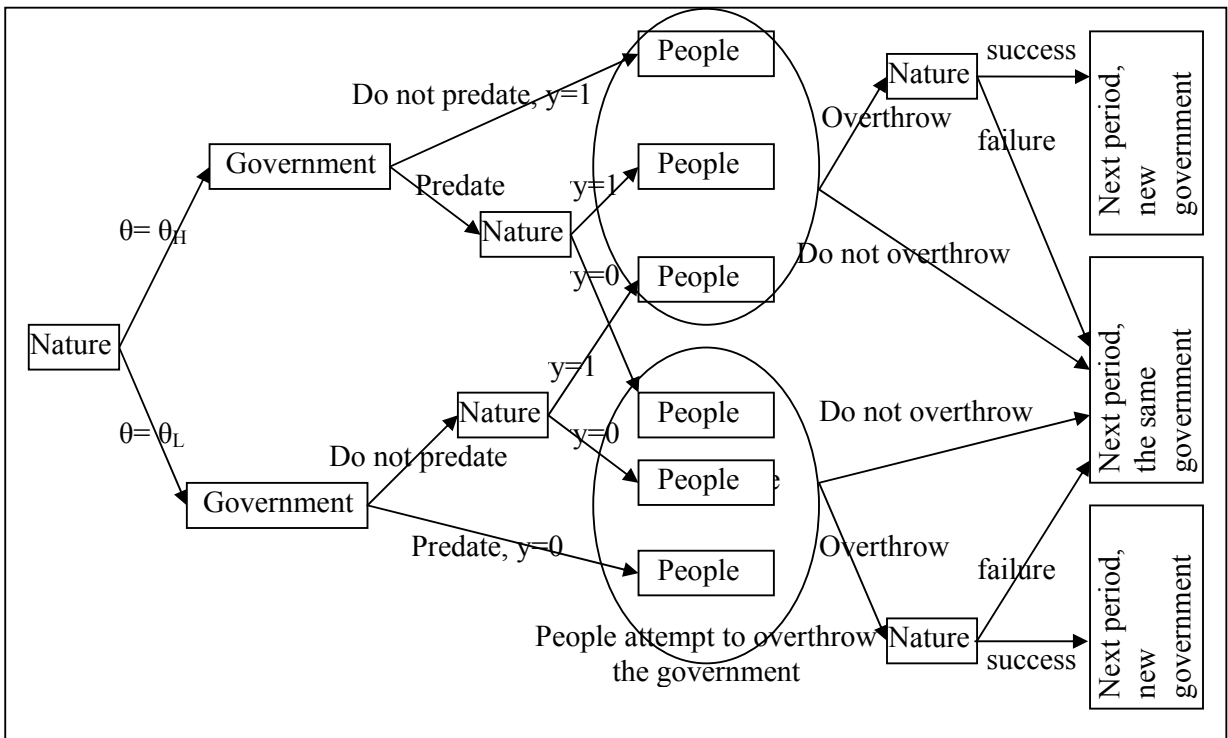


Figure 3. Timing of the first period of stage game. The part of the tree with a short-horizon government is not depicted.

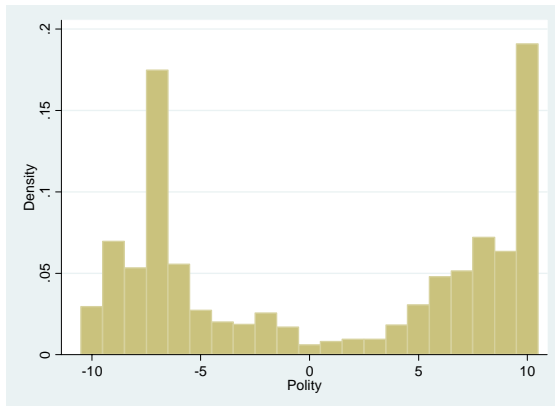


Figure 4. Histogram of Polity variable, 1982-2003 (Polity=Democracy-Autocracy)  
Source: Polity IV Project

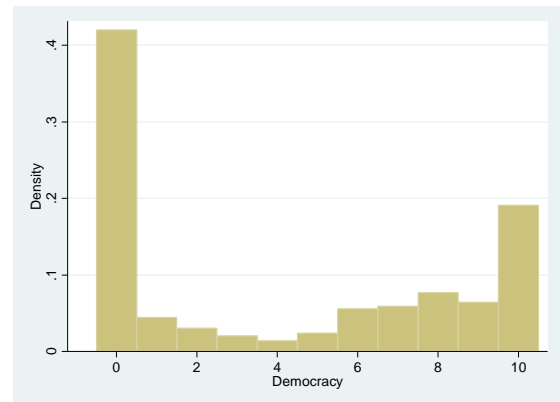


Figure 5. Histogram of Democracy variable, 1982-2003  
Source: Polity IV Project

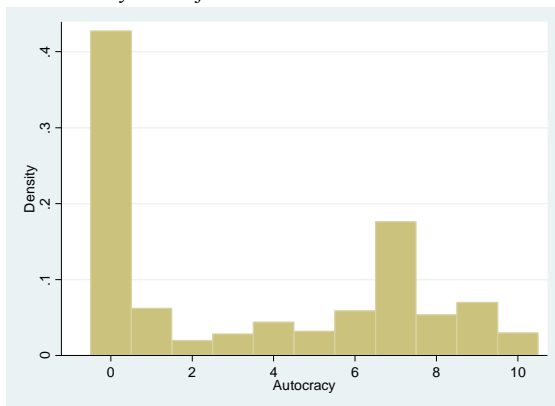


Figure 6. Histogram of Autocracy variable, 1982-2003  
Source: Polity IV Project



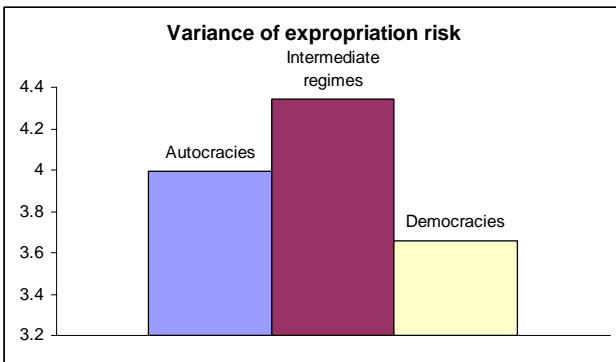


Figure 7. Variance of expropriation risk, by regime type, 1982-2003  
 Source: IRIS-3, Polity IV Project, authors' calculations.

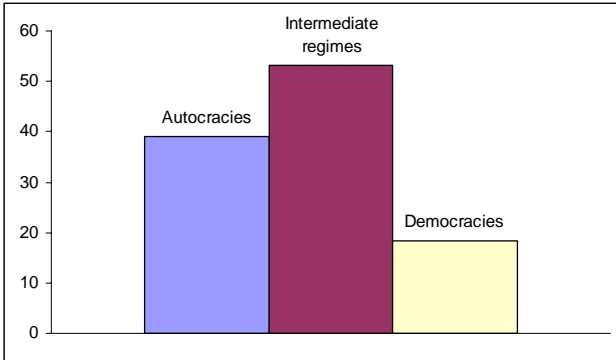
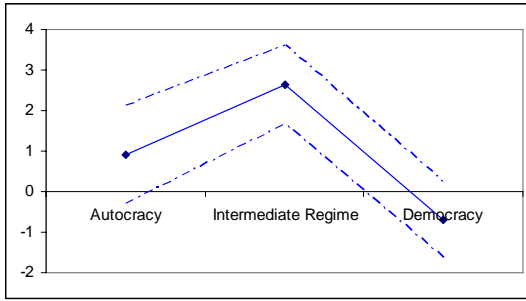
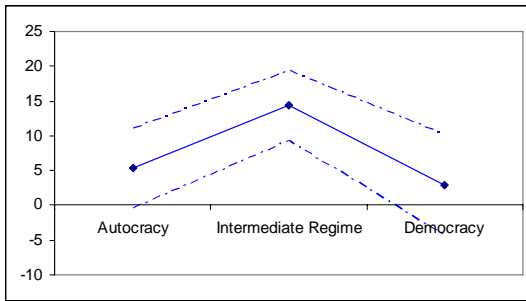


Figure 8. Variance of growth rate, by regime type.  
 Source: WDI 2005, Polity IV Project, authors' calculations.

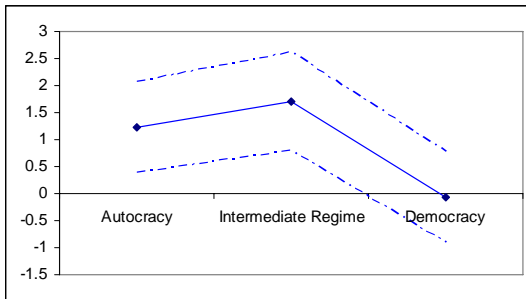
*Expropriation risk*



*Economic Risk*



*Risk of repudiation of contracts*



*Financial Risk*

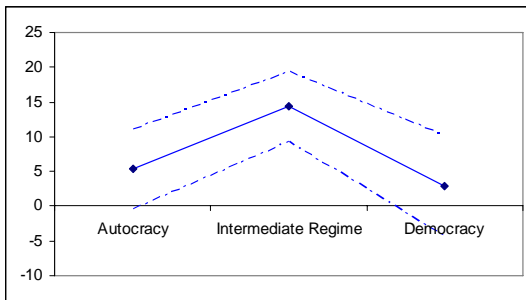


Figure 9. Regression coefficients for collapse effect on risk variables as a function of political regime. Based on the regression from table 6.

**Table 1. Negative economic shocks, by region, 1982-2003**

<i>World Bank region</i>	<i>Number of collapses</i>	<i>Unconditional probability of having collapse</i>
Australia and Oceania	42	.286
Center, South and East Asia	69	.145
Eastern Europe/Formal USSR	89	.211
Latin America	184	.226
North Africa/Middle East	115	.258
Sub-Saharan Africa	287	.262
Western Europe/North America	75	.140
<b>Total</b>	<b>861</b>	<b>.219</b>

Source: WDI 2005, authors' calculations

**Table 2. Average growth variables for economic shocks, by region, 1982-2003**

<i>WB Region</i>	<i>Average growth before</i>	<i>Average growth after</i>	<i>Average growth change</i>
Australia and Oceania	4.746	-3.653	-8.399
Center, South and East Asia	3.793	-2.308	-6.101
Eastern Europe/Formal USSR	-.962	-9.524	-8.562
Latin America	2.797	-3.577	-6.374
North Africa/Middle East	3.316	-4.133	-7.449
Sub-Saharan Africa	2.169	-5.404	-7.573
Western Europe/North America	2.970	-4.362	-3.406
<b>Total</b>	<b>2.458</b>	<b>-4.503</b>	<b>-6.962</b>

Source: WDI 2005, authors' calculations

**Table 3. Natural disasters counted for disaster variable**

<i>Disaster type</i>	<i>Occurrence, 1980-2003</i>
Earthquake	590
Drought	496
Extreme Temperature	223
Flood	1978
Slides	343
Volcano	104
Wave / Surge	15
Wind Storm	1685

Source: Emergency Disasters Database, EM-DAT 2006

Table 4. Summary statistics and sources of data

<i>Variable</i>	<i>Source</i>	<i>Observations</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
<i>Expropriation risk</i>	IRIS-3	1945	2.91	2.309	0	9.5
<i>Risk of repudiation of contracts</i>	IRIS-3	1945	3.57	2.343	0	9.5
<i>Economic risk</i>	ICRG	2440	67.50	7.695	50.5	97.5
<i>Financial risk</i>	ICRG	2440	67.69	9.638	50	96
<i>Government stability</i>	ICRG	2453	7.31	2.453	0	12
<i>Polity</i>	Polity IV	3688	0.74	7.592	-10	10
<i>Autocracy dummy</i>	Polity IV, calculations	3230	0.35	0.478	0	1
<i>Intermediate regime dummy</i>	Polity IV, calculations	3230	0.28	0.450	0	1
<i>Democracy dummy</i>	Polity IV, calculations	3230	0.37	0.482	0	1
<i>Collapse dummy</i>	WDI 2005, calculations	4179	0.22	0.416	0	1
<i>Collapse in previous 3 years</i>	WDI 2005, calculations	4186	0.55	0.497	0	1
<i>Natural disasters</i>	EM-DAT, calculations	5643	1.00	2.401	0	33
<i>Natural disasters in previous 3 years</i>	EM-DAT, calculations	5137	2.99	6.802	0	93
<i>Negative term of trade shock dummy</i>	Rodrik (1999), calculations	5643	0.07	0.263	0	1
<i>Negative term of trade shocks in previous 3 years</i>	Rodrik (1999), calculations	5137	0.25	0.572	0	3
<i>Log (GDP per capita)</i>	WDI 2005	3924	8.20	1.135	5.63	11.08
<i>Openness</i>	WDI 2005	3387	79.92	45.546	1.53	296.38
<i>Log (Population)</i>	WDI 2005	5049	15.20	2.086	9.89	20.97
<i>Vulnerability to natural disasters</i>	EM-DAT, calculations	5643	1.00	2.025	0	17.42
<i>Government change dummy</i>	Leadership duration database, PITF	4173	0.16	0.369	0	1

Table 5. Risk variables and economic shocks, FE.

Economic shocks are instrumented by natural disasters and terms of trade shocks

	<i>Expropriation risk, t+1</i>	<i>Risk of repudiation of contracts, t+1</i>	<i>ICRG Economic Risk, t+1</i>	<i>ICRG Financial Risk, t+1</i>
<i>Economic shock in years t, t-1, or t-2</i>	4.394 [2.56]**	3.77 [2.23]**	9.054 [2.92]***	18.022 [2.51]**
<i>Log GDP pc, lagged 3 years</i>	-0.57 [5.40]***	-0.921 [7.89]***	-1.571 [8.78]***	-2.644 [7.04]***
<i>Openness, lagged 3 years</i>	-0.002 [0.62]	-0.003 [0.89]	-0.012 [2.38]**	-0.016 [1.72]*
<i>Year</i>	-0.225 [10.11]***	-0.168 [9.38]***	-0.073 [2.25]**	0.008 [0.14]
<i>Log (Population) lagged 3 years</i>	0.064 [0.54]	-0.022 [0.20]	0.084 [0.46]	0.078 [0.22]
<i>Expropriation Risk, lagged 3 years</i>	0.211 [2.73]***			
<i>Risk of repudiation of contracts, l. 3years</i>		0.151 [1.34]		
<i>ICRG Economic Risk, lagged 3 years</i>			0.385 [11.89]***	
<i>ICRG Financial Risk, lagged 3 years</i>				0.253 [2.84]***
<i>Observations</i>	1170	1170	1666	1666
<b>Number of countries</b>	116	116	123	123

Absolute value of z statistics in brackets

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Table 6. Risk variables and economic shocks, with interactions, FE  
 Economic shocks are instrumented by natural disasters and terms of trade shocks

	<i>Expropriation risk, t+1</i>	<i>Risk of repudiation of contracts, t+1</i>	<i>ICRG Economic Risk, t+1</i>	<i>ICRG Financial Risk, t+1</i>
<i>Shock*Autocracy</i>	1.087 [1.20]	1.228 [1.47]	2.647 [0.52]	5.294 [0.92]
<i>Shock*Intermediate Regime</i>	2.635 [2.69]***	1.707 [1.87]*	13.758 [3.20]***	14.335 [2.88]***
<i>Shock*Democracy</i>	-0.695 [0.75]	-0.059 [0.07]	6.627 [1.21]	2.892 [0.40]
<i>Autocracy</i>	-0.223 [0.28]	-0.378 [0.53]	3.884 [0.84]	1.549 [0.28]
<i>Intermediate Regime</i>	-1.3 [2.02]**	-0.479 [0.84]	-2.772 [0.77]	-3.383 [0.74]
<i>Log GDP pc, lagged 3 years</i>	-0.165 [3.13]***	-0.112 [2.37]**	-0.229 [1.41]	0.635 [3.02]***
<i>Openness, lagged 3 years</i>	-0.43 [0.60]	-0.556 [0.76]	-4.045 [1.41]	-6.389 [1.59]
<i>Year</i>	-0.007 [1.68]*	-0.008 [2.17]**	-0.015 [1.20]	-0.011 [0.72]
<i>Log (Population) lagged 3 years</i>	-4.288 [3.89]***	-4.565 [4.51]***	3.815 [1.28]	-33.082 [7.39]***
<i>Expropriation Risk, lagged 3 years</i>	0.097 [2.18]**			
<i>Risk of repudiation of contracts, l. 3years</i>		0.112 [2.30]**		
<i>ICRG Economic Risk, lagged 3 years</i>			0.042 [0.99]	
<i>ICRG Financial Risk, lagged 3 years</i>				0.161 [2.88]***
<i>Observations</i>	1091	1091	1566	1566
<b><i>Number of countries</i></b>	109	109	117	117

Absolute value of z statistics in brackets

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

APPENDIX

**Lemma 3 (Full version of lemma 2)** *At  $t = 2$ , in a continuation game with the old government, the set of equilibria is the following:*

1. For  $R > \delta(B + R)(1 - p_H)\gamma$  :

- If  $y_1 = 0$ , equilibrium strategies are  $x_{H2} = 1$ ,  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$ ;
- If  $x_{H1} = 1$ ,  $x_{L1} = 0$ , and  $y_1 = 1$  then  $x_{H2} = 1$ ,  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $\frac{\lambda p_L}{p_H(1-p_H)} > 1$ .

2. If  $\delta(B + R)p_L\gamma < R < \delta(B + R)(1 - p_H)\gamma$  :

- If  $y_1 = 0$ , equilibrium strategies are  $x_{H2} = 1$ ,  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$ ;
- If  $y_1 = 1$ ,  $x_{H1} = 1$ , and  $x_{L1} = 0$  then  $x_{H2} = 0$ , and  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $\lambda * \frac{p_L}{p_H} \frac{\lambda(1-\mu)*p_L + \mu*p_H}{(1-\lambda)\mu*p_H*(1-p_H)} > 1$ .
- If  $y_1 = 1$ ,  $x_{H1} = 0$ , and  $x_{L1} = 0$  then  $x_{H2} = 0$ , and  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $\frac{1}{(1-\widehat{\lambda}_1)*(1-p_H)} \frac{\lambda p_L}{(\lambda+(1-\lambda)*p_H)} > 1$ .

3. If  $\delta(B + R)p_L\gamma > R$  :

- If  $y_1 = 0$  and  $x_{H1} = 1$ , equilibrium strategies are  $x_{H2} = 0$ ,  $x_{L2} = 0$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$ ;
- If  $y_1 = 0$ ,  $x_{H1} = 0$ , and  $x_{L1} = 1$ , strategies  $x_{H2} = 0$ ,  $x_{L2} = 0$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute equilibrium in a continuation game only if  $\frac{\widehat{\lambda}_1 * p_L}{(\widehat{\lambda}_1 + (1-\widehat{\lambda}_1)*p_H)(1-\lambda)*(1-p_H)} < 1$ , here  $\widehat{\lambda}_1 = \frac{\lambda}{\frac{\mu}{1-\mu}*(1-\lambda)*(1-p_H)+1}$ ;
- If  $y_1 = 0$ ,  $x_{H1} = 0$ , and  $x_{L1} = 0$ , strategies  $x_{H2} = 0$ ,  $x_{L2} = 0$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute equilibrium in a continuation game only if  $\frac{1-\lambda p_L}{(1-\lambda)*(1-p_H)} \frac{\widehat{\lambda}_1 * p_L}{\widehat{\lambda}_1 + (1-\widehat{\lambda}_1)*p_H} < 1$ , here  $\widehat{\lambda}_1 = \frac{\lambda}{\lambda + \frac{(1-\mu p_H)*(1-\lambda)}{(1-\mu)(1-p_L)}}$ ;
- If  $y_1 = 0$ ,  $x_{H1} = 1$ , and  $x_{L1} = 0$ , strategies  $x_{H2} = 0$ ,  $x_{L2} = 0$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute equilibrium in a continuation game only if  $\frac{(1-\widehat{\lambda}_1 p_L)\lambda p_L}{(1-\widehat{\lambda}_1)*(1-p_H)p_H} < 1$ , here  $\widehat{\lambda}_1 = \frac{\lambda}{\lambda + (1-\lambda) \frac{\mu * p_H}{\mu * p_H + (1-\mu) * p_L}}$ ;

- If  $y_1 = 0$ ,  $x_{H1} = 0$ , and  $x_{L1} = 0$ , strategies  $x_{H2} = 0$ ,  $x_{L2} = 0$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute equilibrium in a continuation game only if  $\frac{1}{(1-\widehat{\lambda}_1)*(1-p_H)} \frac{\lambda p_L}{(\lambda+(1-\lambda)*p_H)} > 1$ , here  $\widehat{\lambda}_1 = \frac{\lambda}{\lambda+(1-\lambda)*\frac{\mu*p_H}{\mu+(1-\mu)*p_L}}$ ;

4. For any  $\gamma$ , if  $x_{H1} = 1$ ,  $x_{L1} = 0$  or  $1$ , and  $y_1 = 1$ , then  $s_1|1 = s_1|0 = \text{not overthrow}$ ,  $x_{H2} = 1$ , and  $x_{L2} = 1$  constitute equilibrium in a continuation game;

5. For any  $\gamma$ , if  $x_{H1} = 0$ ,  $x_{L1} = 0$ , and  $y_1 = 1$ , then  $x_{H2} = 1$ , and  $x_{L2} = 1$ , and  $s|1 = s|0 = \text{not overthrow}$  constitute equilibrium in a continuation game.

6. For any  $\gamma$ , if  $x_{H1} = 0$ ,  $x_{L1} = 0$ , and  $y_1 = 1$ , then  $x_{H2} = 1$ ,  $x_{L2} = 1$ , and  $s|1 = s|0 = \text{not overthrow}$  constitute equilibrium in a continuation game if  $\frac{\lambda p_L}{p_H(1-p_H)} > 1$ .

**Proof of Lemma 1.** Consider a subgame at  $t = 2$  if a new government comes to power. For any government from the pool of possible governments, the prior probability that a government has high competence is  $\mu$ , while the prior probability that a government has a long time horizon is  $\lambda$ . As we are looking for the equilibrium in pure strategies, the government's strategy  $Pr(x|\theta, t = 2)$  can be written as  $x_{\theta 2} \in \{0, 1\}$ , where  $\theta$  is the type of the government. This notation refers only to the government with a long time horizon, as all governments with a short time horizon predate in all states of the world.

The outcome  $y = 1$  is possible if: (1) competence  $\theta = \theta_H$ , discount  $\delta = \delta$ , and predation  $x = 1$ , (2) competence  $\theta = \theta_H$ , discount  $\delta = \delta$ , and predation  $x = 0$ , (3) competence  $\theta = \theta_H$ , discount  $\delta = 0$ , and predation  $x = 1$ , (4) competence  $\theta = \theta_L$ , discount  $\delta = \delta$ , and predation  $x = 0$ . The outcome  $y = 0$  is possible in the following cases: (1) competence  $\theta = \theta_H$ , discount  $\delta = \delta$ , and predation  $x = 1$ , (2) competence  $\theta = \theta_H$ , discount  $\delta = 0$ , and predation  $x = 1$ , (3) competence  $\theta = \theta_L$ , discount  $\delta = \delta$ , and predation  $x = 0$ , (4) competence  $\theta = \theta_L$ , discount  $\delta = \delta$ , and predation  $x = 1$ , and (5) competence  $\theta = \theta_L$ , discount  $\delta = 0$ , and predation  $x = 1$ . Probabilities of these outcomes depend on people's prior beliefs about the types of a government and on the government's strategy. People's posterior beliefs about the government's competence are computed by Bayesian formula:

$$\widehat{\mu}_2|_{y=1} = \frac{\mu*\lambda*x_{H2}*p_H + \mu*\lambda*(1-x_{H2}) + \mu*(1-\lambda)*p_H}{\mu*\lambda*x_{H2}*p_H + \mu*\lambda*(1-x_{H2}) + \mu*(1-\lambda)*p_H + (1-\mu)*\lambda*(1-x_{L2})*p_L}$$

$$\widehat{\mu}_2|_{y=0} = \frac{\mu*\lambda*x_{H2}*(1-p_H) + \mu*(1-\lambda)*(1-p_H)}{\mu*\lambda*x_{H2}*(1-p_H) + \mu*(1-\lambda)*(1-p_H) + (1-\mu)*\lambda*(1-x_{L2})*(1-p_L) + (1-\mu)*\lambda*x_{L2} + (1-\mu)*(1-\lambda)}$$



Now consider four possible pure strategy profiles of a government at  $t = 2$ :  $x_{H2} = 1, x_{L2} = 1$ ;  $x_{H2} = 1, x_{L2} = 0$ ;  $x_{H2} = 0, x_{L2} = 1$ ;  $x_{H2} = 0, x_{L2} = 0$ . The rest of the proof is organized as follows. First, for each strategy of a government, we find people's best response to this strategy. Second, we check if the original strategy profile of a government is still a best response to people's strategy, i.e. if a proposed pair of strategies constitute an equilibrium in this game.

Note that everywhere it is optimal for people to change the government if their posterior that the government has high competence is lower than  $\mu$ . Similar, it is optimal to keep the government if people's posterior that the government has high competence is higher than  $\mu$ .

(1) Assume that  $x_{H2} = 1, x_{L2} = 1$ . People's posteriors about the government's competence are  $\widehat{\mu}_2|_{y=1} = \frac{\mu * p_H}{\mu * p_H} = 1 > \mu$ ,  $\widehat{\mu}_2|_{y=0} = \frac{\mu * (1 - p_H)}{\mu * (1 - p_H) + (1 - \mu)} = \frac{\mu * (1 - p_H)}{-\mu p_H + 1} < \mu$ . Therefore, the optimal response of people to the assumed government's strategy is  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$ .

The payoffs of different types of the government given the people's strategy are following. For  $\theta = \theta_H$ , the payoff from predation is  $U(\theta_H|x = 1) = B + R + \delta(p_H(B + R) + (1 - p_H)(1 - \gamma)(B + R))$ , and the payoff from restraint is  $U(\theta_H|x = 0) = B + \delta(B + R)$ . So, for a high-competent government, predation is profitable if  $R > \delta\gamma(1 - p_H)(B + R)$ . Similarly, for  $\theta = \theta_L$ , the payoff from predation is  $U(\theta_L|x = 1) = B + R + \delta(1 - \gamma)(B + R)$ , and the payoff from restraint is  $U(\theta_L|x = 0) = B + \delta(p_L(B + R) + (1 - p_L)(1 - \gamma)(B + R))$ . Therefore, a low-competent government predated if  $R > \delta\gamma p_L(B + R)$ . As  $1 - p_H > p_L$ , strategy profiles  $x_{H2} = 1, x_{L2} = 1$ , and  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$  constitute equilibrium if  $R > \delta\gamma(1 - p_H)(B + R)$ .

(2) Assume that  $x_{H2} = 1, x_{L2} = 0$ . People's posteriors about the government's competence are  $\widehat{\mu}_2|_{y=1} = \frac{\mu * p_H}{\mu * p_H + (1 - \mu) * \lambda * \frac{p_L}{p_H}} = \frac{\mu}{\mu + (1 - \mu) * \lambda * \frac{p_L}{p_H}} > \mu$ ,  $\widehat{\mu}_2|_{y=0} = \frac{\mu * (1 - p_H)}{\mu * (1 - p_H) + (1 - \mu) * \lambda * (1 - p_L) + (1 - \lambda)(1 - \mu)} = \frac{\mu}{\mu + (1 - \mu) * \frac{1 - \lambda p_L}{1 - p_H}} < \mu$ . Therefore, the optimal response of people to the assumed government's strategy is  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$ .

For a high-competent government, predation is profitable if  $R > \delta\gamma(1 - p_H)(B + R)$ . Similarly, a low-competent government predated if  $R > \delta\gamma p_L(B + R)$ . As  $1 - p_H > p_L$ , strategy  $x_{L2} = 0$  is not optimal for a low-type government, and for any parameter values  $x_{H2} = 1, x_{L2} = 0$  is not the part of an equilibrium.

(3) Assume that  $x_{H2} = 0, x_{L2} = 1$ . People's posteriors about the government's competence are  $\widehat{\mu}_2|_{y=1} = \frac{\mu * \lambda + \mu * (1 - \lambda) * p_H}{\mu * \lambda + \mu * (1 - \lambda) * p_H} = 1 > \mu$ ,  $\widehat{\mu}_2|_{y=0} = \frac{\mu * (1 - \lambda) * (1 - p_H)}{\mu * (1 - \lambda) * (1 - p_H) + 1 - \mu} = \frac{\mu}{\mu + (1 - \mu) * \frac{1}{(1 - \lambda) * (1 - p_H)}} < \mu$ . Therefore, the optimal response of people to the assumed government's strategy is  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$ .

As before, for a high-competent government, predation is profitable if  $R > \gamma\delta(1 - p_H)(B + R)$ . Similarly, for  $\theta = \theta_L$ , predation is optimal if  $R > \delta\gamma p_L(B + R)$ . As  $1 - p_H > p_L$ , strategy profiles  $x_{H2} = 0, x_{L2} = 1$ , and  $s|1 = \textit{not}$

overthrow,  $s|0 = overthrow$  constitute equilibrium if  $\gamma\delta p_L(B + R) < R < \gamma\delta(1 - p_H)(B + R)$ .

(4) Assume that  $x_{H2} = 0, x_{L2} = 0$ . People's posteriors about the government's competence are  $\widehat{\mu}_2|_{y=1} = \frac{\mu*\lambda + \mu*(1-\lambda)*p_H}{\mu*\lambda + \mu*(1-\lambda)*p_H + (1-\mu)*\lambda*p_L} = \frac{\mu}{\mu + \frac{(1-\mu)*\lambda*p_L}{\lambda + (1-\lambda)*p_H}} > \mu$  (as  $\lambda * p_L < \lambda$ , and, therefore,  $\lambda * p_L < \lambda + (1 - \lambda) * p_H$ ),  $\widehat{\mu}_2|_{y=0} = \frac{\mu*(1-\lambda)*(1-p_H)}{\mu*(1-\lambda)*(1-p_H) + (1-\mu)(1-\lambda p_L)} = \frac{\mu}{\mu + (1-\mu)*\frac{1-\lambda p_L}{(1-\lambda)*(1-p_H)}} < \mu$  (as  $1 > 1 - p_H$ , and  $1 - \lambda p_L > 1 - \lambda$ ). Therefore, the optimal response of people to the assumed government's strategy is  $s|1 = not\ overthrow$ ,  $s|0 = overthrow$ .

As before, for a high-competent government, predation is profitable if  $R > \delta\gamma(1 - p_H)(B + R)$ , and for a low-competent government, the predation is profitable if  $R > \delta\gamma p_L(B + R)$ . As a result, the strategy profiles  $x_{H2} = 0, x_{L2} = 0$ , and  $s|1 = not\ overthrow$ ,  $s|0 = overthrow$  constitute equilibrium if  $\gamma\delta p_L(B + R) > R$ . ■

**Proof of Lemma 2.** After the first period, the people's posterior beliefs that the government has high competence depend on the government strategy in the first period. Similar to the case of a new government in the second period, these beliefs can be computed by Bayesian updating:

$$\widehat{\mu}_1|_{y_1=1} = \frac{\mu*\lambda*x_{H1}*p_H + \mu*\lambda*(1-x_{H1}) + \mu*(1-\lambda)*p_H}{\mu*\lambda*x_{H1}*p_H + \mu*\lambda*(1-x_{H1}) + \mu*(1-\lambda)*p_H + (1-\mu)*\lambda*(1-x_{L1})*p_L}$$

$$\widehat{\mu}_1|_{y_1=0} = \frac{\mu*\lambda*x_{H1}*(1-p_H) + \mu*(1-\lambda)*(1-p_H)}{\mu*\lambda*x_{H1}*(1-p_H) + \mu*(1-\lambda)*(1-p_H) + (1-\mu)*\lambda*(1-x_{L1})*(1-p_L) + (1-\mu)*\lambda*x_{L1} + (1-\mu)*(1-\lambda)}$$

For  $x_{H1} = 1, x_{L1} = 1$ , these beliefs are  $\widehat{\mu}_1|_{y_1=1} = 1$  and  $\widehat{\mu}_1|_{y_1=0} = \frac{\mu*(1-p_H)}{\mu*(1-p_H) + (1-\mu)} < \mu$ .

For  $x_{H1} = 1, x_{L1} = 0$ , these beliefs are  $\widehat{\mu}_1|_{y_1=1} = \frac{\mu*p_H}{\mu*p_H + (1-\mu)*\lambda*p_L} = \frac{\mu}{\mu + (1-\mu)*\lambda*\frac{p_L}{p_H}} > \mu$  and  $\widehat{\mu}_1|_{y_1=0} = \frac{\mu*(1-p_H)}{\mu*(1-p_H) + (1-\mu)*\lambda*(1-p_L) + (1-\lambda)(1-\mu)} = \frac{\mu}{\mu + (1-\mu)*\frac{1-\lambda p_L}{1-p_H}} < \mu$ .

For  $x_{H1} = 0, x_{L1} = 1$ , these beliefs are  $\widehat{\mu}_1|_{y_1=1} = 1 > \mu$  and  $\widehat{\mu}_1|_{y_1=0} = \frac{\mu*(1-\lambda)*(1-p_H)}{\mu*(1-\lambda)*(1-p_H) + 1-\mu} = \frac{\mu}{\mu + (1-\mu)*\frac{1}{(1-\lambda)*(1-p_H)}} < \mu$ .

For  $x_{H1} = 0, x_{L1} = 0$ , these beliefs are  $\widehat{\mu}_1|_{y_1=1} = \frac{\mu*\lambda + \mu*(1-\lambda)*p_H}{\mu*\lambda + \mu*(1-\lambda)*p_H + (1-\mu)*\lambda*p_L} = \frac{\mu}{\mu + \frac{(1-\mu)*\lambda*p_L}{\lambda + (1-\lambda)*p_H}} > \mu$  (as  $\lambda * p_L < \lambda + (1 - \lambda) * p_H$ ), and  $\widehat{\mu}_1|_{y_1=0} = \frac{\mu*(1-\lambda)*(1-p_H)}{\mu*(1-\lambda)*(1-p_H) + (1-\mu)(1-\lambda p_L)} = \frac{\mu}{\mu + (1-\mu)*\frac{1-\lambda p_L}{(1-\lambda)*(1-p_H)}} < \mu$  (as  $1 > 1 - p_H$ , and  $1 - \lambda p_L > 1 - \lambda$ ).

Now, we look separately at the cases of  $y = 0$  and  $y = 1$  and analyze which equilibria might be supported for different strategies of the government in the first period.

1. Assume that  $y = 0, x_{H1} = 1$ , and  $x_{L1} = 1$ . Here  $\widehat{\mu}_1|_{y_1=0} = \frac{\mu*(1-p_H)}{1-\mu p_H} < \mu$ ,  $\widehat{\lambda}_1|_{y_1=0} = \lambda$ .

- If  $x_{H2} = 1$ , and  $x_{L2} = 1$ , the posterior beliefs of people about the government's competence are  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1*(1-p_H)}{-\widehat{\mu}_1 p_H + 1} < \widehat{\mu}_1 < \mu$ . Then the optimal strategy of people is  $s|1 = not$

*overthrow*,  $s|0 = \textit{overthrow}$ . Therefore, as calculations in the proof of Lemma 1 show, strategies  $x_{H2} = 1$ , and  $x_{L2} = 1$ , and  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$  constitute an equilibrium in a continuation game if  $R > \gamma\delta(1 - p_H)(B + R)$ .

- If  $x_{H2} = 1$ , and  $x_{L2} = 0$ , the posterior beliefs of people about the government's competence are  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \widehat{\lambda}_1 * \frac{p_L}{p_H}} = \frac{\mu}{\mu + (1 - \mu) * \lambda * \frac{p_L}{p_H(1 - p_H)}} < \mu$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \frac{1 - \widehat{\lambda}_1 p_L}{1 - p_H}} < \widehat{\mu}_1|_{y_1=0} < \mu$ . Note that  $\widehat{\mu}_2|_{y_2=1}$  is smaller than  $\mu$  if  $\frac{\lambda p_L}{p_H(1 - p_H)} > 1$ , and higher than  $\mu$  if  $\frac{\lambda p_L}{p_H(1 - p_H)} > 1 < 1$ . Then the optimal strategy of people is  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$  if  $\frac{\lambda p_L}{p_H(1 - p_H)} < 1$  and  $s_1|1 = s_1|0 = \textit{overthrow}$  if  $\frac{\lambda p_L}{p_H(1 - p_H)} > 1$ . In both cases, strategy  $x_{L2} = 0$  is not optimal for a low-type government, and for any parameter values  $x_{H2} = 1, x_{L2} = 0$  is not the part of an equilibrium.
- If  $x_{H2} = 0$ , and  $x_{L2} = 1$ , the posterior beliefs of people about the government's competence are  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \frac{1}{(1 - \widehat{\lambda}_1) * (1 - p_H)}} < \widehat{\mu}_1|_{y_1=0} < \mu$ . Then the optimal strategy of people is  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$ . Therefore, as calculations in the proof of Lemma 1 show, strategies  $x_{H2} = 0$ , and  $x_{L2} = 1$ , and  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$  constitute an equilibrium in a continuation game if  $\gamma\delta p_L(B + R) < R < \gamma\delta(1 - p_H)(B + R)$ .
- If  $x_{H2} = 0$ , and  $x_{L2} = 0$ , the posterior beliefs of people about the government's competence are  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + \frac{(1 - \widehat{\mu}_1) * \widehat{\lambda}_1 * p_L}{\widehat{\lambda}_1 + (1 - \widehat{\lambda}_1) * p_H}} = \frac{\mu}{\mu + \frac{(1 - \mu) * \lambda_1 * p_L}{(\lambda_1 + (1 - \lambda_1) * p_H)(1 - p_H)}} > \mu$  (as  $p_L < 1 - p_H$  and  $\widehat{\lambda}_1 < \widehat{\lambda}_1 + (1 - \widehat{\lambda}_1) * p_H$ ) and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \frac{1 - \widehat{\lambda}_1 p_L}{(1 - \widehat{\lambda}_1) * (1 - p_H)}} < \widehat{\mu}_1|_{y_1=0} < \mu$ . Then the optimal strategy of people is  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$ . Therefore, strategies  $x_{H2} = 0$ , and  $x_{L2} = 0$ , and  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$  constitute an equilibrium in a continuation game if  $\gamma\delta p_L(B + R) > R$ .

2. Assume that  $y = 0$ ,  $x_{H1} = 1$ , and  $x_{L1} = 0$ . Here  $\widehat{\mu}_1|_{y_1=0} = \frac{\mu}{\mu + (1 - \mu) * \frac{1 - \lambda p_L}{1 - p_H}} < \mu$ , and  $\widehat{\lambda}_1|_{y_1=0} = \frac{\lambda}{\lambda + (1 - \lambda) * \frac{1 - \mu p_H}{\mu * (1 - p_H) + (1 - \mu) * (1 - p_L)}} < \lambda$ .

- If  $x_{H2} = 1$ , and  $x_{L2} = 1$ , the posterior beliefs of people about the government's competence are  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1 * (1 - p_H)}{-\widehat{\mu}_1 p_H + 1} < \widehat{\mu}_1 < \mu$ . The optimal strategy of people is  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$ . Therefore, strategies  $x_{H2} = 1$ , and  $x_{L2} = 1$ , and  $s|1 = \textit{not overthrow}$ ,  $s|0 = \textit{overthrow}$  constitute an equilibrium in a continuation game if  $R > \gamma\delta(1 - p_H)(B + R)$ .
- If  $x_{H2} = 1$ , and  $x_{L2} = 0$ , the posterior beliefs of people about the government's competence are  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \widehat{\lambda}_1 * \frac{p_L}{p_H}} = \frac{\mu}{\mu + (1 - \mu) * \widehat{\lambda}_1 * \frac{p_L(1 - \lambda p_L)}{p_H(1 - p_H)}}$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \frac{1 - \widehat{\lambda}_1 p_L}{1 - p_H}} < \widehat{\mu}_1|_{y_1=0} < \mu$ .

Note that  $\widehat{\mu}_2|_{y_2=1}$  is higher than  $\mu$  if  $\widehat{\lambda}_1 * \frac{p_L(1-\lambda p_L)}{p_H(1-p_H)} > 1$ , and lower than  $\mu$  if  $\widehat{\lambda}_1 * \frac{p_L(1-\lambda p_L)}{p_H(1-p_H)} < 1$ . Then the optimal strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  if  $\widehat{\lambda}_1 * \frac{p_L(1-\lambda p_L)}{p_H(1-p_H)} > 1$  and  $s_1|1 = s_1|0 = \text{overthrow}$  if  $\widehat{\lambda}_1 * \frac{p_L(1-\lambda p_L)}{p_H(1-p_H)} < 1$ . In both cases, strategy  $x_{L2} = 0$  is not optimal for a low-type government, and for any parameter values  $x_{H2} = 1, x_{L2} = 0$  is not the part of an equilibrium.

- If  $x_{H2} = 0$ , and  $x_{L2} = 1$ , the posterior beliefs of people about the government's competence are  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1-\widehat{\mu}_1) * \frac{1}{(1-\widehat{\lambda}_1) * (1-p_H)}} < \widehat{\mu}_1|_{y_1=0} < \mu$ . Then optimal strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$ . Therefore, strategies  $x_{H2} = 0$ , and  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $\gamma\delta p_L(B + R) < R < \gamma\delta(1 - p_H)(B + R)$ .
- If  $x_{H2} = 0$ , and  $x_{L2} = 0$ , the posterior beliefs of people about the government's competence are  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + \frac{(1-\widehat{\mu}_1) * \widehat{\lambda}_1 * p_L}{\widehat{\lambda}_1 + (1-\widehat{\lambda}_1) * p_H}} = \frac{\mu}{\mu + \frac{(1-\mu) * \widehat{\lambda}_1 * p_L(1-\lambda p_L)}{(\widehat{\lambda}_1 + (1-\widehat{\lambda}_1) * p_H)(1-p_H)}} > \mu$  (as  $p_L(1-\lambda p_L) < 1-p_H$  and  $\widehat{\lambda}_1 < \widehat{\lambda}_1 + (1-\widehat{\lambda}_1) * p_H$ ) and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1-\widehat{\mu}_1) * \frac{1-\widehat{\lambda}_1 p_L}{(1-\widehat{\lambda}_1) * (1-p_H)}} < \widehat{\mu}_1|_{y_1=0} < \mu$  (as  $1 - \widehat{\lambda}_1 p_L > 1 - \widehat{\lambda}_1$ ). The optimal strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$ . Therefore, strategies  $x_{H2} = 0$ , and  $x_{L2} = 0$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $\gamma\delta p_L(B + R) > R$ .

3. Assume that  $y = 0$ ,  $x_{H1} = 0$ , and  $x_{L1} = 1$ . Here  $\widehat{\mu}_1|_{y_1=0} = \frac{\mu}{\mu + (1-\mu) * \frac{1}{(1-\lambda) * (1-p_H)}} < \mu$ ,  $\widehat{\lambda}_1|_{y_1=0} = \frac{\lambda}{\frac{\mu}{1-\mu} * (1-\lambda) * (1-p_H) + 1} < \lambda$ .

- If  $x_{H2} = 1$  and  $x_{L2} = 1$  then  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1 * (1-p_H)}{-\widehat{\mu}_1 p_H + 1} < \mu$ . Then strategies  $x_{H2} = 1$ , and  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $R > \gamma\delta(1 - p_H)(B + R)$ .
- If  $x_{H2} = 1$  and  $x_{L2} = 0$ , then  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1-\widehat{\mu}_1) * \widehat{\lambda}_1 * \frac{p_L}{p_H}} = \frac{\mu}{\mu + \frac{(1-\mu)}{(1-p_H)(1-\lambda)} * \widehat{\lambda}_1 * \frac{p_L}{p_H}}$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1-\widehat{\mu}_1) * \frac{1-\widehat{\lambda}_1 p_L}{1-p_H}} < \widehat{\mu}_1|_{y_1=0} < \mu$ . If  $\widehat{\mu}_2|_{y_2=1} > \mu$ , the optimal strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  and if  $\widehat{\mu}_2|_{y_2=1} < \mu$ , the strategy of people is  $s_1|1 = s_1|0 = \text{overthrow}$ . In both cases,  $x_{H2} = 1, x_{L2} = 0$  is not the part of an equilibrium.
- If  $x_{H2} = 0$  and  $x_{L2} = 1$ , then  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1-\widehat{\mu}_1) * \frac{1}{(1-\widehat{\lambda}_1) * (1-p_H)}} < \widehat{\mu}_1|_{y_1=0} < \mu$ . Then strategies  $x_{H2} = 0$ , and  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $\gamma\delta p_L(B + R) < R < \gamma\delta(1 - p_H)(B + R)$ .

- If  $x_{H2} = 0$  and  $x_{L2} = 0$ , then  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + \frac{(1-\widehat{\mu}_1)*\widehat{\lambda}_1*p_L}{\widehat{\lambda}_1+(1-\widehat{\lambda}_1)*p_H}} = \frac{\mu}{\mu + \frac{(1-\mu)*\widehat{\lambda}_1*p_L}{(\widehat{\lambda}_1+(1-\widehat{\lambda}_1)*p_H)(1-\lambda)*(1-p_H)}}$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1-\widehat{\mu}_1)*\frac{1-\widehat{\lambda}_1*p_L}{(1-\widehat{\lambda}_1)*(1-p_H)}} < \widehat{\mu}_1|_{y_1=0} < \mu$  (as  $1 - \widehat{\lambda}_1 p_L > 1 - \widehat{\lambda}_1$ ). Note that  $\widehat{\mu}_2|_{y_2=1}$  is higher than  $\mu$  if  $\frac{\widehat{\lambda}_1*p_L}{(\widehat{\lambda}_1+(1-\widehat{\lambda}_1)*p_H)(1-\lambda)*(1-p_H)} < 1$ , and lower than  $\mu$  if  $\frac{\widehat{\lambda}_1*p_L}{(\widehat{\lambda}_1+(1-\widehat{\lambda}_1)*p_H)(1-\lambda)*(1-p_H)} > 1$ . Then the optimal strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  if

$$\frac{\widehat{\lambda}_1*p_L}{(\widehat{\lambda}_1+(1-\widehat{\lambda}_1)*p_H)(1-\lambda)*(1-p_H)} < 1$$

and  $s_1|1 = s_1|0 = \text{overthrow}$  if  $\frac{\widehat{\lambda}_1*p_L}{(\widehat{\lambda}_1+(1-\widehat{\lambda}_1)*p_H)(1-\lambda)*(1-p_H)} > 1$ . Note that  $x_{H2} = 0$ , and  $x_{L2} = 0$  are not best responses to  $s_1|1 = s_1|0 = \text{overthrow}$ . As a result, strategies  $x_{H2} = 0$ , and  $x_{L2} = 0$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game only if  $\gamma\delta p_L(B+R) > R$  and  $\frac{\widehat{\lambda}_1*p_L}{(\widehat{\lambda}_1+(1-\widehat{\lambda}_1)*p_H)(1-\lambda)*(1-p_H)} < 1$ .

4. Assume that  $y = 0$ ,  $x_{H1} = 0$ , and  $x_{L1} = 0$ . Here  $\widehat{\mu}_1|_{y_1=0} = \frac{\mu}{\mu+(1-\mu)*\frac{1-\lambda p_L}{(1-\lambda)*(1-p_H)}} < \mu$ ,  $\widehat{\lambda}_1|_{y_1=0} = \frac{\lambda}{\lambda + \frac{(1-\mu p_H)*(1-\lambda)}{(1-\mu)(1-p_L)}} < \lambda$ .

- If  $x_{H2} = 1$  and  $x_{L2} = 1$  then  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1*(1-p_H)}{-\widehat{\mu}_1 p_H + 1} < \mu$ . Then strategies  $x_{H2} = 1$ , and  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $R > \gamma\delta(1-p_H)(B+R)$ .
- If  $x_{H2} = 1$  and  $x_{L2} = 0$ , then  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1-\widehat{\mu}_1)*\widehat{\lambda}_1*\frac{p_L}{p_H}} = \frac{\mu}{\mu + \frac{(1-\mu)*\frac{1-\lambda p_L}{(1-\lambda)}*\widehat{\lambda}_1*\frac{p_L}{p_H}}}$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1-\widehat{\mu}_1)*\frac{1-\widehat{\lambda}_1*p_L}{1-p_H}} < \widehat{\mu}_1|_{y_1=0} < \mu$ . If  $\widehat{\mu}_2|_{y_2=1} > \mu$ , the optimal strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  and if  $\widehat{\mu}_2|_{y_2=1} < \mu$ , the strategy of people is  $s_1|1 = s_1|0 = \text{overthrow}$ . In both cases,  $x_{H2} = 1, x_{L2} = 0$  is not the part of an equilibrium.
- If  $x_{H2} = 0$  and  $x_{L2} = 1$ , then  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1-\widehat{\mu}_1)*\frac{1}{(1-\widehat{\lambda}_1)*(1-p_H)}} < \widehat{\mu}_1|_{y_1=0} < \mu$ . Then strategies  $x_{H2} = 0$ , and  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $\gamma\delta p_L(B+R) < R < \gamma\delta(1-p_H)(B+R)$ .
- If  $x_{H2} = 0$  and  $x_{L2} = 0$ , then  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + \frac{(1-\widehat{\mu}_1)*\widehat{\lambda}_1*p_L}{\widehat{\lambda}_1+(1-\widehat{\lambda}_1)*p_H}} = \frac{\mu}{\mu + \frac{(1-\mu)*\widehat{\lambda}_1*p_L(1-\lambda p_L)}{(\widehat{\lambda}_1+(1-\widehat{\lambda}_1)*p_H)(1-\lambda)*(1-p_H)}}$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1-\widehat{\mu}_1)*\frac{1-\widehat{\lambda}_1*p_L}{(1-\widehat{\lambda}_1)*(1-p_H)}} < \widehat{\mu}_1|_{y_1=0} < \mu$  (as  $1 - \widehat{\lambda}_1 p_L > 1 - \widehat{\lambda}_1$ ). Note that  $\widehat{\mu}_2|_{y_2=1}$  is higher than  $\mu$  if

$$\frac{\widehat{\lambda}_1*p_L}{\widehat{\lambda}_1 + (1-\widehat{\lambda}_1)*p_H} \frac{1-\lambda p_L}{(1-\lambda)*(1-p_H)} < 1$$

and lower than  $\mu$  if  $\frac{\widehat{\lambda}_1 * p_L}{\widehat{\lambda}_1 + (1 - \widehat{\lambda}_1) * p_H} \frac{1 - \lambda p_L}{(1 - \lambda) * (1 - p_H)} > 1$ . Then the optimal strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  if  $\frac{\widehat{\lambda}_1 * p_L}{\widehat{\lambda}_1 + (1 - \widehat{\lambda}_1) * p_H} \frac{1 - \lambda p_L}{(1 - \lambda) * (1 - p_H)} < 1$  and  $s_1|1 = s_1|0 = \text{overthrow}$  if  $\frac{1 - \lambda p_L}{(1 - \lambda) * (1 - p_H)} \frac{\widehat{\lambda}_1 * p_L}{\widehat{\lambda}_1 + (1 - \widehat{\lambda}_1) * p_H} > 1$ . Note that  $x_{H2} = 0$ , and  $x_{L2} = 0$  are not best responses to  $s_1|1 = s_1|0 = \text{overthrow}$ . As a result, strategies  $x_{H2} = 0$ , and  $x_{L2} = 0$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game only if  $\gamma \delta p_L (B + R) > R$  and  $\frac{1 - \lambda p_L}{(1 - \lambda) * (1 - p_H)} \frac{\widehat{\lambda}_1 * p_L}{\widehat{\lambda}_1 + (1 - \widehat{\lambda}_1) * p_H} < 1$ .

5. Assume that  $y = 1$ ,  $x_{H1} = 1$ , and  $x_{L1} = 1$ . Here  $\widehat{\mu}_1|_{y_1=1} = 1 > \mu$ ,  $\widehat{\lambda}_1|_{y_1=1} = \lambda$ . For any strategy of the government in the second period, posterior beliefs about the government's competence are  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = 1$ . Therefore, the optimal strategy for people is  $s_1|1 = s_1|0 = \text{not overthrow}$ , and  $x_{H2} = 1$ , and  $x_{L2} = 1$  is the government's optimal response to that. So, the strategies  $s_1|1 = s_1|0 = \text{not overthrow}$ ,  $x_{H2} = 1$ , and  $x_{L2} = 1$  constitute equilibrium in a continuation game.

6. Assume that  $y = 1$ ,  $x_{H1} = 1$ , and  $x_{L1} = 0$ . Here  $\widehat{\mu}_1|_{y_1=1} = \frac{\mu}{\mu + (1 - \mu) * \lambda * \frac{p_L}{p_H}} > \mu$ ,  $\widehat{\lambda}_1|_{y_1=0} = \frac{\lambda}{\lambda + (1 - \lambda) \frac{\mu * p_H}{\mu * p_H + (1 - \mu) * p_L}} > \lambda$ .

- If  $x_{H2} = 1$ , and  $x_{L2} = 1$ , then  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1 * (1 - p_H)}{1 - \widehat{\mu}_1 p_H} = \frac{\mu}{\mu + (1 - \mu) * \lambda * \frac{p_L}{p_H (1 - p_H)}}$ . Note that  $\widehat{\mu}_2|_{y_2=0}$  is higher than  $\mu$  if  $\frac{\lambda p_L}{p_H (1 - p_H)} < 1$ , and lower than  $\mu$  if  $\frac{\lambda p_L}{p_H (1 - p_H)} > 1$ . Then the optimal strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  if  $\frac{\lambda p_L}{p_H (1 - p_H)} < 1$  and  $s_1|1 = s_1|0 = \text{not overthrow}$  if  $\frac{\lambda p_L}{p_H (1 - p_H)} > 1$ . Therefore, strategies  $x_{H2} = 1$ ,  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $R > \gamma \delta (1 - p_H) (B + R)$  and  $\frac{\lambda p_L}{p_H (1 - p_H)} > 1$ , while strategies  $x_{H2} = 1$ ,  $x_{L2} = 1$ , and  $s_1|1 = s_1|0 = \text{not overthrow}$  constitute equilibrium if  $\frac{\lambda p_L}{p_H (1 - p_H)} < 1$ .
- If  $x_{H2} = 1$ , and  $x_{L2} = 0$ , then  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \widehat{\lambda}_1 * \frac{p_L}{p_H}} > \widehat{\mu}_1 > \mu$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \frac{1 - \widehat{\lambda}_1 p_L}{1 - p_H}} = \frac{\mu}{\mu + (1 - \mu) * \lambda * \frac{p_L}{p_H} * \frac{1 - \lambda p_L}{1 - p_H}}$ . If  $\widehat{\mu}_2|_{y_2=0} > \mu$ , the optimal strategy of people is  $s|1 = s|0 = \text{not overthrow}$  and if  $\widehat{\mu}_2|_{y_2=0} < \mu$ , the strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$ . In both cases,  $x_{H2} = 1, x_{L2} = 0$  is not the part of an equilibrium.
- If  $x_{H2} = 0$ , and  $x_{L2} = 1$ , then  $\widehat{\mu}_2|_{y_2=1} = 1$  and

$$\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \frac{1}{(1 - \widehat{\lambda}_1) * (1 - p_H)}} = \frac{\mu}{\mu + (1 - \mu) * \lambda * \frac{p_L}{p_H} \frac{\lambda (1 - \mu) * p_L + \mu * p_H}{(1 - \lambda) \mu * p_H * (1 - p_H)}}$$

If  $\widehat{\mu}_2|_{y_2=0} > \mu$ , the optimal strategy of people is  $s|1 = s|0 = \text{not overthrow}$  and if  $\widehat{\mu}_2|_{y_2=0} < \mu$ , the strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$ . If  $s|1 = s|0 = \text{not overthrow}$ , the strategy

$x_{H2} = 0$  and  $x_{L2} = 1$  is not a best response. Therefore, strategies  $x_{H2} = 0$ , and  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $\gamma\delta p_L(B + R) < R < \gamma\delta(1 - p_H)(B + R)$  and  $\lambda * \frac{p_L}{p_H} \frac{\lambda(1-\mu)*p_L + \mu*p_H}{(1-\lambda)\mu*p_H*(1-p_H)} > 1$ .

- If  $x_{H2} = 0$ , and  $x_{L2} = 0$ , then  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + \frac{(1-\widehat{\mu}_1)*\lambda_1*p_L}{\lambda_1 + (1-\lambda_1)*p_H}} > \widehat{\mu}_1 > \mu$  and

$$\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \frac{1 - \widehat{\lambda}_1 p_L}{(1 - \widehat{\lambda}_1) * (1 - p_H)}} = \frac{\mu}{\mu + (1 - \mu) * \frac{(1 - \widehat{\lambda}_1 p_L) \lambda p_L}{(1 - \widehat{\lambda}_1) * (1 - p_H) p_H}}$$

Note that  $\widehat{\mu}_2|_{y_2=0}$  is higher than  $\mu$  if  $\frac{(1 - \widehat{\lambda}_1 p_L) \lambda p_L}{(1 - \widehat{\lambda}_1) * (1 - p_H) p_H} < 1$ , and lower than  $\mu$  if  $\frac{(1 - \widehat{\lambda}_1 p_L) \lambda p_L}{(1 - \widehat{\lambda}_1) * (1 - p_H) p_H} > 1$ . Then the optimal strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  if  $\frac{(1 - \widehat{\lambda}_1 p_L) \lambda p_L}{(1 - \widehat{\lambda}_1) * (1 - p_H) p_H} < 1$  and  $s_1|1 = s_1|0 = \text{not overthrow}$  if  $\frac{(1 - \widehat{\lambda}_1 p_L) \lambda p_L}{(1 - \widehat{\lambda}_1) * (1 - p_H) p_H} > 1$ . Therefore, strategies  $x_{H2} = 0$ , and  $x_{L2} = 0$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $\gamma\delta p_L(B + R) > R$  and  $\frac{(1 - \widehat{\lambda}_1 p_L) \lambda p_L}{(1 - \widehat{\lambda}_1) * (1 - p_H) p_H} < 1$ .

7. Assume that  $y = 1$ ,  $x_{H1} = 0$ , and  $x_{L1} = 1$ . Here  $\widehat{\mu}_1|_{y_1=1} = 1 > \mu$ ,  $\widehat{\lambda}_1|_{y_1=1} = \frac{\lambda}{\lambda + (1 - \lambda) * p_H} < \lambda$ . For any strategy of the government in the second period, posterior beliefs about the government's competence are  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = 1$ . Therefore, the optimal strategy for people is  $s_1|1 = s_1|0 = \text{not overthrow}$ , and  $x_{H2} = 1$ , and  $x_{L2} = 1$  is the government's optimal response to that. So, the strategies  $s_1|1 = s_1|0 = \text{not overthrow}$ ,  $x_{H2} = 1$ , and  $x_{L2} = 1$  constitute equilibrium in a continuation game.

8. Assume that  $y = 1$ ,  $x_{H1} = 0$ , and  $x_{L1} = 0$ . Here  $\widehat{\mu}_1|_{y_1=1} = \frac{\mu}{\mu + \frac{(1-\mu)*\lambda*p_L}{\lambda+(1-\lambda)*p_H}} > \mu$ ,  $\widehat{\lambda}_1|_{y_1=1} = \frac{\lambda}{\lambda+(1-\lambda)*\frac{\mu*p_H}{\mu+(1-\mu)*p_L}} > \lambda$ .

- If  $x_{H2} = 1$  and  $x_{L2} = 1$  then  $\widehat{\mu}_2|_{y_2=1} = 1$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1 * (1 - p_H)}{-\widehat{\mu}_1 p_H + 1} = \frac{\mu}{\mu + \frac{(1-\mu)*\lambda*p_L}{(\lambda+(1-\lambda)*p_H)(1-p_H)}} > \mu$ . Then strategies  $x_{H2} = 1$ , and  $x_{L2} = 1$ , and  $s|1 = s|0 = \text{not overthrow}$  constitute an equilibrium in a continuation game.
- If  $x_{H2} = 1$  and  $x_{L2} = 0$ , then  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \frac{p_L}{p_H}} > \widehat{\mu}_1 > \mu$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \frac{1 - \widehat{\lambda}_1 p_L}{1 - p_H}}$ . If  $\widehat{\mu}_2|_{y_2=1} > \mu$ , the optimal strategy of people is  $s|1 = s|0 = \text{not overthrow}$  and if  $\widehat{\mu}_2|_{y_2=1} < \mu$ , the strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$ . In both cases,  $x_{H2} = 1, x_{L2} = 0$  is not the part of an equilibrium.

- If  $x_{H2} = 0$  and  $x_{L2} = 1$ , then  $\widehat{\mu}_2|_{y_2=1} = 1$  and

$$\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \frac{1}{(1 - \widehat{\lambda}_1) * (1 - p_H)}} = \frac{\mu}{\mu + (1 - \mu) * \frac{1}{(1 - \widehat{\lambda}_1) * (1 - p_H)} \frac{\lambda p_L}{(\lambda + (1 - \lambda) * p_H)}}$$

If  $\widehat{\mu}_2|_{y_2=0} < \mu$ , the optimal strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  and if  $\widehat{\mu}_2|_{y_2=1} > \mu$ , the strategy of people is  $s_1|1 = s_1|0 = \text{not overthrow}$ . Then strategies  $x_{H2} = 0$ , and  $x_{L2} = 1$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $\gamma \delta p_L (B + R) < R < \gamma \delta (1 - p_H) (B + R)$  and  $\frac{1}{(1 - \widehat{\lambda}_1) * (1 - p_H)} \frac{\lambda p_L}{(\lambda + (1 - \lambda) * p_H)} > 1$ .

- If  $x_{H2} = 0$  and  $x_{L2} = 0$ , then  $\widehat{\mu}_2|_{y_2=1} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + \frac{(1 - \widehat{\mu}_1) * \widehat{\lambda}_1 * p_L}{\widehat{\lambda}_1 + (1 - \widehat{\lambda}_1) * p_H}} > \widehat{\mu}_1|_{y_1=1} > \mu$  and  $\widehat{\mu}_2|_{y_2=0} = \frac{\widehat{\mu}_1}{\widehat{\mu}_1 + (1 - \widehat{\mu}_1) * \frac{1 - \widehat{\lambda}_1 p_L}{(1 - \widehat{\lambda}_1) * (1 - p_H)}} = \frac{\mu}{\mu + (1 - \mu) * \frac{(1 - \widehat{\lambda}_1 p_L)}{(1 - \widehat{\lambda}_1) * (1 - p_H)} \frac{\lambda * p_L}{\lambda + (1 - \lambda) * p_H}}$ . If  $\widehat{\mu}_2|_{y_2=0} < \mu$ , the optimal strategy of people is  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  and if  $\widehat{\mu}_2|_{y_2=1} > \mu$ , the strategy of people is  $s_1|1 = s_1|0 = \text{not overthrow}$ . Therefore, strategies  $x_{H2} = 0$ , and  $x_{L2} = 0$ , and  $s|1 = \text{not overthrow}$ ,  $s|0 = \text{overthrow}$  constitute an equilibrium in a continuation game if  $\gamma \delta p_L (B + R) > R$  and  $\frac{(1 - \widehat{\lambda}_1 p_L)}{(1 - \widehat{\lambda}_1) * (1 - p_H)} \frac{\lambda * p_L}{\lambda + (1 - \lambda) * p_H} > 1$ .

■

**Proof of Proposition 1.** We consider the case of the following equilibrium in a continuation game: after observing  $y_1 = 0$ , citizens play  $s_1|1 = \text{not overthrow}$ ,  $s_1|0 = \text{overthrow}$  for any government's strategy in the first period, while after observing  $y_1 = 1$ , citizens play  $s_1|1 = s_1|0 = \text{not overthrow}$  for any government's strategy in the first period. Equilibrium strategies of the government in the second period after  $y_1 = 0$  are computed conditional on  $\gamma$ . Continuation payoffs of the government after the first period depend on its strategy in the first period and the realization of policy outcome in the first period.

Denote  $V_{type, w, y_1}$  a continuation payoff for type *type* after observing  $y_1$  following strategy profile  $w \in \{00, 01, 10, 11\}$  of governments in the first period.

We are looking for Perfect Bayesian equilibrium. To find all pure strategy equilibrium, the strategy of each type of the government should be a best response to the strategy of the other type of the government given beliefs.

Payoffs of the government are the following:

$$U_H(x_{H1} = 1, x_{L1} = 1) = B + R + \delta (p_H V_{H,11,1} + (1 - p_H)(1 - \gamma) V_{H,11,0})$$

$$U_L(x_{H1} = 1, x_{L1} = 1) = B + R + \delta (1 - \gamma) V_{L,11,0}$$

$$U_H(x_{H1} = 1, x_{L1} = 0) = B + R + \delta (p_H V_{H,10,1} + (1 - p_H)(1 - \gamma) V_{H,10,0})$$

$$U_L(x_{H1} = 1, x_{L1} = 0) = B + \delta (p_L V_{L,10,1} + (1 - p_L)(1 - \gamma) V_{L,10,0})$$



$$U_H(x_{H1} = 0, x_{L1} = 1) = B + \delta V_{H,01,1}$$

$$U_L(x_{H1} = 0, x_{L1} = 1) = B + R + \delta(1 - \gamma)V_{L,01,0}$$

$$U_H(x_{H1} = 0, x_{L1} = 0) = B + \delta V_{H,00,1}$$

$$U_L(x_{H1} = 0, x_{L1} = 0) = B + \delta(p_L V_{L,00,1} + (1 - p_L)(1 - \gamma)V_{L,00,0})$$

Continuation payoffs are the following:

$$V_{H,11,1} = V_{H,01,1} = V_{H,00,1} = (1 + \delta)[B + R]$$

$$V_{H,11,0} = V_{H,10,1} = V_{H,10,0} = \begin{cases} B + R + \delta(p_H + (1 - p_H)(1 - \gamma))[B + R] & \text{if } R > \gamma\delta(1 - p_H)(B + R) \\ B + \delta[B + R] & \text{if } \gamma\delta p_L(B + R) < R < \gamma\delta(1 - p_H)(B + R) \\ B + \delta[B + R] & \text{if } R < \gamma\delta p_L(B + R) \end{cases}$$

$$V_{L,11,0} = V_{L,10,0} = V_{L,10,1} = V_{L,01,0} = V_{L,00,1} =$$

$$= V_{L,00,0} = \begin{cases} B + R + \delta(1 - \gamma)[B + R] & \text{if } R > \gamma\delta(1 - p_H)(B + R) \\ B + R + \delta(1 - \gamma)[B + R] & \text{if } \gamma\delta p_L(B + R) < R < \gamma\delta(1 - p_H)(B + R) \\ B + \delta(p_L + (1 - p_L)(1 - \gamma))[B + R] & \text{if } R < \gamma\delta p_L(B + R) \end{cases}$$

The best response of a high-competent government to  $x_{L1} = 1$  is  $x_{H1} = 1$  if

$$B + R + \delta(p_H V_{H,11,1} + (1 - p_H)(1 - \gamma)V_{H,11,0}) > B + \delta V_{H,01,1}$$

i.e. if  $R + \delta(1 - p_H)(1 - \gamma)V_{H,11,0} > \delta(1 - p_H)V_{H,11,1}$ . For  $R < \gamma\delta(1 - p_H)(B + R)$ , this condition is equivalent to  $\frac{R}{\delta(1 - p_H)} + (1 - \gamma)(B + \delta[B + R]) > (1 + \delta)[B + R]$ , i.e.  $\gamma < 1 + \frac{\frac{R}{\delta(1 - p_H)} - (1 + \delta)[B + R]}{(B + \delta[B + R])} = \frac{\frac{R}{\delta(1 - p_H)} - R}{(B + \delta[B + R])} = \frac{R(1 - \delta(1 - p_H))}{(B + \delta[B + R])\delta(1 - p_H)}$ . In other words, the best response to  $x_{L1} = 1$  is  $x_{H1} = 1$  if  $\gamma \in \left[ \frac{\delta(1 - p_H)(B + R)}{R}, \frac{R(1 - \delta(1 - p_H))}{(B + \delta[B + R])\delta(1 - p_H)} \right]$ . For  $R > \gamma\delta(1 - p_H)(B + R)$ , condition  $R + \delta(1 - p_H)(1 - \gamma)V_{H,11,0} > \delta(1 - p_H)V_{H,11,1}$  is equivalent to  $R + \delta(1 - p_H)(1 - \gamma)(B + R + \delta(p_H + (1 - p_H)(1 - \gamma))[B + R]) > \delta(1 - p_H)(1 + \delta)[B + R]$ , i.e.  $(1 - \gamma)^2 \delta^2 (1 - p_H)^2 [B + R] + (1 - \gamma)\delta(1 - p_H)(B + R)(1 + \delta p_H) + R - \delta(1 - p_H)(1 + \delta)[B + R] > 0$ . Taking into account that  $\gamma$  is probability and belongs to  $[0, 1]$  interval, the latest condition is equivalent to  $\gamma > 1 - \gamma_2$ , where  $\gamma_2$  is a positive solution of equation  $(1 - \gamma)^2 \delta(1 - p_H) + (1 - \gamma)(1 + \delta p_H) + R/(B + R)\delta(1 - p_H) - (1 + \delta) = 0$ . So, the best response to  $x_{L1} = 1$  is  $x_{H1} = 1$  if  $\gamma \in \left[ \gamma_2, \max \left\{ \frac{R(1 - \delta(1 - p_H))}{(B + \delta[B + R])\delta(1 - p_H)}, \frac{\delta(1 - p_H)(B + R)}{R} \right\} \right]$ .

Similarly, the best response of a high-competent government to  $x_{L1} = 0$  is  $x_{H1} = 1$  if  $B + R + \delta(p_H + (1 - p_H)(1 - \gamma))V_{H,10,0} > B + \delta V_{H,00,1}$ , i.e. if the same conditions as before are satisfied.

The best response of a low-competent government to  $x_{H1} = 1$  is  $x_{L1} = 1$  if  $B + R + \delta(1 - \gamma)V_{L,11,0} > B + \delta(p_L V_{L,10,1} + (1 - p_L)(1 - \gamma)V_{L,10,0})$ , i.e. if  $R > \gamma p_L \delta V_{L,11,0}$ . If  $R > \gamma\delta p_L(B + R)$ , this inequality is equivalent to  $R > \gamma p_L \delta(1 + \delta(1 - \gamma))[B + R]$ , which can be rewritten as  $\gamma^2 p_L \delta^2 - \gamma p_L \delta(1 + \delta) + \frac{R}{B + R} > 0$ . If  $R$  is sufficiently

large,  $p_L^2 \delta^2 (1 + \delta)^2 - 4 \frac{R}{B+R} p_L \delta^2 < 0$ , and, as a result, the best response to  $x_{H1} = 1$  is  $x_{L1} = 1$ . Alternatively, if  $R < \gamma \delta p_L (B + R)$ ,  $x_{L1} = 1$  is a best response if  $R > \gamma p_L \delta (B + \delta (p_L + (1 - p_L)(1 - \gamma)) [B + R])$ . The latter inequality is equivalent to  $\gamma^2 (1 - p_L) - \gamma (\frac{B}{B+R} + \delta) + \frac{R}{p_L \delta (B+R)} > 0$ , which is always satisfied if  $R$  is sufficiently large, i.e. if  $(\frac{B}{B+R} + \delta)^2 - 4 \frac{R}{p_L \delta (B+R)} (1 - p_L) < 0$ . Therefore, for a low-competent government, if  $R$  is sufficiently large, the best response to  $x_{H1} = 1$  is  $x_{L1} = 1$ . In contrast, if  $R$  is sufficiently small, the best response to  $x_{H1} = 1$  might be  $x_{L1} = 0$  for sufficiently large  $\gamma$ .

Similarly, the best response of a low competent government to  $x_{H1} = 0$  is  $x_{L1} = 1$  if  $R$  is sufficiently large, and  $x_{L1} = 0$  if  $R$  is sufficiently small and  $\gamma$  is sufficiently large.

For people, for all strategy profiles except  $x_{H1} = 1, x_{L1} = 0, s_1|1 = \textit{not overthrow}, s_1|0 = \textit{overthrow}$  is a best response as a positive outcome increases the ex-post probability of a high-competent government, while a negative outcome decreases this probability.

As a result, possible equilibria in the first stage are the following. If  $R$  is sufficiently large, the equilibrium set of strategies is  $x_{L1} = 1, x_{H1} = 1, s_1|1 = \textit{not overthrow}, s_1|0 = \textit{overthrow}$  if  $\gamma$  is sufficiently large (i.e.  $\gamma > \gamma_2$ ) and  $x_{L1} = 1, x_{H1} = 0, s_1|1 = \textit{not overthrow}, s_1|0 = \textit{overthrow}$  if  $\gamma$  is sufficiently small. If  $R$  is sufficiently small, the equilibrium set of strategies is  $x_{L1} = 1, x_{H1} = 1, s_1|1 = \textit{not overthrow}, s_1|0 = \textit{overthrow}$  if  $\gamma$  is sufficiently large (i.e.  $\gamma > \gamma_2$ ),  $x_{L1} = 1, x_{H1} = 0, s_1|1 = \textit{not overthrow}, s_1|0 = \textit{overthrow}$  if  $\gamma$  is in intermediate range, and  $x_{L1} = 0, x_{H1} = 0, s_1|1 = \textit{not overthrow}, s_1|0 = \textit{overthrow}$  if  $\gamma$  is sufficiently small.

Equilibria in continuation games are described above in lemma2. ■

**Proof of Proposition 2.** From the proof of lemma 2,  $\widehat{\mu}_1|_{y_1=0, x_{H1}=1, x_{L1}=1} = \frac{\mu^*(1-p_H)}{1-\mu p_H} < \mu$ ,  $\widehat{\mu}_1|_{y_1=0, x_{H1}=0, x_{L1}=1} = \frac{\mu}{\mu+(1-\mu)^* \frac{1}{(1-\lambda)^*(1-p_H)}} < \mu$ , and  $\widehat{\mu}_1|_{y_1=0, x_{H1}=0, x_{L1}=0} = \frac{\mu}{\mu+(1-\mu)^* \frac{1-\lambda p_L}{(1-\lambda)^*(1-p_H)}} < \mu$ . In any case, the risk of predation goes up, as low-competent government predate more often. ■

**Proof of Proposition 3.** For intermediate values of  $\gamma$ , a low-competent government predate, while a high-competent government refrains from predation in the second period. The risk of predation, therefore, varies with  $\widehat{\mu}_1$ , the posterior belief about  $\mu$ . For high or low values of  $\gamma$ , both types of government behave in the same way, both in the first and in the second period. So, the estimated risk of predation does not change in these cases. ■



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