CHAPTER THREE – FORMAL MODEL
CHAPTER THREE

1 Introduction

In Chapters One and Two, I presented the puzzle that motivates this study. An important body of mostly empirical work in political science has suggested that rents from oil and similar minerals promote authoritarianism. Yet this finding appears to contradict the claim of country experts that oil rents fostered democratic stability in Venezuela, one of the oldest oil exporters in the world.

In this chapter, I develop a formal model that reconciles these competing claims. The model elucidates a mechanism through which resource wealth promotes democracy. My analysis does not contradict the assertion the resource rents promote authoritarianism because, as we will see, resources can also have an authoritarian effect. The strength of the model is that it allows us to compare the mechanisms through which resources can lead to democracy to those through which it can lead to authoritarianism and thereby generate conjectures about when the democratic or authoritarian effects of resource wealth will be more important. In addition, as my statistical analysis of time-series cross-section data elsewhere will show, the empirical link between resources and democracy is more general than previous analysts have suggested. Thus, understanding the link between resource rents and democracy constitutes an important agenda for research on the political effects of resource wealth, and a central contribution of the model developed in this chapter.

2 The theoretical approach

Scholars of comparative politics have developed many different approaches to understanding processes of democratization as well as democratic breakdown, from the extensive literature on the role of intra-elite schisms in prompting transitions to democracy (e.g., O’Donnell and Schmitter 1986: 19) to the literature emphasizing the international dimensions of democratization (e.g., Huntington 1991: 40, 45-46). These traditions have generated many important insights, and I view the argument I develop here as largely complementary to, rather than competitive with, these approaches. Like most of the "transitions to democracy" literature, I emphasize the internal dynamics rather than external sources of democratization and democratic breakdown. However, building on a recent literature on the role of popular
mobilization "from below" and the politics of redistribution in shaping the emergence of democratic and authoritarian regimes (especially Acemoglu and Robinson 2001, 2005, Collier 1999 and Rueschemeyer, Stephens, and Stephens 1992), I also emphasize the role of economic conflict and of political cleavages based on economic divisions. My substantive wager in undertaking this study is that if resource rents are to have an influence on the political regime type, it will be through their effect on these "economic" sources of authoritarianism and democracy.

The strategic environment of the model is similar in some respects to Acemoglu and Robinson (2001, 2005) and also Boix (2003). First, I conceive of politics as being defined by the conflict between a relatively small group of elites and a relatively large group of masses whose members act to advance common interests or purposes. Second, the approach is instrumental, in the sense that preferences over policy outcomes – here, economic outcomes – will drive preferences over political institutions, since institutions allocate political power and thus ultimately help determine policy outcomes. Third, I will emphasize the role of inequality of wealth and income in producing economic conflict and thereby influencing the institutional preferences of different groups. Finally, following the assertion of Reuschemeyer, Stephens and Stephens (1992:5) that "democratization represents first and foremost an increase in political equality," I will assume that elites exercise more political power under authoritarianism, while the masses, who are more numerous, have more political power under democracy. This assertion does not imply that the "masses" exercise political power to the exclusion of elites in any real-world democracy: institutional and electoral rules (Beard 1913, Persson and Tabellini 2000), lobbying (Grossman and Helpman 2001), cross-cutting cleavages (Roemer 1998), and other factors can all undercut the influence of a democratic majority. Instead, it should be understood primarily as a comparative statement about the ability of masses to influence policy under democracy, relative to a modal authoritarian system, and as a useful building block in a theory of the emergence and persistence of democratic and authoritarian regimes.

My approach also emphasizes that although institutions allocate formal political power, groups sometimes have other sources of power: in particular, the ability to take control of the state by force. For example, elites may launch coups against democracy, while subordinate groups can threaten authoritarian regimes with popular mobilization and, in the limit, with revolution. Yet opportunities for coups may be transient, and social revolutions are rare events (Skocpol 1979). In historical perspective, we have perhaps more often observed
political regime change that is relatively non-violent and that does not involve a dramatic transformation of state institutions. Yet why would the beneficiaries of incumbent regimes willingly relinquish power? The approach I develop here emphasizes that the threat posed by out-of-power groups to take power by force can induce both policy change and institutional reform (Acemoglu and Robinson 2000, 2001, 2005). For example, a mass mobilization against an authoritarian regime may force elites to choose between repression of the masses, which may be costly; some possibly temporary policy change aimed at defusing popular opposition; or some possibly more durable institutional change such as democratization, which tends to allocate both present and future political power to the majority. That we do not often observe the exercise of the implicit "revolutionary" threat may be precisely because elites have averted this outcome through some combination of repression, policy moderation, or institutional reform. Similarly, democratic majorities may also sometimes moderate policy, or adopt institutional reforms or informal measures that limit their own formal political power, in order to avoid a coup (see, e.g., Collier 1999 on Southern Europe, Wantchekon 1999 on El Salvador, or Londregan 2000 on Chile). Of course, whether this image of politics provides a useful analytic window on the sources of democracy and authoritarianism in resource-rich countries is an empirical question, one I take up in subsequent chapters.

Given this theoretical framework, the main contribution of the model developed in this chapter is to clarify how resource rents shape economic conflict and thereby influence the development of political institutions. Along with previous analysts, I emphasize the unique characteristics of resource rents. These rents flow directly into the fiscal coffers of the state at a relatively low cost of extraction, relative to other sources of revenue such as taxation, and their effects are largely felt on the expenditure side of the fiscal balance (Beblawi 1987: 53-54). Yet I differ from other analysts in my assessment of the political consequences of this characteristic of resource rent. The existing literature on oil and authoritarianism emphasizes that resource rents increase the incentives of elites to block or reverse processes of democratization, because resource rents flow directly into the coffers of the state and may be appropriated by authoritarian elites and used to repress or coopt popular opposition (Ross 2001). My analysis does not necessarily contradict this claim, since, in the model, conflict over the distribution of resource rents can reduce the incidence of democracy. Yet there is also an important "indirect" effect of resource wealth. Because resource rents are less costly to extract than taxes from citizens, resource rents displace taxation as a source of revenue for public spending. As we will see, resource rents will therefore reduce the extent
to which democratic majorities want to *redistribute* income away from rich elites. This indirect effect of resource wealth, working through the effect of resource rents on taxation, will make democracy less costly for elites. Thus, there are two contrasting political effects of resource wealth in the model. After introducing the model in section 3, and deriving the main comparative statics implications in section 3.4, I discuss the broader implications for our interpretation of politics in resource-rich societies in section 4.

3 The model

3.1 The setting

Consider an infinitely-repeated game in a society with a continuum of citizens of mass 1. Citizens belong to one of two groups, the "elites" and the "masses" (or, equivalently, the "rich" and the "poor"). These groups are distinguished both by their size and by their level of private income. First, a fraction $\delta \in (0, \frac{1}{2})$ of the population is rich and a fraction $(1 - \delta)$ is poor, so the poor are more numerous. Second, let the the fraction of total private income accruing to the rich group be $\theta$, with $\theta > \delta$. Total (and average) private income is $\bar{y}$, so the income of each rich individual is $y^r = \frac{\theta}{\delta} \bar{y}$, while the income of each poor individual is $y^p = \frac{(1 - \theta)}{(1 - \delta)} \bar{y}$. Thus, $y^r > \bar{y} > y^p$.

Citizens derive utility from private consumption and from public spending. In each period $t$ of the game, the instantaneous utility of individual $i$ is given by:

$$U^i_t = c^i_t + V(g_t)$$  \hspace{1cm} (1)$$

where $c^i_t$ is the (post-tax) consumption of individual $i$ at time $t$ and $g_t$ is public spending at time $t$. All citizens seek to maximize the (discounted) infinite-horizon sum of their instantaneous utilities, $\sum_{t=0}^{\infty} \beta^t U^i_t$, where $\beta \in (0, 1)$ is the common discount factor.

Private consumption is just private income net of taxes, so

$$c^i_t = (1 - \tau_t) y^i$$  \hspace{1cm} (2)$$

where $\tau_t$ is the proportional tax on income adopted in period $t$. Public spending, on the other hand, comes from two sources: tax revenue and resource rent. Tax revenue is collected from citizens by the central government and disbursed through public spending. Resource
rent flows directly into the public coffers, without any need for collection of private income from citizens. The government budget constraint in each period is given by:

$$g_t = H(\tau_t y) + R$$

(3)

where $\tau_t y$ is total tax revenue in period $t$ and $R$ is the resource rent.

$V$ and $H$ are both concave functions but they have different interpretations. The concavity of $V$ captures diminishing marginal utility of public spending as well as inefficiencies involved in the provision of goods and services valued by the public. Diminishing marginal utility of public spending is a standard assumption in the public finance literature, where quasilinear utility functions of the form in equation (1) are standard. On the other hand, the concave function $H$ captures the specific inefficiency associated with collecting taxes relative to resource rents. Tax revenues are hard to raise: they may demand a developed and capable state bureaucracy that can monitor and enforce restrictions on tax evasion. Even in societies with comparatively capable bureaucracies, raising taxes to high enough levels may eventually cause some diversion of production into non-taxable activities and therefore some efficiency loss. Resource rents, in contrast, are more like manna from heaven. These rents flow directly into state coffers and can be converted more efficiently into public spending. Formally, the model captures this distinction between the taxation of citizens and resource rents by assuming that unlike resource rents, tax revenues cannot be converted unit-by-unit into public spending.

The tax rate $\tau$ will be the choice variable in the model. Using the definitions in equations (1), (2), and (3), we have that in each period $t$, the ideal tax rate for group $i$ is given by:

$$\arg \max_\tau (1 - \tau) y^i + V(H(\tau_t y) + R)$$

Thus, the following first-order condition implicitly defines this ideal tax rate of individual $i$:

$$-y^i + V'(H(\tau^i y) + R)H'(\tau^i y)\bar{y} = 0$$

(4)

where for simplicity I abstract from the time subscripts (since, as we will see, the ideal tax rate of each individual or group of individuals will be the same in every period). Rearranging, we have:

$$V'(H(\tau^i y) + R) = \frac{y^i}{H'(\tau^i y)\bar{y}}$$

(5)
where $\tau^i$ is the tax rate preferred by the group with private income $y^i$.

Since $y^r > y^p$, the rich prefer lower taxes than the poor. This is because, if the numerator on the right-hand side of equation (5) increases, either the denominator or the left-hand side of the equation must increase as well (or both), in order to maintain the equality required by the first-order condition. By the concavity of $V$ and $H$, both $V'(H(\tau^i\bar{y}) + R)$ and $H'(\tau^i\bar{y})$ are decreasing in $\tau^i$, so $\tau^i$ must be decreasing in $y^i$. Thus:

$$\tau^p > \tau^r$$

that is, the poor prefer a higher tax rate and more public spending than the rich.\(^1\)

Each period of this infinite-horizon game is defined by a "state of the world," which has two characteristics. First, society is either authoritarian or democratic; thus, $P \in \{D, A\}$, where "P" is for political regime, "D" is for democracy, and "A" is for authoritarianism. Under authoritarianism, elites are assumed to have political power, and therefore they choose policy, while democracy implements the preferences of the poor. Note that the median voter in the model is poor, and that the ideal tax policy $\tau^p$ of the poor is a Condorcet winner (that is, it will defeat any other policy proposal under a pairwise vote).\(^2\) The assumption that the elite set policy under authoritarianism and the masses set policy under democracy simply captures the idea that democracy gives political power to the majority, relative to authoritarianism. It is relatively straightforward to extend the set-up of this model to characterize "intermediate" types of democracy or authoritarianism, in which public policy can be thought of as a weighted average of the preferences of elites and masses, with a greater weight on the preferences of the poor masses under democracy than under authoritarianism.\(^3\)

The second characteristic of the state of the world determines the collective action capacities of the "out-of-power" group, which will determine their ability to pose a threat to the in-power group. Under democracy, the collective action capacity of the rich is measured by the cost of a coup: $\varphi \in \{\varphi^L, \varphi^H\}$, with "L" for low and "H" for high. Under authoritarianism, on the other hand, the collective action capacity of the poor is measured by the

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\(^1\)This a standard result of public finance models in the tradition of Romer (1975), Roberts (1977), and Meltzer and Richard (1981).

\(^2\)Thus, in the background is an unmodelled process of Downsian political competition in which democracy leads to convergence on the policy preferred by the median voter (as in, e.g., Wittman 1995). The analytic results developed in this model would be robust in a similar model in which, say, electoral rules or party systems undercut the political influence of a poor democratic majority – as long as the masses generally have more influence under democracy than they do under authoritarianism.

\(^3\)Acemoglu and Robinson (2005) develop a probabilistic voting model which provides some microfoundations for such weights.
cost of revolution to the poor: $\mu \in \{\mu^L, \mu^H\}$. Empirically, groups clearly sometimes do have opportunities to stage coups or revolutions, yet such opportunities may exist only in special circumstances: for example, an economic recession, a threat of a foreign war (Skocpol 1979), or other contingent events. Thus, I assume that $\varphi^L, \mu^L \to \infty$, so a coup is only possible when $\varphi = \varphi^H$ and a revolution is only possible when $\mu = \mu^H$. In any democratic period, $\varphi = \varphi^H$ with probability $p$ and $\varphi^L$ with probability $(1 - p)$, while in any authoritarian period, $\mu = \mu^H$ with probability $q$ and $\mu^L$ with probability $1 - q$. To capture the idea that opportunities for coups or revolutions are rare, let $p, q \leq \frac{1}{2}$. The notation may be somewhat confusing: the idea is that when the relevant variable is "high," the out-of-power group has the collective-action capacities necessary to pose a threat to the in-power group.

The state space of the game is therefore $S = \{(D, \varphi^H), (D, \varphi^L), (A, \mu^H), (A, \mu^L)\}$. The regime type $P \in \{D, A\}$ will be determined by the history of the game, in particular, the regime type at the end of the immediately preceding period. The capacity for collective action of the out-of-power group in each period will be determined in each period by the realization of the random variable $\mu$ or $\varphi$. The structure of the game and the distributions of $\mu$ and $\varphi$ are all common knowledge.

The timing of each stage game depends on whether the society is democratic or authoritarian. If society is democratic, then the timing of the stage game is as follows:

(D1) Nature determines the realization of the random variable $\varphi_t \in \{\varphi^L, \varphi^H\}$, which is observed by both groups.

(D2) The poor (who, because the society is democratic, hold political power) set a tax rate, $\tilde{\tau}_t^D \in [0, 1]$.

(D3) The rich decide whether to stage a coup, at a cost $\varphi_t$. If the rich stage a coup, they set a new tax rate $\tilde{\tau}_t \in [0, 1]$, instantaneous utilities of both groups are realized, and the period ends. The next period then begins under an authoritarian regime.

(D4) If the rich do not stage a coup, the tax rate $\tilde{\tau}_t^D$ set by the poor in (D2) is implemented, utilities are realized, and the game moves to the next period under a democratic regime.

\[4\]The sources of this cost are unmodelled here, but they involve the risks to the rich of staging an unsuccessful coup. In Venezuela, for example, coup plotters who had deposed Hugo Chávez for 48 hours in April 2002 were exiled or imprisoned after his return to power, a cost paid by similarly unsuccessful coup plotters in any number of historical instances.
On the other hand, if the society is authoritarian, then the stage game has the following timing:

(A1) Nature determines the realization of the random variable \( \mu_t \in \{ \mu^L, \mu^H \} \), which is observed by both groups.

(A2) The rich, who are in power, decide whether to repress the poor, at a cost of repression \( \xi \). If the rich repress the poor, they set the tax rate, utilities are realized, and the period ends. The next period then begins under an authoritarian regime.

(A3) If the rich do not choose to repress the poor in (A2), the rich then have two choices:

(i) They can set a tax rate \( \tilde{\tau}_t^A \in [0, 1] \).

(ii) They can democratize, which gives political power to the poor. If the rich democratize, the poor set the tax rate, utilities are realized, and the next period of the game begins under democracy.

(A4) If the rich choose to set a tax rate \( \tilde{\tau}_t^A \) as in (A3)(i), then the poor decide whether to revolt or not. If the poor mount a revolution, they control political power for the rest of the infinite-horizon game, and they set the tax rate in the current and every future period. However, revolution also carries a cost \( \mu_t \), as described below. If the poor do not revolt, the tax rate \( \tilde{\tau}_t^A \) is implemented, utilities are realized, and the game moves to the next period under an authoritarian regime.

### 3.2 Definition of equilibrium

The equilibrium concept used to solve the game will be pure-strategy Markov perfect equilibrium. This equilibrium concept is a refinement of sub-game perfect Nash equilibria, in which the strategies of the players can be contingent only on the payoff-relevant state of the world in the current period, as well as any prior actions taken within the same period. Use of the Markov perfect solution concept has an important implication in the current context. Because strategies in every period cannot be conditioned on the history of play prior to the current period (with the exception of the current regime type, which does depend on the immediately-preceding period), both groups will have a limited capacity to commit to future policies. As we will see, in any period in which the in-power group is unconstrained by the
threat of a coup or a revolution from the out-of-power group, it will always be optimal for the in-power group to impose its ideal tax policy.

For states of the world such that \( P = D \), so the society is democratic, the action set of the poor consists of a tax rate \( \tau^D : \{ \varphi^L, \varphi^H \} \rightarrow [0, 1] \), while the action set of the rich consists of a coup decision \( \phi : \{ \varphi^L, \varphi^H \} \times [0, 1] \rightarrow \{0, 1\} \), with \( \phi = 1 \) indicating a coup. For example, \( \phi(\varphi^H, \tau^D) \) is a mapping from the "high" state and the tax rate proposed by the poor into a coup decision. For states such that \( P = A \), so the society is authoritarian, the action set of the rich consists of a repression decision \( \rho : \{ \mu^L, \mu^H \} \rightarrow \{0, 1\} \), where \( \rho = 1 \) indicates a decision to repress, a democratization decision \( \psi : \{ \mu^L, \mu^H \} \rightarrow \{0, 1\} \), where 1 indicates a decision to democratize, and a tax rate \( \tau^A : \{ \mu^L, \mu^H \} \rightarrow [0, 1] \). The action set of the poor under authoritarianism consists of a decision to revolt, \( \gamma : \{ \mu^L, \mu^H \} \times [0, 1]^2 \times [0, 1] \rightarrow \{0, 1\} \), where 1 indicates a decision to revolt, so that \( \gamma(\mu, \rho, \psi, \tau^A) \) is the mapping of the state variable \( \mu \) and the actions of the rich into a revolution decision.

A strategy profile for the poor is then defined as \( \sigma_p = \{ \tau^D(\cdot), \gamma(\cdot) \} \), while a strategy profile for the rich is defined as \( \sigma_r = \{ \phi(\cdot), \rho(\cdot), \psi(\cdot), \tau^A(\cdot) \} \). A Markov perfect equilibrium is a strategy combination, \( \{ \tilde{\sigma}_p, \tilde{\sigma}_r \} \), such that \( \tilde{\sigma}_p \) and \( \tilde{\sigma}_r \) are mutual best-responses for all states in the state space \( S \).

### 3.3 Analysis

I characterize the Markov perfect equilibria outcomes of the game in Proposition I at the end of this sub-section. The approach is to define Bellman equations that express the value functions for each group in each state of the world. I then compare these Bellman equations to define critical threshold values of \( \varphi^H, \mu^H \), and \( \xi \) (the repression cost), which I will employ to characterize the equilibria in Proposition I. These critical values will also be useful for developing the comparative statics results of section 3.4.

Assume without loss of generality that society is initially authoritarian but has reached the state \( \{ D, \varphi^L \} \), that is, society has democratized at some previous point and we are in a "low" state in the current period. Because a coup is prohibitively costly for the rich when \( \varphi = \varphi^L \), the poor can set their ideal tax rate in the current period, unconstrained by the threat of a coup, and society will remain democratic in the following period. The instantaneous utilities of the rich and the poor in this period will therefore be defined at \( \tau^p \), the ideal tax rate of the poor. However, the value function of each individual today
will also depend on what will happen tomorrow. Members of both groups know that with probability \( p \), the state tomorrow will be \( \{ D, \varphi^H \} \). In this case, the rich may want to stage a coup (or, the poor may want to set a tax rate different from \( \tau^p \) in order to avoid a coup). On the other hand, with probability \( 1 - p \) the state tomorrow will be \( \{ D, \varphi^L \} \). Then, the game looking into the infinite horizon will look exactly like the game looking into the infinite horizon today, because \( \varphi \) is stationary.

The following Bellman equations therefore define the value functions of each group in the state \( \{ D, \varphi^L \} \):

\[
U^r(D, \varphi^L) = (1 - \tau^p)y^r + V(H(\tau^p \bar{y}) + R) + \beta[pU^r(D, \varphi^H) + (1 - p)U^r(D, \varphi^L)]
\]  

(7)

and

\[
U^p(D, \varphi^L) = (1 - \tau^p)y^p + V(H(\tau^p \bar{y}) + R) + \beta[pU^p(D, \varphi^H) + (1 - p)U^p(D, \varphi^L)]
\]  

(8)

These Bellman equations have a form that will recur throughout the analysis below. The first set of terms on the right-hand side of each equation is the instantaneous utility of each group in the present period, defined at the tax rate \( \tau^p \). For example, in equation (7), \( (1 - \tau^p)y^r + V(H(\tau^p \bar{y}) + R) \) is the instantaneous utility of the rich, who have income \( y^r \), defined at the tax rate \( \tau^p \). Next, the set of terms in brackets is the continuation value of living under democracy tomorrow, which is discounted by \( \beta \) (because it occurs tomorrow). This continuation value is the weighted sum of the value of living under democracy when \( \varphi = \varphi^H \) and living under democracy when \( \varphi = \varphi^L \), where the weights are the probability \( p \) that \( \varphi = \varphi^H \) tomorrow and the probability \( 1 - p \) that \( \varphi = \varphi^L \) tomorrow.

However, to define the value functions in equations (7) and (8), we will have to know \( U^r(D, \varphi^H) \) and \( U^p(D, \varphi^H) \). That is, what is the continuation value of living under democracy when the state is \( \{ D, \varphi^H \} \) and the rich may therefore want to stage a coup? To answer this question, first suppose the poor follow a strategy of setting a tax rate \( \bar{\tau}^D \) in any period in which \( \varphi = \varphi^H \) and that the rich do not stage a coup, given this tax rate. Then the payoffs to living under democracy when the state is \( \{ D, \varphi^H \} \) will be:

\[
U^r(D, \varphi^H, \bar{\tau}^D) = (1 - \bar{\tau}^D)y^r + V(H(\bar{\tau}^D \bar{y}) + R) + \beta[pU^r(D, \varphi^H, \bar{\tau}^D) + (1 - p)U^r(D, \varphi^L)]
\]  

(9)

and
\[ U^p(D, \varphi^H, \tilde{\tau}^D) = (1 - \tilde{\tau}^D)y^p + V(H(\tilde{\tau}^D y^p + R) + \beta[pU^p(D, \varphi^H, \tilde{\tau}^D) + (1 - p)U^p(D, \varphi^L)] \tag{10} \]

On the other hand, rather than accept the tax rate \( \tilde{\tau}^D \) that the poor offer, the rich may prefer to stage a coup. What is the payoff to a coup? Let \( U^r(A, \mu^L) \) be the payoff to the rich under authoritarianism in any period in which \( \mu = \mu^L \) (we will define this payoff below), and note that in any such period, the rich can set their unconstrained preferred tax rate \( \tau^r \), and society will remain authoritarian in the following period. But the payoff to the rich under authoritarianism when the state is \( \mu^L \) is identical to the payoff to the rich of staging a coup, net of the cost of a coup, since in both cases the rich can set their unconstrained preferred tax rate for one period and the society is authoritarian in the following period. So, the payoff of the rich in any period in which they stage a coup is simply \( U^r(A, \mu^L) - \varphi^H \).

Putting this discussion together, we can define the continuation values \( U^r(D, \varphi^H) \) and \( U^p(D, \varphi^H) \) in equations (7) and (8) as follows:

\[ U^r(D, \varphi^H) = \max_{\phi = \{0, 1\}} \phi[U^r(A, \mu^L) - \varphi^H] + (1 - \phi)U^r(D, \varphi^H, \tilde{\tau}^D) \tag{11} \]

\[ U^p(D, \varphi^H) = \phi[U^p(A, \mu^L)] + (1 - \phi)U^p(D, \varphi^H, \tilde{\tau}^D) \tag{12} \]

where \( \phi = \{0, 1\} \) is an indicator function describing the decision to stage a coup (with 1 indicating that a coup takes place). If staging a coup maximizes the utility of the rich in equation (11), then \( \phi = 1 \) and \( U^r(D, \varphi^H) = U^r(A, \mu^L) - \varphi^H \). On the other hand, if the rich are better off not staging a coup and accepting \( \tilde{\tau}^D \), then \( \phi = 0 \) in equation (11) and \( U^r(D, \varphi^H) = U^r(D, \varphi^H, \tilde{\tau}^D) \). I assume that if the rich are indifferent between these options, \( \phi = 0 \), so society remains democratic. Equation (12) gives the utility of the poor under democracy as a function of the coup decision of the rich.

We can now begin to define several key threshold values of the coup cost that will be useful both for characterizing the equilibria of the game and for analyzing how resource rents influence the incentives of the rich to stage coups against democracy in Section 3.4. First, let the coup constraint be binding in any period in which \( \varphi = \varphi^H \) if the rich prefer staging a coup to living forever in an unconstrained democracy in which the poor always set \( \tilde{\tau}^D = \tau^p \), regardless of the realization of \( \varphi \). The coup constraint therefore binds if
Clearly, if the poor set $\tau^D = \tau^p$ whenever $\varphi = \varphi^H$, they will also do so when $\varphi = \varphi^L$. Thus, the instantaneous utility of the rich in every democratic period will be $(1 - \tau^p)y^r + V(H(\tau^p\bar{y}) + R)$. The value of receiving this instantaneous utility forever, beginning in period $t$, is therefore:

\[
U^r(D, \varphi^H, \tau^p) = \sum_{t=0}^{\infty} \beta^t[(1 - \tau^p)y^r + V(H(\tau^p\bar{y}) + R)]
\]

which gives the right-hand side of (13).

On the other hand, $U^r(A, \mu^L)$ on left-hand side of (13) is:

\[
U^r(A, \mu^L) = (1 - \tau^r)y^r + V(H(\tau^r\bar{y}) + R) + \beta[qU^r(A, \mu^H) + (1 - q)U^r(A, \mu^L)]
\]

Now, solving equation (16) for $U^r(A, \mu^L)$ will involve defining an expression for $U^r(A, \mu^H)$. That is, the value function of the rich in equation (16) will depend on what the rich expect to happen under authoritarianism when the state $\mu = \mu^H$ is reached. Since the society was initially authoritarian, and since we are considering the coup constraint (in which the rich weigh the costs and benefits of a coup against democracy), we are considering a society in which democratization must have occurred in a prior period in the state $\mu^H$. Thus, if society previously democratized in the state $S_t = \{A, \mu^H\}$, we must be in the part of the parameter space in which society will democratize again when $\mu^H$ is reached. Recall that if society democratizes, the poor can set their preferred tax rate in the current period before the game moves to the next period under democracy. The continuation payoff of the rich in any period in which the state $\{A, \mu^H\}$ is reached is therefore equivalent to their continuation payoff to democracy when the threat state is low and the poor can set their unconstrained ideal tax policy in the current period. Thus, we can set $U^r(A, \mu^H) = U^r(D, \varphi^L)$ in equation (16), where $U^r(D, \varphi^L)$ is defined by equation (7).

Finally, to define the coup constraint in terms of the parameters of the model, note that equation (7) involves $U^r(D, \varphi^H)$, which is in turn defined by equation (11). That is, the utility of the rich under democracy, in periods when they cannot threaten a coup, will
depend on what will happen in future periods when they do have the ability to threaten a coup. We will therefore also have to put some restrictions on what happens after the society redemocratizes and the state \( \phi = \phi^H \) is reached again. One possible approach is to assume that since a coup previously occurred in the state \( \{D, \phi^H\} \), the solution to the maximization problem of the rich in equation (11) must be \( \phi = 1 \), so another coup will occur when this state is reached again. Then, with \( U^r(D, \phi^H) = U^r(A, \mu^L) - \phi^H \) and \( U^r(A, \mu^H) = U^r(D, \phi^L) \), equations (7) and (16) make up a system of two equations which we can solve for the two unknowns \( U^r(D, \phi^L) \) and \( U^r(A, \mu^L) \).

A different approach is to use the "one-shot deviation" principle (Fudenberg and Tirole 1991: 108-110), in which we assume that although a coup previously occurred at \( \phi^H \), it will not occur again after redemocratization. It turns out that these two approaches have identical implications for the critical threshold value developed below (see Acemoglu and Robinson 2005: 203-204 for a discussion) and since it is simpler to work with the "one-shot deviation" approach here, I adopt this approach. Thus, I assume that once society redemocratizes and reaches the state \( \{D, \mu^H, H\} \), it will remain democratic, and there will be no further coups. Using equation (14), we therefore have:

\[
U^r(A, \mu^H) = U^r(D, \phi^H, \tau^D = \tau^p) = \frac{(1 - \tau^p)y^r + V(H(\tau^p\bar{y}) + R)}{1 - \beta} \tag{17}
\]

Now, substituting this expression for \( U^r(A, \mu^H) \) into equation (16), solving for \( U^r(A, \mu^L) \), substituting into equation (13) and using equation (14) gives the following definition of the coup constraint:

\[
\left[ \frac{(1 - \tau^r)y^r + V(H(\tau^r\bar{y}) + R) - ((1 - \tau^p)y^r + V(H(\tau^p\bar{y}) + R))}{1 - \beta(1 - q)} \right] > \phi^H \tag{18}
\]

If this coup constraint binds, the poor cannot set their ideal tax rate in all periods without incurring a coup. Instead, if they want to avoid a coup, they will have to moderate the tax rate they set in periods in which \( \phi = \phi^H \).

Note that the numerator of the coup constraint in equation (18) is simply the difference between the utility of the rich at their ideal point, \( \tau^r \), and the utility of the rich at the ideal point of the poor, \( \tau^p \). Let

\[
U^r(\tau^r(R), R) = (1 - \tau^r)y^r + V(H(\tau^r\bar{y}) + R) \tag{19}
\]

be the utility of the rich at their ideal tax policy, and let
be the utility of the rich at the ideal policy of the poor, where in writing $U^r(\tau^p(R), R)$ and $U^r(\tau^p(R), R)$ I have made the dependence of the ideal tax rate on $R$ explicit. Then we can rewrite the coup constraint as:

$$\frac{U^r(\tau^r(R), R) - U^r(\tau^p(R), R)}{1 - \beta(1 - q)} > \varphi^H$$

(21)

As we will see, the various critical thresholds of the coup and repression costs developed below will all depend in some way on this utility difference. This is intuitive because, under democracy, the poor will always be able to impose $\tau^p$ in the state $\{D, \varphi^L\}$, while under authoritarianism the rich will always be able to impose $\tau^r$ in the state $\{A, \mu^L\}$. So looking into the future, each group will take into account its utilities in these two states, discounted by the probabilities of being in each state. For example, note that the denominator in equation (21) is $1 - \beta(1 - q)$ because the rich take into account the fact that under authoritarianism, society will democratize once the state reaches $\mu^H$, which occurs with probability $(1 - q)$.

If the inequality in expression (18) (or equivalently, 21) holds, then if the poor want to avoid a coup, they will sometimes have to set the tax rate at some point different from their ideal point, that is, they will have to set $\tilde{\tau}^D \in [\tau^r, \tau^p]$. However, another question is whether the poor will be able to avoid a coup by setting $\tilde{\tau}^D \neq \tau^p$ when $\varphi = \varphi^H$. If the poor will ever be able to induce the rich not to stage a coup, it will be by setting the tax rate at the ideal point of the rich when threatened by a coup (since they cannot offer the rich greater utility than the utility of the rich at their ideal point). Note, however, that the poor cannot credibly promise to set $\tilde{\tau}^D = \tau^r$ when $\varphi = \varphi^L$, because in any Markovian equilibria, the poor will set $\tilde{\tau}^D = \tau^p$ whenever they are unconstrained by the threat of a coup. Thus, setting $\tilde{\tau}^D = \tau^r$ when $\varphi = \varphi^H$ and $\tilde{\tau}^D = \tau^p$ when $\varphi = \varphi^L$ is the minimum amount of taxation that the poor can credibly promise.

Suppose, then, that the poor follow a strategy of setting $\tilde{\tau}^D = \tau^r$ when $\varphi = \varphi^H$ and $\tilde{\tau}^D = \tau^p$ when $\varphi = \varphi^L$. Given this strategy by the poor, the rich will stage a coup whenever $U^r(A, \mu^L) - \varphi^H > U^r(D, \varphi^H, \tilde{\tau}^D = \tau^r)$. We can therefore define a threshold value of $\varphi^H$, which we will call the critical coup cost, which is the cost of a coup such that the rich are just indifferent between staging a coup in a high period and living under democracy. This critical coup cost will satisfy the following equality:
\[ U^r(A, \mu) - \varphi^H = U^r(D, \varphi^H, \bar{\tau}^D = \tau^r) \]  

The left-hand side of equation (22) is the value to the rich of imposing authoritarianism, net of the critical coup cost \( \varphi^H \) which defines the value of \( \varphi \) at which equation (22) is satisfied. The right-hand side of equation (22), on the other hand, is the value to the rich of living under democracy when the poor follow the strategy of setting \( \bar{\tau}^D = \tau^r \) when \( \varphi = \varphi^H \) and setting \( \bar{\tau}^D = \tau^p \) when \( \varphi = \varphi^L \). Note that if the left-hand side of equation (22) is greater than the right-hand side, the poor will never be able to induce the rich not to stage a coup. Thus, the poor cannot avoid a coup for any \( \varphi^H < \varphi^H \).

For purposes of the analysis below, it is also useful to develop the critical coup cost under the following set of suppositions. Suppose we are in the part of the parameter space in which the cost of revolution is such that if the society is authoritarian, the rich are unconstrained by a threat of revolution from a poor (in other words, the revolution constraint, to be defined below, does not bind), but there has been a deviation in a previous period of the game, such that we have somehow reached the state \( \{D, \varphi^H\} \). Again, the rich will be indifferent between a coup and no coup if \( U^r(A, \mu) - \varphi^H = U^r(D, \varphi^H, \bar{\tau}^D = \tau^r) \), where \( \varphi^H \) is the critical coup cost defined under this supposition. Because the rich will be unconstrained by the threat of a revolution, returning to authoritarianism will allow the rich to impose their ideal point in every period. Thus:

\[ U^r(A, \mu) = \frac{(1 - \tau^r)y^r + V(R + \tau^r \bar{y})}{1 - \beta} \]  

The value of living under democracy, on the other hand, will be defined by \( U^r(D, \varphi^H, \bar{\tau}^D = \tau^r) \), which is the value function of the rich under democracy given that the poor set \( \bar{\tau}^D = \tau^r \) when \( \varphi = \varphi^H \) and set \( \bar{\tau}^D = \tau^p \) when \( \varphi = \varphi^L \). Note that equations (7) and (9), with \( U^r(D, \varphi^H) = U^r(D, \varphi^H, \bar{\tau}^D = \tau^r) \), constitute a system of two equations in the two unknowns \( U^r(D, \varphi^H) \) and \( U^r(D, \varphi^H, \bar{\tau}^D = \tau^r) \). So, solving equation (7) for \( U^r(D, \varphi^H, \bar{\tau}^D = \tau^r) \) and substituting into equation (9), we have:

\[ U^r(D, \varphi^H, \bar{\tau}^D = \tau^r) = \]

\[ \frac{(1 - \beta(1 - p))(1 - \tau^r)y^r + V(H(\tau^r \bar{y}) + R) + \beta(1 - p)(1 - \tau^p)y^r - V(H(\tau^p \bar{y}) + R)}{1 - \beta} \]  

(24)
This expression tells us the minimum level of redistribution to which the poor can credibly commit themselves over time. Notice that this level of redistribution is limited by the commitment problem of the poor. To see this, suppose, instead, that the poor could credibly promise to set the tax rate at $\tau^r$ in every period, whether the state is low or high. Since the rich would receive instantaneous utility defined at $\tau^r$ in every period, the value function of the rich under such a strategy by the poor would simply be:

$$
U^r(D, \tau^D = \tau^r) = \frac{[(1 - \tau^r)y^r + V(H(\tau^r \bar{y}) + R)}{1 - \beta}
$$

which is the same as equation (23), the utility of the rich from living under an authoritarianism where they are unconstrained by the threat of revolution. (In writing equation 25, I have not entered $\varphi$ as an argument to utility because we are temporarily imagining that the poor follow the same strategy in every period, whether $\varphi = \varphi^H$ or $\varphi = \varphi^L$). Clearly, by the definition of $\tau^r$ as the solution to the maximization problem of the rich, equation (25) is greater than equation (24). What this implies is that if the poor could somehow promise to set a tax rate lower than $\tau^p$ in periods when $\varphi = \varphi^L$, they could promise more to the rich than equation (24), but this is not possible in any Markovian equilibria.

Thus, by $U^r(A, \mu^L) - \hat{\varphi}^H = U^r(D, \varphi^H*, \tau^D = \tau^r)$ and the definitions of $U^r(A, \mu^L)$ in equation (23) and $U^r(D, \varphi^H*, \tau^D = \tau^r)$ in equation (24), the critical coup cost $\hat{\varphi}^H$ will be defined by:

$$
\hat{\varphi}^H = \frac{[\beta(1 - p)][(1 - \tau^r)y^r + V(H(\tau^r \bar{y}) + R) - (1 - \tau^p)y^r - V(H(\tau^p \bar{y}) + R)]}{(1 - \beta(1 - q))}
$$

Notice that as in the definition of the coup constraint in equations (18) and (21), the numerator of this critical coup cost involves the difference between the utility of the rich at their optimal policy and the utility of the rich at the optimal policy of the poor. Here, this utility difference is multiplied by the (discounted) probability that the state tomorrow is $\varphi^L$, because the rich take into account that if they do not stage a coup, society will be democratic tomorrow and with probability $(1 - p)$ they will not be able to extract a concession of $\tau^D = \tau^r$ from the poor.

Now, to define the equilibria of the game, we will also need to characterize the payoffs of the rich and the poor under authoritarianism. First, note that revolution is an "absorbing state" in the model; once a revolution takes place, society never reverts to authoritarianism or democracy. The payoffs to revolution to the poor will simply be
\[ U^p(R; \mu) = \frac{(1 - \tau^p)y^p + V(H(\tau^p\bar{y}) + R) - \mu}{1 - \beta} \]  

Equation (27) expresses the payoff to the poor when the poor set their unconstrained ideal policy in each period forever (and thus \( \tau = \tau^p \)), net of the cost of revolution which is \( \mu \in \{\mu^L, \mu^H\} \). The value of \( \mu \) depends on the state in the period in which revolution takes place (which is why revolution never takes place when \( \mu = \mu^L \), because \( \mu^L \to \infty \)). Note that by equation (27), revolution is costly not just today but also in future periods. The idea is that although revolution allows the poor to set policy as they like for the rest of the game, it also destroys a part of economic output permanently (perhaps by encouraging economic flight by the rich).

For the rich, revolution is assumed to be the costliest outcome, because after a revolution they no longer exert any influence over policy. To model this idea, I simply normalize the payoff to the rich of revolution at zero:

\[ U^r(R; \mu) = 0 \]

It is worth emphasizing that we do not not know much empirically about public finance or redistributive policy in the wake of a revolution in a resource-rich country, because revolution is a rare event among both resource-poor and resource-rich countries (Skocpol 1979). As we will see, however, revolution is also off the equilibrium path in this model: it is mainly the threat of revolution that will induce a change in the policies adopted by the rich.

In order to begin to characterize the incentives of the rich and the poor under authoritarianism, we will first want to know the condition under which a revolutionary threat will constrain the tax policy adopted by the rich. Let \( \bar{\tau}^A \) be the tax rate chosen by the rich in any stage game under authoritarianism, and suppose that the rich set \( \bar{\tau}^A = \tau^r \) in every period, whether the state is high or low. Then the payoff to the poor is:

\[ U^p(A, \mu^H, \bar{\tau}^A = \tau^r) = \frac{(1 - \tau^r)y^p + V(H(\tau^r\bar{y}) + R)}{1 - \beta} \]  

The revolution constraint will bind in the state \( \mu^H \) when \( U^p(R, \mu^H) > U^p(A, \mu^H, \bar{\tau}^A = \tau^r) \); or using equation (27),

\[ \mu^H < (1 - \tau^p)y^p + V(H(\tau^p\bar{y}) + R) - (1 - \tau^r)y^p - V(H(\tau^r\bar{y}) + R) \]  

(29)
If the inequality in (29) holds, the rich may want to avoid a revolution by using temporary redistribution at some rate \( \tilde{\tau}^A \in (\tau^r, \tau^p) \), that is, by offering a tax rate that is better for the poor than the ideal tax rate of the rich.

A key question is therefore whether the rich will be able to avoid a revolution simply by offering some tax rate \( \tilde{\tau}^A = \tau^p \), that is, the ideal point of the poor. Clearly, the rich will always set \( \tilde{\tau}^A = \tau^r \) whenever \( \mu = \mu^L \), since in such periods the poor cannot mount a credible revolutionary threat. Thus, if the rich can ever avoid a revolution through redistribution, they will be able to do so by setting \( \tilde{\tau}^A = \tau^p \) when \( \mu = \mu^H \) and setting \( \tilde{\tau}^A = \tau^r \) whenever \( \mu = \mu^L \).

Let \( U^p(A, \mu^H, \tilde{\tau}^A = \tau^p) \) be the continuation value of authoritarianism to the poor, given that the rich follow this strategy. Then whenever the state is high, so that \( \mu = \mu^H \), the poor will be indifferent between a revolution and accepting the offer \( \tilde{\tau}^A = \tau^p \) at the critical revolution cost \( \mu^{H*} \) such that \( U^p(A, \mu^{H*}, \tilde{\tau}^A = \tau^p) = U^p(R, \mu^{H*}) \). The latter term is given by equation (27) with \( \mu = \mu^{H*} \). For any \( \mu^H < \mu^{H*} \), the rich will not be able to avoid a revolution by setting a tax rate higher than their ideal point.

Note, however, that \( U^p(A, \mu^H, \tilde{\tau}^A = \tau^p) \) is not the same as equation (28) with \( \tilde{\tau}^A = \tau^p \), since now, in every period in which \( \mu = \mu^L \), the rich will set \( \tilde{\tau}^A = \tau^r \). Thus, in order to define the critical revolution cost, we must develop an expression for \( U^p(A, \mu^H, \tilde{\tau}^A = \tau^p) \).

This expression is:

\[
U^p(A, \mu^H, \tilde{\tau}^A = \tau^p) = (1 - \tau^p) y^p + V(H(\tau^p \bar{y}) + R) + \beta[qU^p(A, \mu^H, \tilde{\tau}^A = \tau^p) + (1 - q)U^p(A, \mu^L, \tilde{\tau}^A = \tau^p)]
\]

(30)

where the first set of terms is the instantaneous utility of the poor at the tax rate \( \tau^p \) and second set of terms define the continuation values to the poor of living under authoritarianism.

The payoff to the poor in a low period is defined analogously as:

\[
U^p(A, \mu^L, \tilde{\tau}^A = \tau^r) = (1 - \tau^r) y^p + V(H(\tau^r \bar{y}) + R) + \beta[qU^p(A, \mu^H, \tilde{\tau}^A = \tau^p) + (1 - q)U^p(A, \mu^L, \tilde{\tau}^A = \tau^r)]
\]

(31)

Thus, equations (30) and (31) constitute a system of two linear equations in the unknowns \( U^p(A, \mu^H, \tilde{\tau}^A = \tau^p) \) and \( U^p(A, \mu^L, \tilde{\tau}^A = \tau^r) \). We can then substitute to solve for \( U^p(A, \mu^H, \tilde{\tau}^A = \tau^p) \), which gives:
\[ U^p(A, \mu^H, \tau^A = \tau^p) = \]
\[
\frac{(1 - \beta(1 - q))[(1 - \tau^p)y^p + V(H(\tau^p\bar{y}) + R)] + \beta(1 - q)[(1 - \tau^r)y^p + V(H(\tau^r\bar{y}) + R)]}{(1 - \beta)}\]  
(32)

Equating this expression to equation (27) and setting \( \mu = \mu^{H*} \) then gives the critical revolution cost:

\[ \mu^{H*} = \beta(1 - q)[(1 - \tau^p)y^p + V(H(\tau^p\bar{y}) + R) - (1 - \tau^r)y^p - V(H(\tau^r\bar{y}) + R)] \]  
(33)

which is just the difference between the utility of the poor at the tax rates \( \tau^p \) and \( \tau^r \), multiplied by the (discounted) probability \((1-q)\) that there is no revolutionary threat tomorrow and the rich can therefore set \( \tilde{\tau}^A = \tau^r \). For any \( \mu^H < \mu^{H*} \), the rich will be unable to avoid a revolution through temporary redistribution at the rate \( \tilde{\tau}^A = \tau^p \) in states \( \mu^H \).

Suppose equation (33) does not hold, and \( \mu^H < \mu^{H*} \), so that the rich cannot avoid a revolution by changing tax policy. The rich may then want to democratize. Democratization is a more credible way to commit to a higher future tax rate for the rich, because under democracy, the poor can implement their preferred tax rate \( \tau^p \) in any period in which the state is low (whereas, under authoritarianism, when the state is low the rich implement \( \tau^r \)). However, we have not yet analyzed the incentives of elites to redistribute at a tax rate \( \tilde{\tau}^A \neq \tau^r \), to democratize, or, alternatively, to repress the poor. I now turn to the analysis of this question, which is the final issue for analysis prior to characterizing the equilibria of the game.

First, consider the case in which the revolution constraint binds but \( \mu^H \geq \mu^{H*} \); that is, there exists some \( \tilde{\tau}^A = \hat{\tau}^A \in (\tau^r, \tau^p] \) such that the poor are indifferent between revolution and accepting this temporary redistribution at the rate \( \hat{\tau}^A \). Then the question is whether the rich will prefer to a strategy in which they adopt \( \hat{\tau}^A \) in all periods in which the state is \( \mu^H \) (and adopt \( \tilde{\tau}^A = \tau^r \) whenever the state is \( \mu^L \)) or will instead prefer a strategy of repression. Using the analogues to equations (30) and (31), now defined for the rich rather than the poor, and solving by substitution, we have that the payoff to the former strategy in the high state is:

\[ U^r(A, \mu^H, \tilde{\tau}^A = \hat{\tau}^A) = \]
Repression, on the other hand, allows the rich to set $\tau^A = \tau^r$ in every period, whether the state is high or low, but it carries a cost of $\zeta$. Thus the payoff to repression is given by:

$$U^r(O, \mu^H, \zeta) = (1-\tau^r)y^r + V(R + \tau^r y^r) - \zeta + \beta[qU^r(O, \mu^H, \zeta) + (1-q)U^r(O, \mu^L, \tau = \tau^r)]$$

(35)

(where the notation "O" stands for "oppression," since I already used "R" for revolution).

What is the interpretation of equation (35)? As with the other Bellman equations, the first term captures the instantaneous utility, here the utility of the rich evaluated at $\tau^r$, net of the cost of repression. The final terms capture the continuation value to the rich. With probability $q$, the state tomorrow is also $\mu^H$, and the revolution constraint will bind tomorrow as well. Now, if the rich found it optimal to repress in a Markovian equilibrium today, they may clearly find it optimal tomorrow; I will therefore restrict the analysis to strategies in which the continuation value in the next period will again be $U^r(O, \mu^H, \zeta)$. However, with probability $(1-q)$, the state tomorrow is $\mu^L$, and the poor cannot threaten a revolution. The rich will clearly not pay the repression cost $\zeta$ in this case, and they will set $\tau = \tau^r$. Thus, the continuation value of the low state will be:

$$U^r(O, \tau^A = \tau^r, \mu^L) = (1-\tau^r)y^r + V(R + \tau^r y^r) + \beta[qU^r(O, \mu^H, \zeta) + (1-q)U^r(O; \tau = \tau^r, \mu^L)]$$

(36)

We can then solve for $U^r(O, \mu^H, \zeta)$ by substitution:

$$U^r(O, \mu^H, \zeta) = \frac{(1-\tau^r)y^r + V(R + \tau^r y^r) - (1-\beta(1-q))\zeta}{1-\beta}$$

(37)

The interpretation of this expression is as follows. Because the elite will always repress when faced with a threat of revolution from the poor, they can set their preferred tax policy in any period. However, they will only need to pay the repression cost $\zeta$ in periods in which $\mu = \mu^H$, which occurs with probability $q$. So the present discounted value of playing the repressive strategy in any high period is not the payoff to imposing $\tau^r$ minus the repression cost, divided by $1 - \beta$, but rather the payoff to imposing $\tau^r$ minus the smaller quantity $(1-\beta(1-q))\zeta$, divided by $1 - \beta$. That the numerator is larger than the payoff to $\tau^r$ minus
the repression cost stems from the fact that the rich will not have to pay the repression cost in all periods. We can confirm that as \( q \to 1 \), the numerator of equation (37) approaches the payoff to imposing \( \tau^r \) minus the repression cost \( \zeta \).

Using equations (29) and (37), I now define the critical value of the repression cost \( \zeta \) at which the rich will be indifferent between repression and redistribution at a tax rate \( \tilde{\tau}^A \) in the high state. This critical repression cost will satisfy \( U^r(A; \mu^H, \tilde{\tau}^A = \tilde{\tau}^A) = U^r(O; \mu^H, \zeta^*) \), or:

\[
\zeta^*(\tilde{\tau}^A) = \left[ (1 - \tau^r)y^r + V(H(\tau^r\bar{y}) + R) - (1 - \tilde{\tau}^A)y^r - V(H(\tilde{\tau}^A\bar{y}) + R) \right]
\]

where I have written \( \tilde{\tau}^A \) as an argument to make explicit the dependence of this critical repression cost on the rate at which the rich must redistribute to the poor to avoid a revolution. For any \( \zeta < \zeta^*(\tilde{\tau}^A) \), the rich will prefer to repress the poor in high periods rather than redistribute to the poor at a rate \( \tilde{\tau}^A \). It is straightforward to show that \( \zeta^* \) is increasing in \( \tilde{\tau}^A \); that is, the more the rich have to raise taxes in order to buy off a revolutionary threat, the greater their incentives to repress.

Consider, then, the choice of the rich in the part of the parameter space where \( \mu^H < \mu^{H^*} \). Here, the rich will not be able to avoid a revolution through temporary redistribution at any tax rate \( \tilde{\tau}^A \). The rich therefore have a choice between repression and democratization. One way to derive the critical threshold at which the rich will be indifferent between these choices, develop analogies to equations (30) and (31) for the continuation payoffs of the rich, which after substitutions, gives:

\[
U^r(D, \varphi^L) = \frac{(1 - \beta)(1 - q)[(1 - \tau^p)y^r + V(R + \tau^p\bar{y})] + \beta p[(1 - \tau^r)y^r + V(R + \tau^r\bar{y})]}{(1 - \beta)(1 - \beta)(1 - p) - \beta p\beta q}
\]

The critical cost of repression at which the rich are indifferent between repression and democratization is therefore the cost \( \tilde{\zeta} \) at which:

\[
U^r(O, \mu^H, \tilde{\zeta}) = U^r(D, \varphi^L)
\]

It will be useful for the analysis below to develop an expression for the critical repression cost under a different set of suppositions. Assume that we are in the part of the parameter space in which, once society democratizes, it remains democratic forever, no matter what policy the poor set (that is, the coup constraint does not bind). This is the case in which
the rich will be most unlikely to want to democratize, since democratization is at its most costly for the rich: the poor will be able to set their ideal tax rate in every period of the game after democratization. The payoff to the rich from democratization, given that we are in a part of the parameter space in which the coup constraint will not bind, will be:

\[ U_r(D, \varphi^L) = \frac{(1 - \tau^p)y^r + V(R + \tau^p\bar{y})}{1 - \beta} \]

As above, the payoff from repression will be:

\[ U_r(O, \mu^H, \zeta) = \frac{(1 - \tau^r)y^r + V(R + \tau^r\bar{y}) - (1 - \beta(1 - q))\zeta}{1 - \beta} \]

Now let \( \bar{\zeta} \) be the critical cost of repression at which these two value functions are equated, and thus the rich are indifferent between repression and democratization. After some algebra, we have:

\[ \bar{\zeta} = \frac{(1 - \tau^r)y^r + V(R + \tau^r\bar{y}) - [(1 - \tau^p)y^r + V(R + \tau^p\bar{y})]}{(1 - \beta(1 - q))} \tag{40} \]

I now use the definitions of the critical thresholds developed above to state the Markov perfect equilibrium outcomes of the fully dynamic game.

**Proposition 1** The outcomes of a Markov perfect equilibrium of the game developed above are as follows:

1. If the revolution constraint in equation (29) does not bind, the society remains authoritarian forever, and the rich set \( \bar{\tau}^A = \tau^r \) in every period.

2. If the revolution constraint binds, then there are several possibilities:
   
   (a) If \( \mu^H \geq \mu^{H*} \) in equation (33) and \( \zeta \geq \zeta^* (\bar{\tau}^A) \) in equation (38), at the \( \bar{\tau}^A \) at which the poor are indifferent between revolution and redistribution, then society remains authoritarian forever but the rich redistribute at the rate \( \bar{\tau}^A \) in periods where \( \mu = \mu^H \). In periods where \( \mu = \mu^L \), the rich set their ideal tax rate \( \tau^r \).

   (b) If \( \mu^H \geq \mu^{H*} \) but \( \zeta < \zeta^* (\bar{\tau}^A) \), the society remains authoritarian forever but the rich use repression in periods where the state is \( \mu = \mu^H \). In every period, the rich set their preferred tax rate \( \tau^r \).

   (c) If \( \mu^H < \mu^{H*} \) but the cost of repression is less than the critical cost which the equality in equation (39) is satisfied, the society remains authoritarian forever but the rich
use repression in periods where the state is \( \mu = \mu^H \). In every period, the rich set their preferred tax rate \( \tau^r \).

(d) If \( \mu^H < \mu^{H*} \) and \( \zeta \geq \hat{\zeta} \), the society democratizes in the first period in which \( \mu = \mu^H \). Then, however, there are three possibilities.

(i) If the coup constraint given by the inequality in (18) does not hold, the society remains democratic forever and the poor set their unconstrained preferred tax rate \( \tau^p \) in every period.

(ii) If the coup constraint holds and \( \varphi^H \geq \varphi^{H*} \), the society remains democratic forever but the poor set a tax rate \( \tau^D \in [\tau^r, \tau^p) \) in periods when \( \varphi = \varphi^H \) (and set \( \tau^D = \tau^p \) when \( \varphi = \varphi^L \)).

(iii) If \( \varphi^H < \varphi^{H*} \), the society reverts to authoritarianism in the first period after democratization in which \( \varphi = \varphi^H \), then the regime type oscillates in every period in which \( \mu = \mu^H \) (under authoritarianism) or \( \varphi = \varphi^H \) (under democracy).

3.4 Comparative Statics

The key theoretical question we want to answer is how the equilibria of the model vary as a function of the level of resource rent in society. The prevailing claim in political science is that resource wealth encourages authoritarianism, in part by increasing the incentives and the ability of elites to resist democratization or to stage coups against democracy. If this is correct, and if the model developed here provides a reliable guide to the economic sources of democracy and authoritarianism, then we would expect that resource rents will increase the incentives of the rich to block or reverse democratization.

3.4.1 Resource rents and democratization

I begin by considering the effects of resource rents on the incentives of elites to repress rather than democratize, under an existing authoritarian regime. In equation (40), I derived the critical cost of repression at which the rich are indifferent between repression and democratization, under the supposition that once society democratizes, it remains democratic forever (that is, under the supposition that we are in the part of the parameter space where the coup constraint does not bind). Note that this is the most costly possible democratization from the point of view of elites, since the poor will be able to set their ideal tax rate \( \tau^A = \tau^p \) in every period. It is therefore attractive to analyze the effects of resource wealth on the
critical repression cost under this supposition, since this setting will maximize the incentives of elites to repress rather than democratize.

Repeating equation (40), the critical repression cost is:

$$\bar{\zeta} = \frac{(1 - \tau^r)y^r + V(H(\tau^r \bar{y}) + R) - [(1 - \tau^p)y^r + V(H(\tau^p \bar{y}) + R)]}{\lambda}$$

(41)

where $\lambda = (1 - \beta(1 - q))$. Recall that for any $\zeta < \bar{\zeta}$, elites will prefer to repress the masses rather than democratize.

The numerator of equation (41) is just the utility of the rich evaluated at the value of $\tau$ that maximizes the utility of the rich, minus the utility of the rich at the value of $\tau$ that maximizes the utility of the poor. So, let

$$U^r(\tau^r(R), R) = (1 - \tau^r)y^r + V(H(\tau^r \bar{y}) + R)$$

(42)

be the utility of the rich at their own ideal point, and let

$$U^r(\tau^p(R), R) = (1 - \tau^p)y^r + V(H(\tau^p \bar{y}) + R)$$

(43)

be the utility of the rich at the ideal point of the poor, that is, the tax policy that maximizes the utility of the poor. (In writing $U^r(\tau^r(R), R)$ and $U^r(\tau^p(R), R)$ in equations 42 and 43, I have made the dependence of the tax rate on $R$ explicit). We can therefore rewrite equation (41) as:

$$\bar{\zeta} = \frac{1}{\lambda}[U^r(\tau^r(R), R) - U^r(\tau^p(R), R)]$$

Now, differentiating with respect to $R$ and using the chain rule, we have:

$$\frac{\partial \bar{\zeta}}{\partial R} = \frac{1}{\lambda} \left[ \frac{\partial (U^r(\tau^r(R), R) - U^r(\tau^p(R), R))}{\partial R} + \frac{\partial (U^r(\tau^r(R), R) - U^r(\tau^p(R), R))}{\partial \tau} \cdot \frac{\partial \tau}{\partial R} \right]$$

(44)

We can see that resource wealth has two effects on the incentives of the rich to repress the poor. The first term is the "direct effect" of resource wealth: that is, it is the partial derivative with respect to resource rents of the difference between the utility of the rich at their optimal policy and at the optimal policy of the poor. The second term is the "indirect" effect of resource wealth on this difference, because the effect of $R$ works through the tax rate. As we will now see, the direct effect of $R$ increases the critical repression cost and thus
increases the incidence of repression, since the rich will repress for any value of $\zeta$ that is less than the critical cost. However, the indirect effect of $R$ decreases the critical repression cost and thus makes repression take place over a smaller part of the parameter space. We can call these effects the "authoritarian" and "democratic" effects of resource wealth, respectively.

**The authoritarian effect of resource wealth**

One effect of resource wealth is to increase the difference between the utility of the rich at their own ideal point and at the ideal point of the poor. This is because, using equations (42) and (43):

$$\frac{\partial(U^r(\tau^r(R), R) - U^p(\tau^p(R), R))}{\partial R} = V'(H(\tau^r y) + R) - V'(H(\tau^p y) + R) > 0$$

(45)

The positive sign of the partial derivative follows from the concavity of $V$, because $\tau^p > \tau^r$ and thus $(H(\tau^p y) + R) > (H(\tau^r y) + R)$. Thus, the direct effect of resource rents is to increase the critical repression cost and thereby increase the part of the parameter space over which repression occurs (and thereby decrease the incidence of democratization). Here, the intuition behind the authoritarian effect of resource wealth in this model depends on the marginal rates of substitution of the rich and the poor between resource wealth and taxation: the rich would prefer to substitute away from taxation towards financing public spending from resource rents, at a faster rate than the poor.

The authoritarian effect of resource wealth is also underscored by the extensions to the model in the Appendix below, where I allow for targeted transfers of the resource rent. In these extensions, the group that is in power can choose to consume the resource rent and exclude the other group from public spending (and it can choose to give some public spending to the other group, for example in order to avoid revolution or coups). We will see that in that extension as well, the direct effect of resource wealth is to increase the incentives of the rich to block or reverse democratization – because holding political power allows the rich to consume the entirety of the resource rent in any period in which the poor cannot mount an effective threat to the power of the rich. However, as I show in the Appendix, the "democratic" effect of resource rent will persist. What is this effect?

**The democratic effect of resource rent**

The second term in equation (44) defines the indirect effect of resource wealth. Using equations (42) and (43), we have:
\[
\frac{\partial(U'(\tau^r(R), R) - U'(\tau^p(R), R))}{\partial \tau} \cdot \frac{\partial \tau}{\partial R} = \frac{\partial \tau^p}{\partial R} [y^r - V'(H(\tau^p \bar{y}) + R)H'(\tau^p \bar{y})\bar{y}] < 0 \quad (46)
\]

where I have applied the envelope theorem, which states that \( \frac{\partial U'(\tau^r(R), R)}{\partial \tau} = 0 \) because \( \tau^r \) is the tax policy that maximizes \( U'(\tau^r(R), R) \). The term inside the brackets can be rewritten as \( y^r - y^p \), because \( V'(H(\tau^p \bar{y}) + R)H'(\tau^p \bar{y})\bar{y} = y^p \) by equation (4). Since \( y^r > y^p \), this term inside the brackets in equation (46) is positive.

Next, to investigate the sign of \( \frac{\partial \tau^p}{\partial R} \), note that by the first-order condition in equation (4) with \( i=p \):

\[
-y^p + V'(H(\tau^p \bar{y}) + R)H'(\tau^p \bar{y})\bar{y} = 0
\]

Implicitly differentiating this expression with respect to \( R \) and rearranging terms, we have:

\[
\frac{\partial \tau^p}{\partial R} = \frac{-V''(H(\tau^p \bar{y}) + R)H'(\tau^p \bar{y})\bar{y}}{[V''(H(\tau^p \bar{y}) + R)H'(\tau^p \bar{y})\bar{y}^2 + V'(H(\tau^p \bar{y}) + R)H''(\tau^p \bar{y})(\bar{y})^2]} < 0 \quad (47)
\]

Both terms in the denominator are negative (by the concavity of \( V \) and \( H \)), and the term in the numerator is positive. Thus, since the term in brackets in equation (46) is positive, and \( \frac{\partial \tau^p}{\partial R} \) is negative, equation (46) is also negative. An increase in resource rents decreases the ideal tax rate of the poor.

What is the interpretation of equation (46)? Recall that this equation expresses the "indirect" effect of resource wealth on the difference between the utility of the rich at their ideal policy and the utility of the rich at the ideal policy of the poor, where the effect is indirect because it works through the tax rate. As we can see by the sign of equation (46), the indirect effect of resource wealth decreases this difference in utilities. Why is this? The utility of the rich from setting their optimal tax rate is unchanged, since they will continue to set their optimal tax rate, taking into account the level of \( R \) in society. However, resource rents drive down the rate at which the poor want to tax the rich, since \( \frac{\partial \tau^p}{\partial R} < 0 \). This makes democracy less costly for the rich, since the poor will set \( \tau^p \) in every democratic period but now \( \tau^p \) is smaller. Thus, the indirect, "democratic" effect of resource rents drives down the critical repression cost \( \bar{\zeta} \) and thus to make repression occur over a smaller part of the parameter space.

In the model, the indirect effect of resource wealth is to increase the incidence of democracy.

Putting this discussion together, we can see that:
\[
\frac{\partial \hat{c}}{\partial R} = \left[ V'(H(\tau^r y) + R) - V'(H(\tau^p y) + R) + \frac{\partial \tau_p}{\partial R} \left[ y^r - V'(H(\tau^p y) + R) H'(\tau^p y) y \right] \right]
\] (48)

However, we cannot sign this expression, because resource rents have ambiguous total effects on the incentives of authoritarian elites to repress the masses. The direct effect of resource wealth promotes authoritarianism in the model, while the indirect effect promotes democracy.

### 3.4.2 Resource rents and coups

Let us also investigate the incentives of the rich to stage coups against democracy. In equation (26) above, I developed an expression for the critical coup cost at which the rich are indifferent between a coup and living under democracy, given that a coup allows the rich to set \( \tilde{\tau}^A = \tau^r \) forever and given that under democracy, the poor set \( \tilde{\tau}^D = \tau^r \) when \( \varphi = \varphi^H \) and \( \tilde{\tau}^D = \tau^p \) when \( \varphi = \varphi^L \). Repeating equation (26), this critical coup cost is:

\[
\hat{\varphi}^H = \frac{\beta(1-p)((1-\tau^r)y^r + V(H(\tau^r y) + R) - (1-\tau^p)y^r - V(H(\tau^p y) + R))}{(1 - \beta(1 - q))}
\] (49)

For any coup cost \( \varphi^H < \hat{\varphi}^H \), the poor cannot avoid a coup by setting tax policy at the ideal point of the rich in high periods.

Note that the term in brackets in the numerator of equation (49) is, again, the difference between the utility of the rich at their own ideal policy and the utility of the rich at the ideal policy of the poor. Thus, we can rewrite equation (49) as:

\[
\hat{\varphi}^H = \frac{\beta(1-p)[U^r(\tau^r(R), R) - U^r(\tau^p(R), R)]}{(1 - \beta(1 - q))}
\] (50)

Then, using the chain rule, we have:

\[
\frac{\partial \hat{\varphi}^H}{\partial R} = \frac{\beta(1-p)}{(1 - \beta(1 - q))} \left[ \frac{\partial(U^r(\tau^r(R), R) - U^r(\tau^p(R), R))}{\partial R} + \frac{\partial(U^r(\tau^r(R), R) - U^r(\tau^p(R), R))}{\partial \tau} \frac{\partial \tau}{\partial R} \right]
\] (51)

Just as in the discussion of the cost of repression above, there are mixed effects of resource rents on the critical coup cost \( \hat{\varphi}^H \). The "direct" effect of resource wealth will make coups take place over a larger part of the parameter space, because:
\[
\frac{\partial(U^r(\tau^r(R), R) - U^p(\tau^p(R), R))}{\partial R} = V'(H(\tau^r\tilde{y}) + R) - V'(H(\tau^p\tilde{y}) + R) > 0 \tag{52}
\]

However, the "indirect" effect of resource wealth reduces the incentives of elites to stage coups against democracy. This is because:

\[
\frac{\partial(U^r(\tau^r(R), R) - U^p(\tau^p(R), R))}{\partial \tau} \cdot \frac{\partial \tau^p}{\partial R} = \frac{\partial \tau^p}{\partial R} [y^r - V'(H(\tau^p\tilde{y}) + R)H'(\tau^p\tilde{y})\tilde{y}] < 0 \tag{53}
\]

just as in equation (46).

One way to think about the interpretation of the latter effect is as follows. The poor would like to induce the rich not to stage a coup against democracy, by promising the ideal point of the rich: \( \tilde{\tau}^D = \tau^r \). However, the poor face an intertemporal commitment problem, because in any period in which \( \varphi = \varphi^L \), it will be optimal for the poor to set \( \tilde{\tau}^D = \tau^p \). If the rich do not stage a coup, the poor retain their democratic political power and can impose their own preferred policy in any period of the game in which the rich cannot threaten a coup.

However, the "democratic" effect of resource rents mitigates this commitment problem. This is because resource wealth endogenously affects tax policy; that is, resource rents reduce the tax rate preferred by the poor. Resource rents displace taxation, and this allows the poor to commit not to redistribute wealth away from the rich. The source of the democratic effect is that resource rents reduce the difference between the utility of the rich at their preferred tax rate and at the tax rate preferred by the poor.

Putting this together, we have the following definition:

\[
\frac{\partial \hat{\varphi}^{H*}}{\partial R} = \frac{\beta(1 - p)}{(1 - \beta(1 - q))} \left[ V'(H(\tau^r\tilde{y}) + R) - V'(H(\tau^p\tilde{y}) + R) + \frac{\partial \tau^p}{\partial R} [y^r - V'(H(\tau^p\tilde{y}) + R)H'(\tau^p\tilde{y})\tilde{y}] \right] \tag{54}
\]

The sign of this expression is ambiguous, and the effects of resource wealth on the coup incentives of the rich are mixed.

Having identified the mixed effects of resource wealth on the incentives to stage coups, I now turn to the most important question. When do we expect resource wealth to promote authoritarianism, and when might we expect it to promote democracy?
3.4.3 The role of inequality

Inequality of income plays an important role in this model. To see this, recall that the fraction of total private income accruing to the rich group is \( \theta \), with \( \theta > \delta \). The income of each rich individual is \( y^r = \frac{\theta}{\delta} \bar{y} \) and the income of each poor individual is \( y^p = \frac{(1-\theta)}{(1-\delta)} \bar{y} \), where \( \bar{y} \) is total (and average) income and \( y^r > \bar{y} > y^p \). Thus, for fixed \( \bar{y} \), \( \theta \) is a measure of inequality.

Now consider the critical coup cost defined in equation (26) above. Substituting \( y^r = \frac{\theta}{\delta} \bar{y} \), we have:

\[
\hat{\varphi}^H = \frac{[\beta(1-p)][(1-\tau^r)\frac{\theta}{\delta} \bar{y} + V(H(\tau^r \bar{y}) + R) - (1-\tau^p)\frac{\theta}{\delta} \bar{y} - V(H(\tau^p \bar{y}) + R)]}{(1-\beta(1-q))} \tag{55}
\]

Then, implicitly differentiating the expression for the critical coup cost with respect to \( \theta \), using the envelope theorem to simplify, and substituting terms, we have:

\[
\frac{\partial \hat{\varphi}^H}{\partial \theta} = \frac{[\beta(1-p)][\frac{\bar{y}}{\delta} \delta \bar{y} - V(H(\tau^p \bar{y}) + R)H''(\tau^p \bar{y})\bar{y}^2]}{(1-\beta(1-q))} - \tau^p + \frac{\partial \tau^p}{\partial \theta} (y^r - y^p) > 0 \tag{56}
\]

The inequality follows from \( \tau^p > \tau^r \), \( y^r > y^p \), and the fact that the preferred tax rate of the poor is increasing in inequality, because, implicitly differentiating the first-order condition of the poor with respect to \( \theta \), we have:

\[
\frac{\partial \tau^p}{\partial \theta} = \frac{-\bar{y}}{(1-\delta)[V''(H(\tau^p \bar{y}) + R)(H''(\tau^p \bar{y})\bar{y})^2 + V'(H(\tau^p \bar{y}) + R)H''(\tau^p \bar{y})\bar{y}^2]} > 0 \tag{57}
\]

Equation (56) says that inequality increases the incentives of elites to stage a coup in this model. Note also that since equation (55) is identical to equation (50), equation (56) also implies that inequality increases the difference between the utility of the rich at their ideal point and at the ideal point of the poor. This is intuitive, since inequality widens the distance between the ideal points of the rich and the poor. (We can easily check that in contrast to equation 57, we have \( \frac{\partial \tau^r}{\partial \theta} < 0 \), that is, inequality decreases the preferred tax rate of the rich).

However, as we saw above, the indirect effect of resource wealth is to decrease the difference between the utility of the rich at their ideal point and at the ideal point of the poor. We might therefore conjecture that resource rents mitigate the impact of inequality on the critical coup cost. Ideally, we would like to know the sign of the cross-partial derivative of
the critical coup cost $\hat{\phi}_R$ with respect to $R$ and $\theta$, because this will tell us how resource rents affect the impact of inequality on the critical coup cost. Implicitly differentiating equation (56) with respect to $R$, we have:

$$\frac{\partial^2 \hat{\phi}_R}{\partial \theta \partial R} = \frac{[\beta (1 - p)]}{(1 - \beta (1 - q))} \frac{\bar{y}}{\delta} \left( \frac{\partial \tau_R}{\partial R} - \frac{\partial \tau^p}{\partial R} \right) + \frac{\partial^2 \tau^p}{\partial R \partial \theta} (y^r - y^p) < 0 \quad (58)$$

As long as the third derivatives of $H$ and $V$ are positive on $R^{++}$, the cross-partial derivative of equation (58) is negative, which is straightforward though laborious to show. This implies that inequality makes the impact of resources on the critical coup cost less positive (more negative) – in other words, inequality increases the democratic effects of resource wealth. Here I take the approach of calibrating the model numerically using these functional forms and presenting simulation results that will motivate my empirical work in subsequent chapters. Consider the following concave functions, which have positive third derivatives on $R^{++}$:

$$V(x) = x^{\frac{1}{2}}$$

$$U(x) = x^{\frac{1}{2}}$$

Figure 1 depicts a simulation using these functional forms on $V$ and $U$ and the following parameter values: $R = 1.25$, $\bar{y} = 3.75$, $\delta = 0.1$, and $\beta = p = q = \frac{1}{4}$. So in this simulation, the rich are ten percent of the population, and $R = 100 \times \left( \frac{1.25}{5} \right) = 25$ percent of total economic output $R + \bar{y}$ – call this sum "GDP." The point of the simulation is to show visually how $\frac{\partial \hat{\phi}_R}{\partial R}$ varies with the measure of inequality $\theta$. First, when society is completely equal, so that $\delta = \theta$, the partial derivative $\frac{\partial \hat{\phi}_R}{\partial R}$ is positive, so that resource rents encourage coups against democracy. However, when society is completely unequal, so that $\theta = 1$, the partial derivative $\frac{\partial \hat{\phi}_R}{\partial R}$ is negative, so that resource rents discourage coups against democracy. In fact, because $\frac{\partial^2 \hat{\phi}_R}{\partial R \partial \theta}$ is everywhere negative, resources are better for democracy at higher levels of inequality. This theoretical finding will motivate my empirical approach, which is to posit

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5I conduct the simulations here under the assumption of targeted transfering, as in Section 5.1 of the Appendix. Simulations on the basic model of this section yield similar qualitative results, yet targeted transfers widen the part of the parameter space over which the authoritarian effect occurs and therefore make the results on inequality more convenient to depict visually.
that we should see the democratic effect of resource rents when inequality of non-resource income (i.e., $\theta$) is high.

[FIGURE 1 ABOUT HERE]

### 3.4.4 The role of economic development

Simulation results can also suggest how the level of economic development of non-resource sectors of the economy mediates between resource rents and political outcomes. In the next two simulations, the sum of resource rents $R$ and total private income $\tilde{y}$ – call this sum "GDP" – is held constant at 5, just as in Figure 1. However, the ratio of $R$ to GDP is allowed to vary. In Figure 2, $R = 2.5$, so $R$ is 50 percent of GDP. In Figure 3, $R = 2.5$, so $R$ is 75 percent of GDP.

What the simulations show visually is that resources are worse for democracy when they make up a larger proportion of total economic output. For example, under the parameter values and functional form assumptions of the simulation presented in the Figure 1, when resources comprise 25 percent of GDP, the effect of resource wealth becomes democratic when the rich have around 55 percent of total income. However, when resources reach 75 percent of GDP, as in Figure 3, the effect of resources only becomes democratic when the rich have 70 percent of resource income. The particular thresholds are not what matters most, since these depend on the parameter values of the simulation, but rather the qualitative result: the authoritarian effect of resource wealth is more important when resources are a larger part of total GDP. This is because the "direct" effect of resource wealth becomes more important, relative to the role of resources in reducing the redistribution of non-resource income.

[FIGURES 2 AND 3 ABOUT HERE]

### 3.5 Discussion and interpretation

Leading studies of politics in resource-rich countries have contended that rents from resources such as oil and other minerals promote authoritarianism. This claim has rested on several different arguments. First, since rents from oil and related minerals may be relatively easily controlled by the central government, resource rents are thought to increase the incentives of elites to invest in political power, as opposed to other forms of economic or social power.
Access to resource rents may decrease the incentives of elites to empower citizens politically, for example through extension of the suffrage (Bueno de Mesquita et al. 2003: 94-95). Highly "specific" and immobile assets like oil and other minerals, which are easier for the masses to expropriate, should make democracy more costly for wealthy elites, who could otherwise more easily control these assets under authoritarian forms of rule (Boix 2003). Second, resource rents are thought to increase the ability of authoritarian elites to maintain power. In the leading empirical study in political science, for example, Ross (2001) has emphasized that resource rents may provide elites with an increased capacity to coopt political opposition through material inducements, and they may also endow elites with an increased degree of repressive power.

The analysis above does not contradict claims about the link between resource rents and authoritarianism. As we saw above, the "direct" effect of resource rents increases the incentives of elites to block or reverse democratization. In the model developed in this section, the intuition behind this direct, "authoritarian" effect of resource rent depends on the rate at which the rich and the poor want to finance public spending from the resource rent rather than from taxation. In the extension developed in the Appendix below, where we allow for targeted transfers of the resource rent, this direct effect of resource rent will have additional interpretations. There, as we will see, conflict over the distribution of resource rent will increase the incentives to control power, because the group that holds political power will be able to appropriate the entirety of the resource rent in any period in which that group is unconstrained by a threat from the out-of-power group. This direct effect of resource wealth in the model appears to capture some of the arguments in the existing literature about the political effects of resource wealth.

Yet there is also an "indirect" effect of resource wealth in the model, which works through the effect of resource wealth on the preferred tax rate of the poor. The source of this effect is that, working through the tax rate, resource wealth decreases the difference between the utility of the rich at their ideal point and the utility of the rich at the ideal point of the poor. Since democracy always allows the poor to implement their ideal point, in any period in which they are unconstrained by a threat of a coup from the rich, the "indirect" effect of resource wealth therefore makes democracy less costly for the rich. In this sense, the political empowerment of the poor is less costly to rich elites in resource-rich societies.

The analysis of the model sheds light on another argument often made by scholars of politics in resource-rich societies. As I discussed in Chapters One and Two, the negative
relationship between resource wealth and other forms of revenue-generation, including taxation, has been interpreted as a source of authoritarianism in resource-rich societies. Echoing a common view advanced by scholars of the Middle East, Ross (2001) suggests that because resource wealth obviates the need for domestic taxation, leaders do not need to extend representation. Beblawi (1987: 53-54) argues that “with virtually no taxes, citizens are far less demanding in terms of political participation." In a different but related argument, Bueno de Mesquita et al. (2003: 94-95) suggest that in natural-resource rich countries with small "winning-coalitions" supporting leaders, "leaders do not have to rely on the economic activity of residents to provide the resources they need to reward their supporters as much as when resources are absent. Without the need to hold in check their desire to appropriate income, leaders dependent on small winning coalitions can attempt to seize all of the pie."^6

From the perspective of the model developed here, however, the absence of taxation in resource-rich societies is a central cause of a democratic effect of resource wealth. In this model, resource wealth displaces taxation, but this reduces the incentives of elites to stage coups or repress the poor. The intuition depends on the important conceptual difference between resource rent and other forms of income or wealth. In the model, private income is distributed unequally in society, and individuals therefore have different preferences over optimal tax policy (since individual income determines the desired tradeoff of each individual between private consumption and public spending). Inequality of private income induces a conflict over redistribution, with the poor wanting more redistribution from the rich. Resource rent, however, falls into the public coffers more or less like manna from heaven. While there may be conflict over the distribution of resource rent, resource rents also decrease the extent to which democratic majorities want to redistribute income or wealth away from rich elites. While the political effects of the reduced tax burden in rentier states is ultimately an empirical question, one that I seek to address elsewhere in this study, the model provides a compelling theoretical reason to think that the conventional wisdom on the role of reduced taxation in driving authoritarianism in resource-rich countries may be wrong.

The role played by inequality in this model also differs from previous work on resource-rich countries. For example, in the work of Boix (2003), immobile assets like oil and other minerals

^6Bueno de Mesquita et al. (2003:94) also note that in large winning coalition systems – that is, where leaders must compete for the support of a relatively broad cross-section of society, as in a democracy – "the addition of rents from natural resources enables leaders to provide...public goods and cut taxes," which is the closest statement I have found in the existing formal literature to the democratic mechanism I emphasize here.
– which are assumed to be owned by the rich – are easier to tax than other kinds of assets and therefore create incentives for elites to resist the introduction of democracy. Fearon (2005) suggests that oil may influence political outcomes such as civil war by increasing inequality. It is therefore important to be clear on what inequality means in the model developed here. The parameter $\theta$ is a measure of the share of private income that accrues to the rich. In particular, it is independent of $R$, the level of the resource rent. Inequality should perhaps be thought of as pre-tax and pre-transfer inequality. Unlike the model developed by Boix, here the redistributive pressure on elites under a democratic regime has an inverse relationship to the level of the resource rent, and this drives the main difference between his results and the results presented here. The empirical evidence presented in Chapter Two suggests that indeed, there is a negative relationship between resource rent and the tax burden. On the other hand, the model is designed to analyze the politics of rentier states, in which resource rents tend to flow directly into the coffers of the state. In other settings, because of the kind of resource being exploited or the structure of ownership in the resource industry, resource rent may flow into private hands without the mediation of the state. The political role of the tin barons in pre-revolutionary Bolivia (la Rosca, as the barons were known) may provide an empirical demonstration: there, the flow of rent directly into the hands of an elite may well have played a different kind of political role.

Another point worth underscoring is that in this model, revenue is used to finance public spending from which both groups are assumed to benefit. Yet in many settings, it may seem that public spending can be targeted to particular groups, especially given the evidence of massive appropriation of the resource rent by the political elite in many authoritarian resource-rich countries. I take up this question formally in the Appendix, extending the model developed here to allow for targeted spending will not affect the qualitative results of the model. As I show there, targeting of public spending may well increase the incentives of both groups to fight for political power, and it may also afford the in-power group with a greater ability to "buy off" the out-of-power group whenever the out-of-power group has the collective action capability to mount a credible challenge to the in-power group. However, resource rents will still have ambiguous effects on the incentives of both groups to hold onto power, even in a model in which we allow for targeted transfers: the indirect effect of resource wealth continues to support democracy.

Finally, it is worth underscoring that the image of politics on which this theoretical model builds emphasizes the importance of divisions between groups defined by their relative levels
of income and wealth. More generally, of course, politics may be characterized by a wide range of religious, identity-based, or “post-materialist” cleavages (Inglehart 1990; Kitschelt 1994; Bartolini and Mair 1991), yet even in countries where ethnic or identity-cleavages provide a primary axis of conflict, the political dynamics of economic conflict that I discuss in this study may still be important.

4 Conclusion

Leading studies in political science have argued, on the apparent strength of the cross-national empirical evidence, that resource wealth promotes authoritarianism. From this perspective, the claim of country experts that oil fostered democracy in Venezuela appears incorrect: at the least, Venezuela is simply a statistical outlier. Yet in the model developed here, there are both authoritarian and democratic effects of resource wealth. A central contribution of the model is to elaborate a mechanism through which resource rents promote democracy and to compare this mechanism with the links between resource wealth and authoritarianism.

The remaining chapters of this study turn to the empirical evidence. There are two central issues. First, how general are the democratic effects of resource wealth? In Chapter Six, I present cross-national statistical evidence that suggests that Venezuela is not simply a statistical outlier, and that the relationship in the data between resource rents and democracy is more substantial than previous analysts have thought. One approach I take is to fit a statistical model similar to that presented in Ross (2001), who found a negative relationship between oil and democracy in a global panel of countries, to time-series cross-section data for 18 Latin American countries between 1960 and 2000. The rationale for testing the empirical relationship between resource rents and democracy in Latin America is as follows. First, the formal model links the democratic effect of resource wealth to the influence of resource rents on redistributive politics. According to many analysts, redistributive politics have played an especially crucial role in the emergence of different regime types in Latin America, which is the most unequal region of the world (see Stepan 1985; Collier 1999). Thus, selecting the sample on the basis of the mediating independent variable of inequality and redistributive politics should allow us to partial out the "democratic" from the "authoritarian" effects of resource wealth. Second, if, as the existing cross-national literature has argued, resource rents are linked only to authoritarianism, there is no a priori reason to suspect the relation-
ship in Latin America to be different. Yet my analysis shows that there is a positive and statistically significant relationship between oil and democracy in these data. Moreover, these results are robust to different assumptions about the error processes of the model, and, especially important, they hold up to the inclusion of country and time fixed effects as well as the exclusion of Venezuela from the sample. The fact that the results persist with country dummies is particularly noteworthy, since Ross’s (2001) global results on oil and authoritarianism do not. In Ross’s (2001) analysis, the result is largely driven by a cross-sectional association between oil and authoritarianism, while in my analysis within-country variation does more of the work in producing the partial association. This reduces the possibility that omitted country-specific factors are driving the statistical result. I also conduct further statistical tests of the relationship between resource rents and the regime type, which are reported in Chapter Six.

A second and equally vital question is whether the theoretical framework developed in this chapter helps to capture the mechanisms through which resource rents can promote democracy. I use my extended case study of Venezuela, as well as my briefer analysis of other cases, to address this question. Clearly, using the Venezuelan case – which helped to generate the idea that oil rents could promote democracy in the first place – to test assertions about the general impact of resource wealth on the political regime type has relatively little usefulness or validity. Instead, the purpose of my in-depth study of Venezuela is two-fold. I exploit new temporal variation in political outcomes in Venezuela, including the dramatic transformation of the party system during the 1990’s and the near-breakdown of democracy at several points over the last decade and a half, to assess the validity of the hypothesis that oil promoted democratic stability and, especially, to adjudicate between the mechanisms through which it did so. I find that although previous studies have been correct to emphasize the link between oil and democracy in Venezuela, they have not as clearly emphasized the correct mechanisms, which the more recent variation in outcomes in Venezuela have helped to cast into relief. I argue in my case study of Venezuela that the theoretical framework provided by this model, which emphasizes the role of redistributive conflict, provides more power for explaining why oil supported democracy, and why the decline in oil rents available to the central government in the 1980’s and 1990’s contributed to the destabilization of democracy. My briefer analysis of other cases probes the role of this mechanism further.
5 Appendix: targeted transfers

In the model developed above, resource rents were assumed to finance public spending from which all groups benefit. However, stipulating by fiat that all of the resource rent goes to finance a collective good might seem to "stack the deck" in favor of democracy. In particular, one might want to know why elites cannot simply appropriate all of the resource rent and transfer it to themselves under authoritarian forms of rule. While this image of politics is predatory, and while it may not fit all authoritarian regimes, one is harder-pressed to supply examples of resource-rich authoritarian regimes in which elites do not appropriate a significant proportion of resource rents.\(^7\) If elites are able to appropriate resource rents for private consumption under authoritarianism, this might increase the incentives of the rich to stage a coup against democracy or to use repression to confront popular mobilization. Moreover, under democracy the poor might vote to appropriate all of the resource rent for themselves. For both reasons, resource rents could increase the opportunity cost to the rich of living under democracy and increase the incentives of elites to block or reverse processes of democratization. Perhaps the democratic effect of resources is just an artifact of the way I wrote down the economic model.

In this Appendix, I show that this is not the case. In the subsections below, I extend the model developed in Section 3 to allow for "targeted transfers" of public revenue to particular groups. The first subsection directly extends the model developed in Section 3 to allow for group-specific spending, while the second subsection models the technology by which rents are targeted to groups in a somewhat different way. In both cases, the "democratic" effect of resource wealth persists, even when we extend the model to allow for targeted transfers. As long as there is a wedge between the efficiency cost of raising revenue from income taxation versus resource rent, then resource rents displace taxation. This implies that democracy becomes less redistributive, which decreases the incentives of elites to oppose democratization or stage coups against existing democracies.

5.1 Group-specific spending

\(^7\)See the evidence in Chapters One and Two. A partial exception may be Suharto's Indonesia (Dunning 2005). On the distinction between "predatory" and "developmental" states, see Evans (1989). Robinson (1997) links the incidence of predatory states to resource wealth.
As above, let public spending be financed by resource rents and by tax revenues. However, unlike the model above, assume public spending can now be targeted to particular groups. Thus, let the utility of each individual \( i \) in each period \( t \) be:

\[
U_i^t = c_i^t + V(T_i^t)
\]

where, as before, \( c_i^t = (1 - \tau_t)y_i^t \) is the post-tax private consumption of group \( i \) at time \( t \) and \( V \) is a concave utility function capturing the diminishing marginal utility of public spending, but now \( T_i^t \) is the per-capita transfer to group \( i \), which is shared equally by all members of group \( i \).

The government budget constraint is:

\[
\sum_i T_i^t = H(\tau \bar{y}) + R
\]

(59)

where \( R \) is the resource rent and \( \bar{y} \) is total (and average) income, but now spending is targeted to particular groups. For example, spending on the rich will be \( T^r = H(\tau \bar{y}) + R - T^p \), that is, total revenue net of any transfers to the poor. Since any unconstrained optimum for group \( i \) (that is, an optimum unconstrained by the threat of a coup or revolution) will clearly involve zero transfers to the other group, we can solve for the following first-order condition which implicitly defines the preferred tax rate of individual \( i \):

\[
V'(H(\tau \bar{y}) + R) = \frac{\bar{y}_i^t}{H'(\tau \bar{y}) \bar{y}}
\]

(60)

which is just equation (5) above. Now, implicitly differentiating with respect to \( R \), we have:

\[
\frac{\partial \tau_i^t}{\partial R} = \frac{-V''(H(\tau \bar{y}) + R)H'(\tau \bar{y})\bar{y}}{[V''(H(\tau \bar{y}) + R)(H'((\tau \bar{y})\bar{y})^2 + V'(H(\tau \bar{y}) + R)H''((\tau \bar{y})\bar{y})^2]} < 0
\]

which is equation (47).

Using the definitions above, we can derive the critical value of the coup cost at which the rich will be indifferent between staging a coup when \( \varphi = \varphi^H \) and accepting \( \tilde{\tau}^A = \tau^r \):

\[
\varphi^H = \left[ \beta(1 - p) \right] \frac{[1 - \tau^r]y^r + V(H(\tau^r \bar{y}) + R) - (1 - \tau^p)y^p}{(1 - \beta(1 - q))}
\]

(61)

Note that the rich receive no transfers at the optimal policy of the poor. Nonetheless, the effect of resource rents on the critical coup threshold is still ambiguous, as above. This is because, implicitly differentiating with respect to \( R \), we have:
The first term is positive, while the second term is negative. Thus, resources have mixed effects on the incentives of the rich to stage a coup in this model with group-specific transfers. It is straightforward to check that the same results carry through for the comparative statics with respect to the critical repression threshold.

Note that although intuition might suggest that allowing for group-specific transfers of revenue would allow either group to "buy out" the other group more effectively when necessary to maintain power, this is not necessarily so. Targeting revenue raises the amount that an in-power group can transfer to an out-of-power group when the power of the former is threatened by the potential for revolution or a coup by the latter. On the other hand, when this threat recedes, the in-power group will optimally transfer more away from the out-of-power group to itself. Knowing this, the out-of-power group has increased incentives to contest the power of the in-power group. Thus, even as group-specific transfers makes it easier to appease out-of-power groups when they pose a threat to in-power groups, it also makes periods in which these groups cannot pose a threat more costly to the out-of-power groups.

5.2 A different approach to targeted transfers

We may also formulate a model of group-specific transfers in a different way. In this subsection, I briefly develop such a model and show that similar mechanisms to those developed above drive the results of the model. The model of this subsection has the advantage of capturing the "authoritarian" effects of resource wealth in a perhaps more intuitively compelling way than in the model of public spending developed above. Nonetheless, even in this model, there remains an important "democratic" effect of resource wealth.

Let utility be:

$$U^i = (1 - \tau)y^i + T^i - C(T^i)$$

where $\tau$ is a proportional tax rate and $y^i$ is private income. Here $T^i$ is a group-specific transfer of revenue, where groups $i=r,p$ are the rich and the poor. $C(\cdot)$ is a convex cost function with $C(0) = 0$, $C'(\cdot) > 0$, $C''(\cdot) > 0$, and $\zeta > C(\zeta)$. This cost captures the efficiency loss from spending revenue on transfers to specific groups and plays an equivalent role in this model as the function $V$ in the model above.
As in the previous subsection, the government budget constraint is

\[ \sum_i T^i = R + H(\tau \bar{y}) \]  

(62)

where \( R \) is the resource rent and \( \bar{y} \) is total (and average) income. (Thus, for example, transfers to the rich group will be \( T^r = R + H(\tau \bar{y}) - T^p \), that is, revenue from all sources net of transfers to the poor group). \( H \) is a concave function that expresses the inefficiency loss from raising revenue through taxes. Thus, as above, there is an asymmetry between the cost of raising revenue from taxation and the cost of raising revenue from resources. Unlike resource rent – which is like manna from heaven – tax revenue is comparatively difficult to raise. This is captured formally with the function \( H \), which ensures that unlike resource rent, taxes are not converted unit-by-unit into transfers.

We first want to solve for the optimal tax rate for group \( i \). Any unconstrained optimal policy for group \( i \) will involve zero transfers to the other group. Thus, the following first-order condition implicitly defines the preferred tax rate of group \( i \):

\[ H'(\tau^i \bar{y}) = \frac{y^i}{1 - C'(R + H(\tau^i \bar{y}))\bar{y}} \]  

(63)

Clearly, since \( y^r > \bar{y} > y^p \), the rich want lower taxes than the poor, since decreasing taxes causes both \( H_r \) and \( 1 - C'(R + H(\tau^i \bar{y}))\bar{y} \) to increase.\(^8\) Thus, \( \tau^p > \tau^r \).

To check that resources decrease the preferred tax rate of the poor, I implicitly differentiate the first-order condition with respect to \( R \), which, after some rearranging and substitution, gives:\(^9\)

\[ \frac{\partial \tau^p}{\partial R} = \frac{H'(\tau^p \bar{y})C''(R + H(\tau^p \bar{y}))\bar{y}}{[H''(\tau^p \bar{y})] \left[ \frac{y^p}{H'(\tau^p \bar{y})} \right] \bar{y} - [C''(R + H(\tau^p \bar{y}))(H'(\tau^p \bar{y}))\bar{y}]^2] < 0 \]  

(64)

Now consider the effect of resources on the incentives of the rich to mount a coup against democracy. A policy platform is now a vector, which has as its elements a tax rate and a transfer policy. Suppose the poor promise to implement a policy vector \((\tau^D, \bar{T})\), and the rich decide whether to mount a coup in periods with \( \varphi = \varphi^H \). As usual, we want to know

\(^8\)The first-order condition says \( H_r(\tau^i \bar{y})[1 - C'(R + H(\tau^i \bar{y}))\bar{y}] = y^i \), so when the right-hand side of this expression increases, the left-hand side must increase as well. By concavity, \( H_r(\tau^i \bar{y}) \) is decreasing in \( \tau \), so lowering \( \tau \) increases \( H_r \). By the convexity of \( C', C'(R + H(\tau^i \bar{y}))\bar{y} \) is increasing in \( \tau \), so \( [1 - C''(R + H(\tau^i \bar{y}))\bar{y}] \) is decreasing in \( \tau \). Thus, decreasing \( \tau \) increases both \( H_r(\tau^i \bar{y}) \) and \( [1 - C'(R + H(\tau^i \bar{y}))\bar{y}] \), as required.

\(^9\)The numerator of equation (64) is clearly positive (by \( H_r > 0 \) and \( C' > 0 \)), while the denominator is clearly negative (by \( H_{\tau r} < 0 \), \( H_r > 0 \), and \( C' > 0 \)). Therefore, \( \frac{\partial \tau^p}{\partial R} < 0 \).
the critical coup cost at which the rich are indifferent between a coup and no coup when the poor play a strategy of setting policy at the ideal point of the rich in "high" periods. For any coup cost below this threshold, the poor will not be able to avoid a coup in any democratic period in which \( \varphi = \varphi^H \).

The critical coup cost will be given by:

\[
\varphi^{H^*} = \frac{\beta(1 - p)\left[(1 - \tau^p)y^r + H(\tau\bar{y}) + R - C(H(\tau\bar{y}) + R) - (1 - \tau^p)y^r\right]}{(1 - \beta(1 - q))}
\]

where \((1 - \tau^p)y^r + H(\tau\bar{y}) + R - C(H(\tau\bar{y}) + R)\) is the utility of the rich at their ideal point and \((1 - \tau^p)y^r\) is the utility of the rich at the ideal point of the poor (since any unconstrained optimum for the poor will involve zero transfers to the rich).

Using the envelope theorem, we then have:

\[
\frac{\partial \varphi^*}{\partial R} = \frac{\beta(1 - p)}{(1 - \beta(1 - q))}\left[1 - C'(R + H(\tau\bar{y})) + \frac{\partial \tau^p}{\partial R}y^r\right]
\]

The first term inside the brackets on the right-hand side of equation (66) is positive (specifically, it is equal to one). It represents the marginal opportunity cost to the rich of not staging a coup. Since the optimal policy of the poor gives zero transfers to the rich, the marginal opportunity cost of a one-unit increase in \( R \) simply equals one unit of the resource rent. After staging a coup, the rich could transfer the resource rent directly to themselves, so resources can increase the incentives of the rich to stage a coup.

However, the final two terms of equation (66) are both negative. First, if the rich get zero transfers, they also do not pay the deadweight costs of transferring resource rents to themselves. Second, by equation (64), \( \frac{\partial \tau^p}{\partial R} < 0 \). As above, when resource rents increase, the poor can commit to a lower level of redistribution, because resources decrease their preferred tax rate. As in Section 3, there is an endogenous response of redistributive tax policy to the increase in resource rents, and this is the source of the democratic effect of resource wealth.
6 References for Chapter Three


