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Petro Populism*

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Abstract

We aim to explain petro populism — the excessive use of oil revenues to buy political support. To reap the full gains of natural resource income politicians need to remain in office over time. Hence, even a purely rent-seeking incumbent who only cares about his own welfare, will want to provide voters with goods and services if it promotes his probability of remaining in office. While this incentive benefits citizens under the rule of rent-seekers, it also has the adverse effect of motivating benevolent policymakers to short-term overprovision of goods and services. In equilibrium politicians of all types indulge in excessive resource extraction, while voters reward policies they realize cannot be sustained over time. Our model explains how resource wealth may generate political competition that reduces the tenability of equilibrium policies.

Keywords: resource curse, political economy.

JEL: D72, O13, Q33

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1 Introduction

Much anecdotal evidence and an increasing number of careful empirical studies argue that economies rich in natural resource tend to save too little of their resource income. Estimates by the World Bank (2006) and van der Ploeg (2011) show that countries with a high share of natural resource rents in gross national income (GNI) typically have lower, and often negative, genuine saving rates.[1] A main explanation of this pattern is that politicians in resource-rich countries use resource revenues to secure political support and hold on to their power. Smith (2004), Cuaresma, Oberhofer and Raschky (2011), and Andersen and Aslaksen (2011) find that political leaders in oil rich countries stay longer in office. Monteiro and Ferraz (2010) find the same for municipalities with oil windfalls in Brazil. Goldberg, Wibbels and Mvukiyehe (2008) argue that in the United States officials in states with mineral wealth are able to buy public support and increase their vote share. They conclude that "politicians in resource-rich states have shown considerable skill in using mineral wealth to their advantage" (p. 495). Accounts of policy in various resource rich countries by political analysts (e.g., Parenti 2005; Looney 2007) and in the news media (e.g., Lapper 2006; Foroohar 2009) commonly refer to such policies as *petro populism*.

In this paper, we analyze and aim to explain the phenomenon of petro populism. We define it as follows:

Definition: *Petro populism is the economically excessive use of natural resource revenues to buy political support.*

The concept of petro populism was coined by Parenti (2005) to describe the regime and policy of Venezuela's Hugo Chávez. Parenti vividly describes how Chávez pledged *sembrar el petróleo* — to sow the oil. According to data from the IMF (2011), in Venezuela government spending as a share of GDP increased by almost 10 percentage points between 2000 and 2010, with the budget deficit averaging 1.5 percent of GDP despite a historically high oil price for much of the decade. The World Bank (2006) calculated Venezuela's genuine saving rate at the start of the decade as -2.7 percent of GNI. Commentators both inside and outside of Venezuela have pointed out that Chávez's policies are overly dependent on high oil prices, and therefore seem unsustainable (Parenti 2005; Lapper 2006). Yet he has won numerous presidential elections and national ballots over the last 14 years.[2]

Other politicians commonly associated with petro populism include Mahmoud Ahmadinejad in Iran and Vladimir Putin in Russia. Looney (2007) explains how before Iran's 2005 presidential

[1] Genuine saving is traditional net saving (aggregate saving less capital depreciation), plus spending on education to capture change in human wealth, minus damages of stock pollutants, *minus the value of net depletion of natural resources*. This definition is taken from van der Ploeg (2011) and is based on Hamilton and Clements (1999).

[2] The only exception is the 2007 referendum to abolish term limits, although this was again voted over in the 2009 referendum and this time Chávez got it his way.

election Ahmadinejad promised to "put the oil money on everyone's dinner table," and argues that it contributed greatly to him winning the election. Despite a genuine saving rate of −11.5 percent of GNI in 2000 (World Bank 2006), Iran's government expenditures increased by 27 percent during Ahmadinejad's first year in office, with observers arguing that his policies were designed to boost popular support. During Ahmadinejad's first term, the head of Iran's central bank resigned, and publicly accused the president of plundering Iran's sovereign wealth fund (Foroohar 2009).

Under Putin, Russia's economic policy has been compared to those of Chávez and Ahmadinejad. Foroohar (2009) refers to Putin as a "Petro-Czar" and argues that he built his popularity on oil-fueled public spending. While Russia reduced its sovereign debt from 70 percent to 10 percent of GDP during Putin's first two presidential terms, the government simultaneously promised dramatic rises in budget spending on pensions, wages for state employees, and the military. In the aftermath of Putin's March 2012 election victory, the American bank Citigroup calculated that the price of oil much reach and sustain $150 per barrel for Putin to be able to fulfill his campaign promises. Analysts of the Russian economy expressed concern that, even if the government can fulfill its promises, too little of the oil revenues will remain for the country's sovereign wealth fund.[3] The attempts of using oil revenues to secure political support is thus seen as a cause of excessive spending.

These examples may lead to the conjecture that petro populism is confined to weakly institutionalized regimes, but we would argue otherwise. An illustrative case in point is Norway, whose oil management policy is often put forward as a success story. Yet this success has occurred against the backdrop of the right-wing populist *Progress Party* rising to 20-30 percent support in opinion polls by running on an economic platform of tax cuts *and* higher government spending. For example, Wiedswang (2011) describes the rise of the Progress Party in these terms, and writes (our translation from Norwegian):

> The latest sharp increase in support of the Progress Party started in the 1990's, almost in parallel with the growth of the Oil Fund [Norway's sovereign wealth fund]. The party's solution to nearly all problems has been to spend oil revenues; it became more petro populist than classical right-wing populist .[4]

While the Progress Party has never held office at the national level, our theory makes clear that petro populist policies do not require that petro populists be in power. Rather, it can be the result of political competition from such candidates.[5]

[3] *New York Times*, March 17, 2012.

[4] *Dagens Næringsliv*, June 10, 2011.

[5] Partly as a response to populist pressure, the Norwegian government implemented a fiscal rule for oil revenue spending in 2001. The rule is generally regarded as a good example for other resource-rich countries, but as argued by Harding and van der Ploeg (2009) it does not necessarily provide for sufficient public savings to cover

A key assumption in our theory is that it takes time to reap the full financial gains of petroleum resources. Decisions about extraction rates are decisions about flow variables and, for obvious moral hazard reasons after the renationalizations of petroleum ownership in the 1970s, selling the property rights to oil fields would tend to yield a low price compared to the present value of future oil income.[6] By implication, gaining political influence *over time* is more valuable in oil abundant countries because holding political power in the future is necessary to reap the full benefits of oil revenues.

The core question of our analysis is how systematic overextraction of natural resources can stimulate popular support. Of course, one answer could be that citizens mistakenly perceive high public spending as strong performance by the government, and do not realize it might be financed by overextracting natural resources. Yet given the considerable attention to populism and excessive resource extraction in the popular press, such an explanation seems simplistic; voters are likely to be aware of these practices. We therefore propose a political economy theory of petro populism where, in equilibrium, voters are fully aware that an excessive use of oil revenues is taking place, but still reward it. To our knowledge, this is the first study that attempts to apply political economy insights to show how excessive extraction of natural resources creates popular political support.

Although the connection between natural resource income and populism is novel, our paper is related to a number of literatures. There is a large anecdotal literature on populism, but few formal models of this phenomenon. The recent paper by Acemoglu, Egorov and Sonin (2011) represents the main exception and serves as an inspiration for our study.[7] They study left-wing populism in a setting where a rich elite has interests that are at odds with the majority of the population, and show that even moderate politicians choose a policy to the left of the median voter as a way of signaling that they are not right-wing. A bias in terms of leftist policies is preferred by the median voter because the utility loss before the election increases the probability that the politician is not right-wing and thus yields higher expected future utility. Acemoglu, Egorov and Sonin (2011) do not discuss resource extraction, so our paper can be seen as an application and extension of their methodology to a setting where policy has dynamic effects. Another difference is that populism in their model involves lowering voters' utility before the election, while in our model populist policies entail a short-term utility gain for voters.

Our paper is also related to the equilibrium political business cycle literature, pioneered by Rogoff and Sibert (1988) and Rogoff (1990), in which good (competent) politicians might use fiscal policy before an election to signal their type to voters. However, within this tradition

future costs of Norway's aging population. It should also be noted that not a single *krone* was set aside in the Oil Fund until 1996, i.e., after Norway had been an oil producer for 25 years.

[6] Today, with the exception of the United States, subsoil petroleum is public property in all countries.

[7] Sachs (1989) analyzes a "populist cycle," where high inequality leads to policies that make all voters worse off. Populism in Sachs's model depends on shortsighted voters, whereas we have forward-looking voters.

no papers study resource extraction as a means to finance public spending. Another difference is that in equilibrium voters in Rogoff and Sibert (1988) and Rogoff (1990) are perfectly able to discern if a politician is good or bad. Therefore, in these models, bad politicians are never reelected, whereas this may well happen in our theory.

The resource curse literature provides a third link with our paper. Existing political economy theories of the resource curse predict that increased duration of political regimes fosters a more efficient extraction path, see, e.g., Robinson, Torvik and Verdier (2006). Our theory demonstrates how the causality may run in the reverse direction, and also with an opposite sign of the correlation: a more inefficient extraction path may increase regime duration. Despite a large literature on the political economy of the resource curse,[8] we are not aware of other papers that investigate how the efficiency of the extraction path affects political support.

Finally, our paper relates to studies of politically motivated debt accumulation, such as Persson and Svensson (1989) and Alesina and Tabellini (1990). Besides the different topic under investigation, our theory differs from these in the direction of causality between popularity and policy: in Persson and Svensson (1989) and Alesina and Tabellini (1990) election outcomes are exogenous drivers of policy (debt accumulation), while in the environment we consider election outcomes are endogenously determined by policy (resource extraction).

The rest of the paper is organized as follows. In Section 2 we present our model, and in Section 3 we derive the equilibrium, discuss when petro populism applies, and what forms it take. We also discuss some comparative statics of the model. In Section 4 we conclude. The Appendix contains lemmas and proofs of propositions.

2 Basic Model

In this section we describe our model of petro populism.

2.1 Citizens, Policies, and Politicians

We consider a two-period economy with a continuum of citizens with measure normalized to 1. Citizens' period t utility U_t, is determined by a "felicity" function u defined over publicly provided goods and services and a stochastic component that affects the utility of all citizens in an identical manner. For simplicity, we assume that period utility is additive so that

$$U_t = u\left(G_t\right) + z_t, \quad t = 1, 2,$$

where G_t is period t provision of goods and z_t is the random component of utility. This formulation captures the notion that the mapping from public goods provison to voter utility may

[8] For recent surveys of the resource curse literature, see Deacon (2011), Frankel (2011), and van der Ploeg (2011).

be affected by random factors outside the control of politicans. In particular, this implies that voters cannot use their utility to perfectly observe the amount of resources used for public goods provision. The stochastic component of period utility is distributed on the real line with support $(-\infty, \infty)$, has cumulative density function $H(z)$, and probability density function $h(z)$. Moreover, we assume that $h(z)$ is symmetric around zero, everywhere differentiable, satisfies $h'(z) < 0$ for all $z > 0$ and $h'(z) > 0$ for all $z < 0$.[9] The felicity function satisfies $u' > 0$, $u'' < 0$, and $u(0) = 0$. To ensure internal solutions we also impose $\lim_{G \to 0} u'(G) = \infty$.

The government extracts natural resources $e_t \geq 0$ to finance G_t and rents R_t which are pocketed by the incumbent. The government budget constraint reads

$$G_t + R_t = f(e_t), \ t = 1, 2, \tag{1}$$

where $f(.)$ is the natural resource revenue function. We assume that period t resource revenues increase at a diminishing rate with extraction, $f' > 0$, $f'' \leq 0$. The latter property is standard and could be due to, e.g., increasing marginal costs in resource extraction. Importantly, $f'' \leq 0$ also captures the key characteristic of resource rich countries discussed in the Introduction: it takes time to reap revenues from natural resources. We also assume that $f(0) = 0$. There is a given amount $\overline{e}$ of resources available, implying that the natural resource constraint is

$$e_1 + e_2 \leq \overline{e}. \tag{2}$$

There are two types of politicians in the economy; a benevolent type, denoted by b, and a rent-seeking type, denoted by r. Benevolent politicians have the same preferences as citizens, while rent-seeking politicians care only about the rents that they appropriate for themselves and have period utility given by $u(R_t)$.[10] Benevolent types constitute a fraction p of the pool of political candidates, while the remaining fraction $1 - p$ are r types. Citizens are aware of this distribution, but they are not able to observe a politician's type other than potentially through the actions of the incumbent. Moreover, citizens do not see the amount of rents appropriated by the politician in office and, by implication, not the amount of resources left untapped for future use.

In period 1, an incumbent of type $j = \{b, r\}$ holds office, chooses resource extraction e_1^j, and allocates the resource income between goods provision and rents. At the end of the first period,

[9] These assumptions would, for instance, be satisfied if $z \sim N(0, \sigma^2)$.

[10] Note that in our model appropriating rents is not confined to politicians transferring resource income to their own bank accounts. Rather, rents include spending revenues on any purpose that the representative citizen does not care about. Examples would include enriching cronies and insiders as long as this group constitutes a negligible fraction of the electorate.

To illustrate how this might play out in practice, consider the following claim made by Putin's critics (as reported by Kramer): "insiders benefited [from Russia's natural resource policy]..., leading to the rise of a new class of ultrawealthy bureaucrats among the security service officials and former St. Petersburg city government functionaries who moved to Moscow with Mr. Putin a decade ago" (*New York Times*, September 25, 2011).

there is an election in which voters decide to either reelect the incumbent or allow a challenger of unknown type to take power. The politician with the highest number of votes has the right to decide policy after the election. The reelection probability of the incumbent, to be determined in equilibrium, is denoted by π.

Before the election voters know their utility from past policies U_1, but not the exact amount G_1 of past provision of goods by the government.[11] Hence, voters use their utility to infer the nature of period 1 policy, and thereby to form a judgment about the incumbent's type. Although voters do not immediately know the exact amount that the incumbent has spent on goods provision, they do not make systematic mistakes when estimating this amount. Moreover, our assumptions about the sign of $h'(z)$ ensures that voters are more likely to make small rather than large errors when estimating the previous provision of public goods. The policy that is implemented is more likely to lie close to rather than distant from estimated policy; the voters' estimate is informative.

Using the notation above and denoting by G_t^j the goods provision by a politician of type $j = \{b, r\}$ in period t, we can express the expected lifetime utility of a benevolent incumbent as

$$V^b = u(G_1^b) + z_1 + \pi u(G_2^b) + (1-\pi)\, pu(G_2^b) + (1-\pi)\,(1-p)\, u\,(G_2^r) + z_2. \tag{3}$$

The corresponding expected lifetime utility of a rent-seeking incumbent is given by

$$V^r = u\,(R_1) + \pi u\,(R_2)\,. \tag{4}$$

Note that to simplify notation we assume rent-seekers are unaffected by z_1 and z_2. This assumption has no effect on our results.

2.2 Timing of Events and Definition of Equilibrium

The precise timing of events is as follows:

1. The incumbent decides policy $\{G_1, e_1, R_1\}$.
2. Citizens observe and enjoy $U_1 = u\,(G_1) + z_1$, and use this to update their prior beliefs about the incumbent's type.
3. The election takes place and each citizen supports the incumbent or the opposing candidate.
4. The politician with a majority of votes decides policy $\{G_2, e_2, R_2\}$.

[11] At this point, there is a conceptual difference between Acemoglu, Egorov and Sonin (2011) populism model and our approach. In their model, voters have deterministic utility defined over policy, but voters have imperfect information about this policy. Thus, in Acemoglu, Egorov and Sonin, citizens are uncertain about their own utility when they vote. By contrast, in our model voters know their utility, but they cannot fully determine what part of it was due to deliberately implemented policy and what part was caused by random impulses, respectively.

5. Citizens observe and enjoy $U_2 = u(G_2) + z_2$.

Since we have a dynamic game of incomplete information, the beliefs of players need to be specified. As usual we allow voters to use Bayes' rule to update all relevant subjective probabilities; thus, we look for perfect Bayesian equilibria (in pure strategies). Given that we have many voters, the set of perfect Bayesian equilibria involves a large number of equilibria in which voters use weakly dominated strategies, such as voting for politicians known to be rent-seekers because a majority of voters are doing so. To rule out such unreasonable equilibria we focus on perfect Bayesian equilibria in undominated strategies. This simply implies that citizens vote for the politician that will give them the highest expected utility should their vote turn out to be decisive.[12]

3 Analysis

We next give a brief characterization of the first best situation in our model, and then solve the model by backwards induction.

3.1 First-Best Solution

From the citizens' perspective the first-best solution entails zero rents, $G_t = f(e_t)$, $t = 1, 2$, and an extraction path that solves

$$\max_{e_1, e_2} E\left\{u(f(e_1)) + z_1 + u(f(e_2)) + z_2\right\} \tag{5}$$

subject to (2) holding with equality. Inserting $e_2 = \overline{e} - e_1$ and using the property that all uncertainty relates to the random component of utility, the first-order condition reads

$$u'(f(e_1))\, f'(e_1) = u'(f(\overline{e} - e_1)) f'(\overline{e} - e_1). \tag{6}$$

This is a conventional optimality condition stating that the marginal rate of substitution between consumption in period 1 and 2 should equal the marginal rate of transformation between resource revenues in these two periods. We denote by (e^{fb}, G^{fb}) the first best extraction rate and the associated goods provision as implied by equation (6). The assumptions on the functional forms imposed above imply $e^{fb} \in (0, \overline{e})$.

3.2 Period 2: Behavior of Politicians

The election winner makes the only decision in period 2: how to spend the remaining resource income. Characterizing this choice is straightforward. Let an asterisk denote the equilibrium

[12] We also adopt the convention that if voters are indifferent, they vote for the incumbent. This has no bearing on our results and occurs with probability zero in equilibrium.

value of a designated variable, so that G_2^{j*} is the equilibrium goods provision of a type $j = \{b, r\}$ politician in period 2. During this period, rent-seeking politicians use all resources to obtain personal rents, while benevolent politicians spend remaining resource income on goods provision:

$$G_2^{r*} = 0,\ R_2^{r*} = f\left(\overline{e} - e_1\right)$$

$$G_2^{b*} = f\left(\overline{e} - e_1\right),\ R_2^{b*} = 0.$$

3.3 Period 1: Behavior of Voters

Having experienced U_1, each voter uses Bayes' rule to form a belief $\widetilde{p}$ about the probability that the incumbent is benevolent. Based on this updated probability, each voter decides whether to support the incumbent politician or the opposition candidate.

The incumbent is reelected if the voters' expected period 2 utility is (weakly) higher with the incumbent in office rather than an opposition candidate. The only information voters have about the opposition candidate is that she is benevolent with probability p. Since rent-seeking politicians will provide zero expected period 2 utility to voters, the incumbent is reelected with certainty when $\widetilde{p} \geq p$. If $\widetilde{p} < p$ the incumbent is ousted from office.

We denote voters' beliefs about spending policies by $\widetilde{G}_1^b$ and $\widetilde{G}_1^r$. A voter who has experienced U_1 will assign the following value to the probability that the incumbent is benevolent:

$$\widetilde{p} = \frac{ph(U_1 - u(\widetilde{G}_1^b))}{ph(U_1 - u(\widetilde{G}_1^b)) + (1-p)\,h(U_1 - u(\widetilde{G}_1^r))}. \tag{7}$$

Equation (7) implies that $\widetilde{p} \geq p$ if and only if $h(U_1 - u(\widetilde{G}_1^b)) \geq h(U_1 - u(\widetilde{G}_1^r))$. For now assume that $\widetilde{G}_1^b > \widetilde{G}_1^r$; voters believe that benevolent politicians provide more goods than rent-seeking politicians. (In Proposition 1 below, we show that this belief indeed is correct in equilibrium.) Since z is symmetric around zero, it follows that $\widetilde{p} \geq p$ if

$$U_1 \geq \frac{u(\widetilde{G}_1^b) + u(\widetilde{G}_1^r)}{2}. \tag{8}$$

Because $\widetilde{G}_1^b > \widetilde{G}_1^r$, equation (8) is the necessary and sufficient condition for the incumbent to be reelected.[13] Given (8), the probability of any incumbent being reelected by offering a spending

[13] Equation (8) holds because $h\left(U_1 - u(\widetilde{G}_1^b)\right) \geq h\left(U_1 - u(\widetilde{G}_1^r)\right) \Leftrightarrow |U_1 - u(\widetilde{G}_1^r)| \geq |U_1 - u(\widetilde{G}_1^b)|$, which together with $\widetilde{G}_1^b > \widetilde{G}_1^r$ implies $U_1 - u(\widetilde{G}_1^r) > 0$, and therefore $U_1 - u(\widetilde{G}_1^r) > |U_1 - u(\widetilde{G}_1^b)|$. Because $\widetilde{G}_1^b > \widetilde{G}_1^r$, the latter holds always if $U_1 - u(\widetilde{G}_1^b) \geq 0$, and requires $U_1 \geq \frac{u(\widetilde{G}_1^b) + u(\widetilde{G}_1^r)}{2}$ if $U_1 - u(\widetilde{G}_1^b) < 0$.

policy G is

$$\begin{aligned}\pi(G) &= \Pr\left(u(G)+z \geq \frac{u(\widetilde{G}_1^b)+u(\widetilde{G}_1^r)}{2}\right)\\ &= 1-H\left(\frac{u(\widetilde{G}_1^b)+u(\widetilde{G}_1^r)}{2}-u(G)\right)\\ &= H\left(u(G)-\frac{u(\widetilde{G}_1^b)+u(\widetilde{G}_1^r)}{2}\right), \end{aligned} \tag{9}$$

where the last equality follows from the assumption that $h(z)$ is symmetric around zero.

3.4 Period 1: Behavior of the Incumbent

We next investigate the policy choices of each type of politician in period 1, and thereafter bring these choices together to analyze the equilibrium.

A Benevolent Incumbent

Let us denote the period 1 extraction policy of a benevolent politician by e_1^b. From the utility function (3) and the budget constraint (1), it follows directly that a benevolent incumbent will always choose zero rents and $G_1^b = f\left(e_1^b\right)$. By the resource constraint given in equation (2), b's policy problem thus reduces to choosing extraction only. Using that $E(z_1) = E(z_2) = 0$, we can formally state the problem as

$$\max_{e_1^b} u(f(e_1^b)) + u(f(\overline{e}-e_1^b))[\pi(f(e_1^b)) + (1-\pi(f(e_1^b)))p]. \tag{10}$$

In equation (10) the first term is this politician's utility from publicly provided goods in period 1. The second term is the utility of the remaining resources being spent in period 2 on goods provision, multiplied by the probability that this will be the spending policy. Revenues from resources remaining in period 2 will be devoted to goods provision if either the b incumbent is reelected, which happens with probability $\pi(G_1^b) = \pi(f(e_1^b))$, or if she is replaced by another benevolent candidate, which happens with probability $(1-\pi(f(e_1)))p$.

The first-order condition for this problem is

$$\begin{aligned} u'(f(e_1^b))f'(e_1^b) &= [p+(1-p)\pi(f(e_1^b))]u'(f(\overline{e}-e_1^b))f'(\overline{e}-e_1^b) \\ &\quad -u(f(\overline{e}-e_1^b))(1-p)\,h\left(u(f(e_1^b))-\frac{u(\widetilde{G}_1^b)+u(\widetilde{G}_1^r)}{2}\right)u'(f(e_1^b))f'(e_1^b), \end{aligned} \tag{11}$$

where we have used that equation (9) implies $\pi'(G) = h\left(u(G)-\frac{u(\widetilde{G}_1^b)+u(\widetilde{G}_1^r)}{2}\right)u'(G)$. Lemma 1 in the Appendix establishes that the optimal extraction level of a benevolent incumbent is indeed interior, $e_1^b \in (0,\overline{e})$. The extraction policy of a benevolent politician is therefore characterized by equation (11), and her lifetime utility is locally concave at this point.

A Rent-Seeking Incumbent

Denote the period 1 extraction policy of a rent-seeker by e_1^r. By substituting from equation (2) in equation (4), we can express the period 1 policy problem of a rent-seeking incumbent as

$$\max_{G_1^r, e_1^r} \left\{ u\left(f\left(e_1^r\right) - G_1^r\right) + u\left(f\left(\overline{e} - e_1^r\right)\right) \pi\left(G_1^r\right) \right\}. \tag{12}$$

The first term in the maximand of equation (12) shows that rents enjoyed in period 1 are extraction income net of goods provision. The second term is the r-incumbent's utility in period 2 when all remaining resource income is spent on rents, multiplied by the probability of reelection. This reflects that a rent-seeking incumbent derives utility in period 2 only if reelected. The first-order conditions for this problem with respect to e_1^r and G_1^r are

$$u'(f\left(e_1^r\right) - G_1^r) f'(e_1^r) = \pi(G_1^r) u'(f(\overline{e} - e_1^r)) f'(\overline{e} - e_1^r) \tag{13}$$

and

$$u(f\left(\overline{e} - e_1^r\right)) \left[h\left(u(G_1^r) - \frac{u(\widetilde{G}_1^b) + u(\widetilde{G}_1^r)}{2} \right) \right] u'(G_1^r) = u'(f(e_1^r) - G_1^r), \tag{14}$$

respectively. Lemma 2 in the Appendix establishes that a rent-seeker's optimal policy will consist of interior values, $e_1^r \in (0, \overline{e})$ and $G_1^r \in (0, f(\overline{e}))$. This policy is therefore characterized by equations (13) and (14), and the r-incumbent's lifetime utility is locally concave at this point.

3.5 Equilibrium

In a perfect Bayesian equilibrium, voters' beliefs are consistent with politicians' choices, and these choices are in turn consistent with the first order conditions given in equations (11), (13), and (14). Hence, in equilibrium, $G_1^j = \widetilde{G}_1^j = G_1^{j*}$ and $e_1^j = \widetilde{e}_1^j = e_1^{j*}$, for $j = \{r, b\}$. The analysis above tells us that the period 1 equilibrium policy vector for a benevolent politician is $\{G_1^{b*}, e_1^{b*}, 0\}$, while it is $\{G_1^{r*}, e_1^{r*}, f(e_1^{r*}) - G_1^{r*}\}$ for a rent-seeker.

Let us now investigate the equilibrium more closely. We first establish that in period 1 rent-seeking politicians always provide less goods than benevolent types, which validates that the criterion for reelection is equation (8) as stated earlier.

Proposition 1 *Denote the equilibrium provision of goods of a benevolent politician in period* 1 *by* G_1^{b*} *and that of a rent-seeking politician by* G_1^{r*}. *Then:*

1. $G_1^{b*} > G_1^{r*}$, *i.e., benevolent politicians always provide more goods than rent-seeking politicians;*

2. *The incumbent is reelected if and only if* $u_1 \geq \frac{u\left(G_1^{b*}\right) + u\left(G_1^{r*}\right)}{2}$.

Proof. See the Appendix. ■

By equation (9), the *equilibrium* reelection probabilities of benevolent and rent-seeking politicians are

$$\pi^{b*} = H\left(\frac{u\left(G_1^{b*}\right) - u\left(G_1^{r*}\right)}{2}\right)$$

and

$$\pi^{r*} = H\left(\frac{u\left(G_1^{r*}\right) - u\left(G_1^{b*}\right)}{2}\right),$$

respectively. Observe that Proposition 1 and the symmetry assumption on $h(z)$ together imply that $\pi^{b*} > \frac{1}{2}$ and that $\pi^{r*} = 1 - \pi^{b*} < \frac{1}{2}$. In equilibrium, a benevolent (rent-seeking) incumbent has a higher (lower) than 50 percent reelection probability, and the reelection probabilities of benevolent and rent-seeking politicians sum to one.

Using these results in equations (11), (13), and (14), we can now state the optimality conditions that must hold in equilibrium. By equation (11), the equilibrium policy of benevolent politicians is characterized by

$$u'(f(e_1^{b*}))f'(e_1^{b*}) = u'(f(\overline{e} - e_1^{b*}))f'(\overline{e} - e_1^{b*})\Omega, \tag{15}$$

where

$$\Omega \equiv \frac{p + (1-p)\pi^{b*}}{1 + u(f(\overline{e} - e_1^{b*}))(1-p)h\left(\frac{u\left(G_1^{b*}\right) - u\left(G_1^{r*}\right)}{2}\right)} < 1.$$

Similarly, the equilibrium policy of rent-seeking politicians is described by

$$u'(f(e_1^{r*}) - G_1^{r*})f'(e_1^{r*}) = u'(f(\overline{e} - e_1^{r*}))f'(\overline{e} - e_1^{r*})\pi^{r*}, \tag{16}$$

and

$$u'(f\left(e_1^{r*}\right) - G_1^{r*}) = u(f(\overline{e} - e_1^{r*}))h\left(\frac{u(G_1^{b*}) - u(G_1^{r*})}{2}\right)u'(G_1^{r*}). \tag{17}$$

In equation (17), we have used that $h\left(z\right) = h\left(-z\right)$ since h is symmetric around $z = 0$.

We now turn to the existence and uniqueness of equilibrium. Figure 1 provides the intuition behind these properties, while Proposition 4 in the Appendix gives the precise conditions.

Mathematically, equation (15) characterizes the equilibrium policy of benevolent politicians, G_1^{b*}, when voters believe that rent-seeking politicians would choose some policy $\widetilde{G}_1^r$, and $\widetilde{G}_1^r = G_1^{r*}$. The proof of Proposition 4 (in the Appendix) shows that the relationship between G_1^{b*} and $\widetilde{G}_1^r$ is monotonic with a positive slope, as illustrated by the line $G_1^{b*}(\widetilde{G}_1^r)$ in Figure 1. Points A and C in Figure 1 are $G_1^{b*}(0)$ and $G_1^{b*}(G_1^{b*})$, respectively. The proof of Proposition 4 shows that point A is below $f(\overline{e})$ on the vertical axis. Equations (16) and (17) determine the rent-seeking politicans' choice G_1^{r*} when benevolent politicians are believed to pursue $\widetilde{G}_1^b$, and $\widetilde{G}_1^b = G_1^{b*}$. Figure 1 plots this relationship, labeled $G_1^{r*}(\widetilde{G}_1^b)$, as downward sloping. Points B and D in

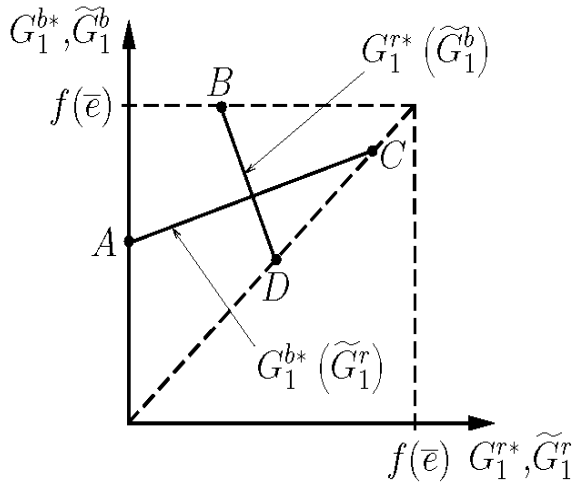

Figure 1: ***Political Equilibrium.*** *$G_1^{r*}\left(\widetilde{G}_1^b\right)$ is rent-seekers' optimal provision of public goods in period 1 consistent with individual optimality conditions and voter beliefs, $G_1^r = \widetilde{G}_1^r = G_1^{r*}$, for given voter beliefs about benevolent policy, $\widetilde{G}_1^b$. $G_1^{b*}\left(\widetilde{G}_1^r\right)$ is benevolent incumbents' optimal provision of public goods in period 1 consistent with individual optimality conditions and voter beliefs, $G_1^b = \widetilde{G}_1^b = G_1^{b*}$, for given voter beliefs about rent-seeker policy, $\widetilde{G}_1^r$. Point A is $G_1^{b*}(0)$, point B is $G_1^{r*}(0)$, point C is $G_1^{b*}\left(G_1^{b*}\right)$ and point D is $G_1^{r*}(G_1^{r*})$. The dashed upward sloping curve is the 45 degree line.*

Figure 1 are $G_1^{r*}(0)$ and $G_1^{r*}(G_1^{r*})$, respectively. We show in the Appendix that point B is located in the interior of the horizontal dashed line in Figure 1. Then, a sufficient condition for existence of equilibrium is that point C is located to the upper-right of point D. Proposition 4 shows that this condition is fulfilled if the fraction benevolent types among political candidates, p, is smaller than a critical value $\widehat{p} > 0$. It is important to note that this critical value may well be larger than one, in which case an equilibrium always exists. A political equilibrium is at the intersection between the two curves. Since $G_1^{b*}(\widetilde{G}_1^r)$ is upward sloping, the equilibrium is unique if $G_1^{r*}(\widetilde{G}_1^b)$ slopes down, or more generally if $G_1^{r*\prime}(\widetilde{G}_1^b) < G_1^{b*\prime}(\widetilde{G}_1^r)$. We give analytical conditions for uniqueness in the appendix.

Overextraction

By comparing equation (15) to the first-best solution in equation (6), it is easy to see that $e_1^{b*} > e^{fb}$: in equilibrium, a benevolent incumbent will extract more natural resources than in the first-best situation. There are two influences driving this result. The first can be labeled *strategic discounting*, and is identified by the numerator in the definition of Ω in equation (15). This numerator is smaller than one, reflecting that benevolent politicians discount the marginal utility of resources left for the future by $\pi^{b*} < 1$. The risk that the benevolent incumbent may be replaced by a rent-seeker shifts the extraction path toward the present because the incumbent cannot be certain that future resources will be spent on goods provision. The second reason why a benevolent incumbent engage in overextraction is that it *increases the reelection probability* as identified by the denominator in the definition of Ω. The term

$$u(f(\overline{e} - e_1^{b*}))(1-p)h\left(\frac{u\left(G_1^{b*}\right) - u\left(G_1^{r*}\right)}{2}\right)$$

in the denominator is the marginal effect of period 1 extraction on the reelection probability. By Proposition 1, this is positive, and hence the total sum of the denominator is larger than one. By increasing goods provision in period 1 above the first-best level, financed by excessive resource extraction, benevolent politicians increase their reelection probability and thereby the likelihood that future resource income will be used to finance G.

Turning to rent-seeking types, we can compare equation (16) to equation (6) and affirm that such politicians will also overextract in equilibrium, $e_1^{r*} > e^{fb}$. To understand the intuition behind this result, assume for a moment that, counterfactually, $G_1^{r*} = 0$. In this case, (16) would read

$$u'(f(e_1^{r*}))f'(e_1^{r*}) = u'(f(\overline{e} - e_1^{r*}))f'(\overline{e} - e_1^{r*})\pi^{r*},$$

which differs from (6) only by the equilibrium reelection probability, $\pi^{r*} < 1$, on the right hand-side. Hence, strategic discounting also serves as an incentive to shift resource extraction towards period 1 for rent-seekers. Recall that rent-seekers will in fact choose $G_1^{r*} > 0$ (this follows from

Lemma 2). Equation (17) shows that the reason is this policy's positive effect on the reelection probability. The marginal effect of an increase in goods provision on rent-seekers' equilibrium reelection probability is

$$\pi'(G_1^{r*}) = h\left(\frac{u(G_1^{b*}) - u(G_1^{r*})}{2}\right) u'(G_1^{r*}) > 0,$$

where we recognize the term on the right hand-side of the equality from equation (17). Because $\lim_{G_1^{r*}\to 0} u'(G_1^{r*}) = \infty$, the effect of goods provision on the reelection probability becomes infinitely strong when G approaches zero. A rent-seeker will choose to spend some revenues on goods provision for purely opportunistic reasons; that is, to increase the likelihood of being in position to grab rents in the future. Clearly, this contributes to excessive resource extraction as this provision of goods is be financed by resource revenues.

The incentives for overextraction from strategic discounting and endogenous popularity are common to benevolent and rent-seeking types. For the latter kind of politician there is also a third motive for excess extraction; *intertemporal smoothing of rents*. For a given extraction rate, a higher G (to boost the reelection probability) lowers rents in period 1. In order to smooth rents over time, r-types must therefore shift extraction towards period 1, an action that further contributes to overextraction. Analytically, this effect on extraction can be identified by comparing the left-hand sides of equations (16) to (6).

The following proposition summarizes our results on overextraction and other properties of the equilibrium:

Proposition 2 *In political equilibrium, the policy vectors of benevolent and rent-seeking politicians are* $\{G_1^{b*} > G^{fb}, e_1^{b*} \in (e^{fb}, \overline{e}), R_1^{b*} = 0\}$ *and* $\{G_1^{r*} > 0, e_1^{r*} \in (e^{fb}, \overline{e}), R_1^{r*} > 0\}$. *In particular, this implies that both types of politicians choose excessive resource extraction.*

Proof. See the Appendix. ■

This proposition shows that there is always excessive extraction of natural resources in equilibrium, independently of the incumbent type. There are two main mechanisms behind this result: electoral uncertainty and signaling through preelection policies.[14] Electoral uncertainty leads to excessive extraction because the incumbent might lose the election to a candidate with other preferences than her own. For a benevolent incumbent the electoral risk is that she might be replaced by a rent-seeker. From the perspective of a rent-seeking incumbent, the risk is that he may be replaced by any other candidate. In both cases, the response of period 1 policy is to increase the extraction and spending of resource revenues.[15]

[14] In addition, rent-seekers overextract because of intertemporal smoothing of private rents. As explained above, however, this is a consequence of their attempt to boost reelection chances by increasing G, i.e., because of their signalling policy.

[15] This mechanism resembles earlier models where politicians might choose inefficient, short-sighted policies in

The second reason for overextraction, preelection signaling, speaks directly to the phenomenon of petro populism. In the Introduction, we defined petro populism as the excessive use of resource revenues to buy political support. In our model this is exactly what both types of politicians attempt in period 1: by providing more goods than would be supplied with their ideal policy (which is the first-best level for a b incumbent and a zero supply for an incumbent of type r), politicians can improve their reelection prospects. Note, however, that the two kinds of politicians have contrasting underlying motivations for petro populist policies. In period 1, a benevolent incumbent spends an excessive amount of resource revenues *to signal her true type* to voters. A rent-seeking incumbent, on the other hand, spends more on goods provision than he prefers in period 1 *to conceal his true type*. Both types of incentives lead to overextraction of natural resources.

To our knowledge, the political incentives for the excessive extraction of natural resources just proposed is new to the literature. We note that these incentives imply that the correlation between the (social) optimality of extraction/spending policies and political stability may be negative. Moreover, causality may well run from policy (in)efficiency to political stability. In our model, both types of politicians can increase their reelection probability by excessive resource extraction. Thus, there is a causal link from inefficient policy (excessive extraction and spending) to the incumbent's survival prospects, implying a negative correlation between political stability (less frequent changes of government) and the social optimality of the policy.

Proposition 2 establishes that both types of politicians overextract resources, but it does not address which type will extract more. The next result answers this question.

Proposition 3 *1. When almost all politicians are benevolent (i.e., when $p \to 1$), rent-seeking incumbents extract more natural resources in period 1 than benevolent incumbents, i.e., $e_1^{b*} < e_1^{r*}$.*

2. When $p \nrightarrow 1$, resource extraction by benevolent politicians may be lower or higher than extraction by rent-seeking politicians.

Proof. See the Appendix. ■

Intuitively, one might think that benevolent politicians will (over)extract less. After all, they are more likely to be reelected (because $G_1^{b*} > G_1^{r*}$), may be replaced by another benevolent type in case of an election loss ($p > 0$), and must finance goods provision only (whereas rent-seekers must finance both goods and rents). Compared to rent-seeking politicians, benevolent politicians thus have high expected future marginal utility of remaining resources and low current marginal

response to electoral uncertainty. Robinson, Torvik and Verdier (2006) show how politicians may overextract natural resources because they discount the future with the probability of winning the election. Likewise, in the seminal papers on excessive public debt accumulation by Persson and Svensson (1989) and Alesina and Tabellini (1990), inefficient public resource allocation over time occurs because incumbents and potential successors have different preferences.

utility of extraction. The first part of Proposition 3 shows that the intuition holds if the pool of political candidates is of very high quality, i.e., if $p \to 1$.

However, as reflected in the second part of Proposition 3, there is an additional, opposing effect in operation which may dominate if p is sufficiently low. To understand this, we note that early extraction is tempting for benevolent politicians, because extraction income provides utility to them both through goods provision *and* increased reelection probability. In contrast, rent-seeking politicians must decide whether to use period 1 resource income to increase their reelection probability by goods provision *or* to get higher utility through extracting higher rents. This effect implies that the marginal lifetime utility gain of spending extraction income today may be higher for benevolent politicians than for rent-seekers. (When $p \to 1$, the increased reelection probability due to period 1 spending is not valuable for a benevolent incumbent since she will (almost) surely be replaced by another benevolent politician should she lose the election). Early spending of resource income has a comparatively high payoff for benevolent politicians, who may therefore choose to extract even faster than rent-seekers.

A notable consequence of the above discussion is that benevolent candidates are especially prone to excess resource extraction in societies where politicians in general are likely to be rent-seekers, i.e., where p is low. In such societies, resource extraction will be particularly excessive if voters are "lucky" and have a benevolent incumbent in charge. The reason is that the presence of a largely rent-seeking opposition forces the benevolent candidate to short-term overprovision of goods, financed by excessive resource extraction, to prevent rent-seekers from coming into office. This phenomenon is petro populism.

Overbidding

The above discussion shows that benevolent politicians respond to increased public goods provision by rent-seeking candidates by increasing their own spending. Such competitive pressure on benign, well-intentioned politicians is the central reason for equilibrium petro populism.

There are two reasons why rent-seekers, by providing goods and services, motivate benevolent politicians to choose excessive extraction and spending in equilibrium. First, if rent-seekers provide more goods, voters find it harder to distinguish benevolent politicians from rent-seekers, leading to a lower reelection probability for a benevolent candidate. A lower reelection probability leads the benevolent incumbent to a higher (strategic) discounting of the future, and as a result she increases short-term goods provision and resource extraction. The second reason for benevolent overbidding is that the more goods rent-seekers provide in equilibrium, the more sensitive is benevolent candidate's reelection probability is to her own provision of goods. Mechanically, this follows from the assumption that $h(z)$ is single peaked at zero, which implies that in equilibrium $h'\left(\frac{u(G_1^{b*})-u(G_1^{r*})}{2}\right) < 0$. Intuitively, when the two types of politicians are expected to pursue similar spending policies, it is difficult to distinguish their types, and the

marginal effect of goods provision on their popularity is large.

4 Conclusion

In many countries with abundant natural resources, politicians seem to base their popularity on unsustainable depletion and spending policies, saving too little of their resource revenues. This paper has presented a framework that can explain this phenomenon. We have shown how rational, forward-looking voters reward excessive spending, as they are more likely to reelect politicians that pursue such policies. This equilibrium behavior of voters and politicians explains the occurence of petro populism: excessive levels of spending financed by short-term revenue streams obtained from selling non-renewable resources.

Even benevolent politicans, sharing preferences with the representative voter, choose to pursue petro populist policies. Facing political competition from rent-seeking candidates, benevolent politicans are motivated to pursue the type of "overbidding" that characterizes petro populism. Finally, our model predicts that higher spending of resource revenues improves the incumbent's prospects for political survival and causes lower political turnover.

Our model builds on asymmetric information between voters and politicans; voters can not perfectly observe policies. This is an assumption in our model, but in reality it would depend on, e.g., the degree of media freedom. In a setting where the freedom of the press is endogenous, rent-seeking politicans in resource abundant countries would have strong incentives to crack down on media freedom to more easily conceal their true type. In this respect it is interesting to note that Egorov, Guriev and Sonin (2009) find that media are less free in oil-rich economies.

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Appendix

Lemmas

The following two lemmas show that both types of politicians choose interior policies in period 1, and that their lifetime utility is concave at these choices.

Lemma 1 *(i) For any pair* $(\widetilde{G}_1^b, \widetilde{G}_1^r)$ *satisfying* $\widetilde{G}_1^b > \widetilde{G}_1^r$*, a benevolent incumbent will choose an interior extraction rate,* $0 < e_1^b < \overline{e}$*, given by the first-order condition (11). (ii) At this point the lifetime utility function of the b incumbent,* $V^b(e_1)$*, is concave:* $V^{b\prime\prime}\left(e_1^b\right) \leq 0$.

Proof. (i) The assumption of $u'(0) = \infty$ implies that $\lim_{e_1 \longrightarrow 0} V^{b\prime}(e_1) = \infty$ and, together with $\pi(f(e_1)) > 0$, that $\lim_{e_1 \longrightarrow \overline{e}} V^{b\prime}(e_1) = -\infty$. It follows immediately that b's optimal extraction is interior, $0 < e_1^b < \overline{e}$. (ii) Recall that the functions $u(G)$, $f(e_1)$ and $\pi(G)$ are continuous and differentiable. Since e_1^b is interior, these properties imply that $V^b(e_1)$ is locally concave at e_1^b. ■

Lemma 2 *(i) For any pair* $(\widetilde{G}_1^b, \widetilde{G}_1^r)$ *satisfying* $\widetilde{G}_1^b > \widetilde{G}_1^r$*, a rent-seeking incumbent will choose an interior extraction rate,* $0 < e_1^r < \overline{e}$*, given by the first-order condition (13), and an interior level of goods provision,* $0 < G_1^r < f(\overline{e})$*. (ii) At this point the lifetime utility function of the r incumbent* $V^r(e_1, G_1)$ *is concave:* $V_{ee}^{r\prime\prime}(e_1^r, G_1^r) \leq 0$*,* $V_{GG}^{r\prime\prime}(e_1^r, G_1^r) \leq 0$*,* $V_{ee}^{r\prime\prime}(e_1^r, G_1^r) V_{GG}^{r\prime\prime}(e_1^r, G_1^r) - V_{eG}^{r\prime\prime}(e_1^r, G_1^r) V_{Ge}^{r\prime\prime}(e_1^r, G_1^r) \geq 0$

Proof. (i) The assumption of $u'(0) = \infty$ implies that $\lim_{e_1 \longrightarrow 0} V_e^{r\prime}(e_1, G_1) = \infty$ and, together with $\pi(G_1) > 0$, that $\lim_{e_1 \longrightarrow \overline{e}} V_e^{r\prime}(e_1, G_1) = -\infty$. It follows immediately that r's optimal extraction is interior, $0 < e_1^r < \overline{e}$. Interior extraction implies $G_1^r \leq f(e_1^r) < f(\overline{e})$. Finally, $G_1^r > 0$ because $u'(0) = \infty$ implies that $\lim_{G_1 \to 0} \pi'(G_1) = \infty$. (ii) Since the functions $u(G)$, $f(e_1)$ and $\pi(G_1)$ are all continuous and differentiable, and because e_1^r, G_1^r are interior, $V^r(e_1^r, G_1^r)$ is locally concave. ■

Proof of Proposition 1

Part 1 Impose that in equilibrium $\widetilde{G}_1^b = G_1^{b*}$ and $\widetilde{G}_1^r = G_1^{r*}$. There are three possibilities: $G_1^{b*} = G_1^{r*}$, $G_1^{b*} < G_1^{r*}$, $G_1^{b*} > G_1^{r*}$. If $G_1^{b*} = G_1^{r*}$, then (7) implies $\widetilde{p} = p$, and thus, by assumption, the incumbent is reelected. The benevolent and rent-seeking incumbents then choose $G_1^{b*} = G^{fb}$ and $G_1^{r*} = 0$, respectively, which contradicts $G_1^{b*} = G_1^{r*}$.

When $G_1^{b*} \neq G_1^{r*}$, then $\widetilde{p} \geq p$ if and only if

$$h(U_1 - u(G_1^{b*})) \geq h\left(U_1 - u\left(G_1^{r*}\right)\right),$$

which simplifies to $U_1 \leq \left[u\left(G_1^{b*}\right) + u\left(G_1^{r*}\right)\right]/2$ if $G_1^{b*} < G_1^{r*}$. The probability of reelection when $G_1^{b*} < G_1^{r*}$ is given by

$$\pi\left(G\right) = \Pr\left(u\left(G\right) + z \leq \frac{u\left(G_1^{b*}\right) + u\left(G_1^{r*}\right)}{2}\right) = H\left(\frac{u\left(G_1^{b*}\right) + u\left(G_1^{r*}\right)}{2} - u\left(G\right)\right),$$

which implies $\pi'\left(G\right) = -h\left(\frac{u\left(G_1^{b*}\right)+u\left(G_1^{r*}\right)}{2} - u\left(G\right)\right) < 0$. Next, we note that by inserting from the budget constraint, a rent-seeking incumbent's value function can expressed as

$$W^r\left(e_1, G\right) = \max_{e_1, G} E\left\{u\left(f\left(e_1\right) - G\right) + u\left(f\left(q, \left(\overline{e} - e_1\right)\right)\right)\pi\left(G\right)\right\}.$$

It immediately follows that if $\pi'\left(G\right) < 0$, then $\partial W^r\left(e_1, G\right)/\partial G < 0$ for any choice of e_1. Thus, $G_1^{b*} < G_1^{r*}$ implies $G_1^{r*} = G^{\min} = 0$, which constitutes a contradiction.

Part 2 By part 1, the only remaining possibility is $G_1^{b*} > G_1^{r*}$. For this case, the statement in part 2 is proved in the text. ■

Existence and uniqueness of equilibrium

The following proposition gives sufficient conditions for existence and uniqueness of equilibrium:

Proposition 4 *There exists a perfect Bayesian equilibrium (in pure strategies) if the share of b-types among political candidates, p, is smaller than a critical value $\widehat{p} > 0$. The critical value $\widehat{p}$ may well be greater than one, so the sufficient condition for equilibrium is $p < \min[1, \widehat{p}]$. The equilibrium is unique if the rent-seekers' reaction curve is downward sloping, or if it is upward sloping and steeper than the reaction curve of benevolent politicians.*

Proof. Preliminaries By Lemma 1, the G_1^{b*} given by (15) is strictly positive. In particular this implies that should $\widetilde{G}_1^r = 0$ (which by Lemma 2 will never occur in equilibrium), then b will choose $G_1^{b*} > 0$, such as at point A in Figure 1. By Lemma 2, the G_1^{r*} implied by equations (16) and (17) is strictly positive. This implies in particular that if $\widetilde{G}_1^b = f\left(\overline{e}\right)$ (which by Lemma 1 will never occur in equilibrium), then r will choose $G_1^{r*} > 0$, such as at point B in Figure 1.

Denote by G_1^C the goods provision that is consistent with equation (15) and fulfills $G_1^{b*} = \widetilde{G}_1^r$. This corresponds to point C in Figure 1. Conversely, denote by G_1^D the goods provision that is consistent with conditions (16) and (17) and that satisfies $G_1^{r*} = \widetilde{G}_1^b$. This would be point D in Figure 1. The discussion in the preceding paragraph implies that $G_1^C > G_1^D$ is a sufficient condition for existence of equilibrium. In terms of Figure 1, the sufficient condition is that point C is located to the upper-right of point D.

Let e_1^{bC} be the e_1^{b*} that corresponds to G_1^C, and let e_1^{rD} be the e_1^{r*} that corresponds to G_1^D. Consider (16) and (17) with goods provision G_1^D. By substituting for $u'\left(f\left(e_1^{rD}\right)-G_1^D\right)$ from (17) in (16), these two equations reduce to

$$u\left(f\left(\overline{e}-e_1^{rD}\right)\right)h\left(0\right)u'\left(G_1^D\right)f'\left(e_1^{rD}\right)=u'\left(f\left(\overline{e}-e_1^{rD}\right)\right)f'\left(\overline{e}-e_1^{rD}\right)\frac{1}{2}, \tag{18}$$

where we have used that $\pi\left(0\right)=1/2$. Similarly, equation (15) with $G_1^{b*}=\widetilde{G}_1^r=G_1^C$ reads

$$\begin{aligned} & u\left(f\left(\overline{e}-e_1^{bC}\right)\right)\left(1-p\right)h\left(0\right)u'\left(G_1^C\right)f'\left(e_1^{bC}\right)+u'\left(G_1^C\right)f'\left(e_1^{bC}\right) \\ = \;& u'\left(f\left(\overline{e}-e_1^{bC}\right)\right)f'\left(\overline{e}-e_1^{bC}\right)\left(\frac{1}{2}+\frac{1}{2}p\right). \end{aligned} \tag{19}$$

Existence We will first show that when $p\to 0$, the condition $G_1^C>G_1^D$ is always fulfilled. Assume the opposite; $G_1^C\leq G_1^D$. Since the Inada conditions imposed on $u(.)$ imply that rent-seeking politicians choose strictly positive rents, it follows that in this case $e_1^{rD}>e_1^{bC}$. This implies that when $p\to 0$, the right-hand side of equation (18) is strictly greater than the right-hand side of equation (19). Hence, for both equations to hold, the left-hand side of (18) must also be strictly greater than the left hand side of (19). But this implies a contradiction since $G_1^C\leq G_1^D$ and $e_1^{rD}>e_1^{bC}$ renders the left-hand side of (18) strictly smaller than the left-hand side of (19). Thus, when $p\to 0$, the only possibility is that $G_1^C>G_1^D$. In this case, it is straightforward to verify that (18) and (19) may hold simultaneously.

Next consider the case where p can take any value on $[0,1]$. Because p does not enter equation (18), G_1^D is unaffected by p. The left-hand side of equation (19) is decreasing in p while the right-hand side is increasing in p. Hence, due to concavity of u and f, equation (19) implies a negative relationship between p and G_1^C (and consequently e_1^{bC}). Because $G_1^C>G_1^D$ when $p=0$, and G_1^C is decreasing in p while G_1^D is unaffected by p, it follows that there exists a $\hat{p}>0$ which is such that $G_1^C=G_1^D$ for $p=\hat{p}$, and $G_1^C>G_1^D$ for $p<\hat{p}$. It is important to note that, mathematically, $\hat{p}$ may well exceed unity, in which case $G_1^C>G_1^D$ always holds. It follows that the sufficient condition for existence of equilibrium is $p<\min\left[1,\hat{p}\right]$, as stated.

Uniqueness We first show that the relationship $G_1^{b*}(\widetilde{G}_1^r)$ is monotonic and increasing. Simplify the notation in equation (15) by defining $u_1\equiv u(f(e_1^{b*}))$, $u_2\equiv u(f(\overline{e}-e_1^{b*}))$, $f_1\equiv f(e_1^{b*})$, and $f_2\equiv f(\overline{e}-e_1^{b*})$. Differentiating (15) with respect to e_1^{b*} and $\widetilde{G}_1^r$ then yields

$$\frac{de_1^{b*}}{d\widetilde{G}_1^r}=\frac{u_2'f_2'\frac{d\Omega}{d\widetilde{G}_1^r}}{u_1''(f_1')^2+u_1'f_1''+u_2''(f_2')^2\Omega+u_2'f_2''\Omega-u_2'f_2'\frac{d\Omega}{de_1^{b*}}}>0.$$

From the definition of Ω, it is straightforward to show that $\frac{d\Omega}{d\widetilde{G}_1^r}<0$. Hence, the nominator in the above expression is strictly negative. Due to our assumptions about the derivatives of $f(.)$ and $u(.)$, the first four terms in the denominator are negative. From the definition of Ω it follows

that $\frac{d\Omega}{de_1^{b*}} > 0$, which implies that the last term in the denominator is also negative. It follows that $\frac{de_1^{b*}}{d\widetilde{G}_1^r} > 0$. Because $G_1^{b*} = f(e_1^{b*})$, we thus have that G_1^{b*} is everywhere increasing in $\widetilde{G}_1^r$.

If the relationship between G_1^{r*} and $\widetilde{G}_1^b$ that is consistent with equations (16) and (17) has a slope $G_1^{r*\prime}\left(\widetilde{G}_1^b\right) < G_1^{b*\prime}\left(\widetilde{G}_1^r\right)$, then $G_1^{r*}\left(\widetilde{G}_1^b\right)$ and $G_1^{b*}\left(\widetilde{G}_1^r\right)$ cross only once and the equilibrium is unique. The analytical expression for $G_1^{r*\prime}\left(\widetilde{G}_1^b\right)$, obtained by differentiating (16) and (17), can be expressed as:

$$\frac{dG_1^{r*}}{d\widetilde{G}_1^b} = -\Theta^{-1}\left[\begin{array}{c} u\left(R_2^*\right)u'\left(R_1^*\right)h'\left(\Psi\right)u'\left(\widetilde{G}_1^b\right)\Delta_{ee}^r \\ +u'\left(R_2^*\right)f'\left(e_2^*\right)h\left(\Psi\right)\Delta_{Ge}^r \end{array}\right]. \tag{20}$$

Here $\Psi \equiv \left[u\left(\widetilde{G}_1^b\right) - u\left(G_1^r\right)\right]/2$, $\Theta \equiv \Delta_{ee}^r\Delta_{GG}^r - \Delta_{eG}^r\Delta_{Ge}^r$, $\Delta_{ee}^r \equiv V_{ee}^{r\prime\prime}\left(e_1^r, G_1^r\right)$, $\Delta_{GG}^r \equiv V_{GG}^{r\prime\prime}\left(e_1^r, G_1^r\right)$, and $\Delta_{eG}^r = \Delta_{Ge}^r \equiv V_{Ge}^{r\prime\prime}\left(e_1^r, G_1^r\right)$.

Since $G_1^{b*\prime}\left(\widetilde{G}_1^r\right) > 0$, a sufficient condition for uniqueness is that $G_1^{r*\prime}\left(\widetilde{G}_1^b\right) < 0$. From Lemma 2 we know that $\Theta \geq 0$. The sign of expression (20) is therefore determined by the bracketed term. By inserting for Δ_{ee}^r and Δ_{Ge}^r into (20), and utilizing the first-order condition (13) and $\pi\left(G_1^{r*}, \widetilde{G}_1^b\right) = H\left(-\Psi\right)$, the necessary and sufficient condition for $G_1^{r*\prime}\left(\widetilde{G}_1^b\right) \leq 0$, and thereby a sufficient condition for uniqueness, may be expressed as:

$$\begin{array}{l} \left[\begin{array}{c} u'\left(R_1^{r*}\right)f''\left(e_1^{r*}\right) + u''\left(R_1^{r*}\right)f'\left(e_1^{r*}\right)^2 \\ +\left(u''\left(R_2^{r*}\right)f'\left(e_2^{r*}\right)^2 + u'\left(R_2^{r*}\right)f''\left(e_2^{r*}\right)\right)\pi\left(G_1^{r*}, \widetilde{G}_1^b\right) \end{array}\right] u\left(R_2^{r*}\right)u'\left(R_1^{r*}\right)u'\left(\widetilde{G}_1^b\right)h'\left(\Psi\right) \\ \geq \\ \left[\frac{u''\left(R_1^{r*}\right)}{u'(R_1^{r*})} + u'\left(G_1^{r*}\right)\frac{h\left(\Psi\right)}{H\left(-\Psi\right)}\right] f'\left(e_1^{r*}\right)u'\left(R_2^{r*}\right)f'\left(e_2^*\right)h\left(\Psi\right) \end{array}$$

where $h'\left(\Psi\right) < 0$ since $\widetilde{G}_1^b > G_1^{r*}$ in the relevant region. ■

Proof of Proposition 2

We start with the benevolent policy vector. As explained in the text, $e_1^{b*} > e^{fb}$ follows by comparing (15) to (6). Lemma 1 immediately implies that $e_1^{b*} < \overline{e}$. Since $e_1^{b*} > e^{fb}$, the budget constraint implies $G_1^{b*} > G^{fb}$. Finally, $R_1^{b*} = 0$ follows trivially from the utility function of b-types. Consider next the policy vector of rent-seekers. As explained in the text, $e_1^{r*} > e^{fb}$ follows by comparing (16) to (6). Lemma 2 immediately implies that $e_1^{r*} < \overline{e}$ and that $G_1^{r*} > 0$. Finally, $\lim_{R\to 0} u'\left(R\right) = \infty$ implies that $R_1^{r*} > 0$. ■

Proof of Proposition 3

Part 1 When $p \to 1$, we note that equation (15) reduces to

$$u'(f(e_1^{b*}))f'(e_1^{b*}) = u'(f(\overline{e} - e_1^{b*}))f'(\overline{e} - e_1^{b*}). \tag{21}$$

Compare this to equation (16). If $e_1^{b*} \geq e_1^{r*}$, the right hand side of equation (21) is strictly larger than the right hand side of equation (16). In this case, the left hand-side of (21) must thus be strictly higher than the left-hand side of (16) for both conditions to hold simultaneously. But this constitutes a contradiction since $e_1^{b*} \geq e_1^{r*}$ implies $u'(f(e_1^{b*}))f'(e_1^{b*}) < u'(f(e_1^{r*}) - G_1^{r*})f'(e_1^{r*})$. When $p \to 1$, it must hence be the case that $e_1^{b*} < e_1^{r*}$, as stated.

Part 2 When $p \nrightarrow 1$, the system (15)-(17) may hold for $e_1^{b*} \gtrless e_1^{r*}$, as stated. ■