RESEARCH ARTICLE
Democratic, capital flows, and odious debt

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Abstract
This paper relates democracy, public and private international capital flows, and odious debt. Democracy commits a ruler to pass borrowed funds on to the private sector which builds the country’s international collateral, and the consequent rise in the credit ceiling is a Pareto-improvement up to a point because the ruler can appropriate a smaller share of rising loan. However, the ruler may still impose odious debt in the sense that the private sector prefers the country to borrow less. Under conditions, a fall in the world interest rate or a rise in productivity growth increases the optimal levels of democracy, borrowing, investment, and welfare. I offer suggestive evidence from a global panel.

Keywords: democracy; capital flows; odious debt; globalization

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A. Introduction
When financial markets allow, undemocratic rulers can borrow and consume funds for which taxpayers will be liable. This is known as the odious debt problem. Well known examples include many of the cold war dictatorships of Africa and Latin America, whose rulers were able to deposit billions of dollars in private bank accounts overseas. In addition, less obvious but more recent examples may include Argentina, Indonesia, Mexico, and Russia in the 1990s, where large shares of national borrowing, though private, was done by a few firms with close political connections and government guarantees. Taxpayers will have to repay this debt. IMF (2003) estimates that current public debt in its sample of emerging markets is 2.5 times higher than the level sustainable under average actual fiscal surpluses 1985-2002, while for developing countries the ratio is slightly higher. The ratio is also positively associated with low public revenues, non-openness to trade, and weak property rights, consistent with the irresponsible government view proposed in this paper. Concern with odious debt has also been a driving force for the World Bank HIPC initiative involving debt forgiveness for qualifying high-debt countries. However, at only forty-one this is far less than the number of countries with abusive rulers who borrowed in the past, and unless the “fundamentals” of the countries change it is unclear that they will avoid new debts in the future.

This paper suggests a formal definition and a model of odious debt. The model supports the intuition that improved access to financial markets can decrease welfare in a non-democracy. However, I also show that, under parameter assumptions, a fall in the world interest rate or a rise in productivity growth can raise democracy, investment, borrowing, the borrowing share of the private sector, and welfare in countries with undemocratic rulers. The key intuition in the model is the following. First, the ruler cannot guarantee international lenders that either she or the private sector in the country will repay foreign debt. However, lenders can punish the private sector up to a part of the future output level, which is therefore the country’s credit ceiling. Second, since future output depends on private investment, and in turn on the income of the private sector, the ruler would like to promise lenders to pass on the borrowed funds – but, with no incentive to do so ex-post, her promise would not be credible. Democracy, however, resolves the ruler’s commitment problem by constraining her ability to appropriate the loan once extended. In turn, up to a point, even the ruler prefers more democracy. This intuition also explains why a lower world interest rate or faster productivity growth can promote democracy: these changes make the private sector a more valuable source of collateral for the ruler and the marginal gain to democracy therefore rises.

In the only other formal odious debt model I are familiar with (Jayachandran and Kremer 2006), there is not the gain to democracy modeled here, since there is no investment. However, despite the scope for democracy, lending sanctions can remain desirables in this paper. The democracy-as-commitment assumption is related to Acemoglu and Robinson (2000), who argue that democracy in the West historically committed wealthy elites to future redistribution. This paper differs because democracy guarantees future transfers to international creditors rather than non-elite citizens. Also, because I argue that “favorable” conditions” (low borrowing rates, rapid productivity growth) can promote democracy, the paper contrasts with a common view that rising debt-to-GDP ratios due to stagnation and rising interest rates promote democracy by making authoritarian regimes illegitimate or unsustainable. While some cases do show incumbents ousted during debt crises, the interest groups which sustain such leaders can remain (Acemoglu and Robinson 2006).
The rest of the paper proceeds as follows. Section B describes the assumptions, solves the model, and solves for the comparative statics with respect to a rise in democracy, a fall in the world interest rate, and a rise in productivity growth for a given democracy level. Section C, which is the core of the paper, endogenizes the ruler’s choice of democracy. I summarize sections B and C in propositions. Section D offers some preliminary evidence and section E concludes.

B. Model

B1. Assumptions

Consider the almost standard two period utility function of a private sector representative agent

\[ U = u(f(k_s) + \alpha b - k_{t+1} - p) + \delta u(k_{t+1} - R(b - p)) \]  

(1)

where \( u(\cdot), \theta, f(\cdot), k_s, R, \delta, b \geq 0 \), and \( p \geq 0 \) are an increasing and strictly concave period utility function, (one plus) a productivity growth parameter, an increasing and strictly concave production function, the capital stock at time s, the competitive gross world interest rate, a discount factor strictly between zero and one, international borrowing in the first period, and the private capital outflow in the first period. The utility and production functions satisfy the Inada conditions. The private sector cannot commit to its investment decision once the loan is received. Private sector indirect utility is \( V(\cdot) \). There is full depreciation of the capital stock and the second period may be a summary of the long or even infinite horizon.

In addition, and now departing from a standard model, an elite called "the ruler" (i) makes the borrowing decision for the country and (ii) appropriates a share (1 - \( \alpha \)) of the loan where \( \alpha \in [\hat{\alpha}, 1], \hat{\alpha} \geq 0 \), is the share kept by the private sector. A rise in \( \alpha \) is therefore a rise in the share of de-facto private borrowing in national borrowing. The ruler is only in office for the first period, while the private sector must repay the debt in the second period.

A low \( \alpha \) occurs where rulers have extensive powers, including countries without democracy or with formal but no substantive (liberal) democracy (Zakaria 1997). While more precisely \( \alpha \) measures constraints on the ruler, I will refer to a rise (fall) in \( \alpha \) as a rise (fall) in democracy or, interchangeably, a fall (rise) in the tax rate on foreign borrowing. All results relating to democracy therefore apply also to non-democracies with more constraints on the ruler. The ruler earns utility

\[ V = v((S + (1 - \alpha)b) \]  

(2)

where \( S \) is the ruler’s existing stock of wealth. Her utility function is increasing and strictly concave. The ruler is an infinitesimal share of the population, so when discussing welfare I focus on the private sector. Following the sovereign debt literature (Cohen 1991; Bulow and Rogoff 1989; Sandleris 2005), I assume that international capital markets lend up to a sovereign credit ceiling defined by the share of future output \( \lambda \in (0,1) \) which can be pledged to creditors. I call this the collateral of the country. Thus,

\[ Rb \leq \lambda f(k_{t+1}) \]  

(3)

Thus,
Like $\alpha$ measures democracy, or the share of the loan passed on to the private sector, I use $\lambda$ as an inverse measure of \textit{ex-post} sovereignty. A fall (rise) in $\lambda$ is a rise (fall) in sovereignty. Appendix 3 shows that the results of the model also apply, under similar conditions, when the punishment for default is loss of access to future borrowing rather than loss of future output.

\textbf{B2. Private control of borrowing}

As a benchmark, suppose that the private sector can decide the country’s borrowing. Because it cannot commit to its investment decision after the loan is made, the investment decision has $b$ given. The sequence of events is described in figure 1.

\begin{center}

| The private sector borrows $b$ | The private sector selects capital at home, $k_{t+1}$, and abroad, $p$ | Output $\Theta(k_{t+1})$ is realized |
\end{center}

Figure 1. Private control of borrowing

Capital held at home and abroad solve

$$\max_{k_{t+1},p} \{u(f(k_t) + \alpha b - k_{t+1} - p) + \delta u(\Theta(k_{t+1}) - R(b - p))\}$$

(4)

so that

$$u'(f(k_t) + \alpha b - k_{t+1} - p) = \delta u'(\Theta(k_{t+1}) - R(b - p))\Theta'(k_{t+1})$$

(5)

defines the optimal domestic investment level $k^*_{t+1} = k^*_{t+1}(\alpha, b, p^*, \ldots)$. The prior stage optimal loan $b^*$ now follows from substituting $k^*_{t+1}$ into (1) and maximizing with respect to the loan $b^* \geq 0$,

$$b^* = \max_{b \geq 0} \left\{ u(f(k_t) + \alpha b - k^*_{t+1}(\alpha, b, p^*, \ldots) - p^*) + \delta u(\Theta(k^*_{t+1}(\alpha, b, p^*, \ldots)) - R(b - p^*)) \right\},$$

(6)

subject to (3) and using $p^* = 0$ whenever $b^* > 0$ and vice versa, since were both positive the private sector could reduce them equally and pay less in taxes.

I will assume away the knife-edge case where the optimal unconstrained borrowing level happens to also satisfy (3) with equality. Therefore the privately optimal investment level satisfies
if (3) is binding, so that $b^* = \frac{\lambda \theta f(k_{t+1})}{R}$ and $p^* = 0$;

$$a\theta f'(k_{t+1}) > R \quad (7a)$$

if the private sector borrows above zero but below the ceiling, so that $0 < b^* < \frac{\lambda \theta f(k_{t+1})}{R}$, $p^* = 0$; and

$$a\theta f'(k_{t+1}) = R \quad (7b)$$

if it does not borrow and there is rather a private capital outflow: $b^* = 0$, $p^* > 0$.

The private sector optimum $(b^*, k^*_{t+1}, p^*)$ coincides with the first best given democracy (Appendix 2) when (3) is non-binding. Otherwise, the outcome is second best. Since this is a standard optimization model with a borrowing constraint and a tax on borrowing, I summarize comparative statics of later interest in proposition 1. The proposition is proved in Appendix 2 and assumes, to narrow the number of parameter cases, that the substitution effect on first period borrowing exceeds the income effect when democracy increases.

**Proposition 1** When the private sector decides borrowing and democracy is fixed

(i) The first-best given democracy occurs whenever equilibrium borrowing is unconstrained. Otherwise, the outcome is second-best.

(ii) If the private sector does not borrow, it sends capital abroad $(b^* = 0$, $p^* > 0)$. In this case, a rise in democracy leaves investment, borrowing, the private capital outflow and welfare unchanged. A fall in the world interest rate raises investment, leaves borrowing unchanged, lowers the private capital outflow, and lowers welfare. A rise in productivity growth raises investment, leaves borrowing unchanged, lowers the private capital outflow, and raises welfare.

(iii) If the private sector borrows, it sends no capital abroad $(b^* > 0$, $p^* = 0)$. In this case, regardless of whether the credit constraint is binding, a rise in democracy raises investment and borrowing, leaves the private capital outflow unchanged, and raises welfare. A fall in the world interest rate raises investment and borrowing, leaves the private capital outflow unchanged, and raises welfare. A rise in productivity growth raises investment and borrowing, leaves the private capital outflow unchanged, and raises welfare.

**B3. Ruler control of borrowing**

Unlike the benchmark case in the previous section, the private sector does not actually control the nation’s borrowing. The real sequence of events is shown in figure 2.
Since the ruler is not liable for repayment, she borrows until (3) is binding,

\[ b^e = \frac{\lambda \theta f(k_{t+1}^e)}{R} \]  

(8)

where the superscript denotes equilibrium outcomes. \( b^e \) is generally different from the privately optimal loan in (6) subject to (3) because the ruler now distorts both the “intensive” margin, by taxing a given loan, and the “extensive” margin by increasing the loan. Thus, agents still solve (4) to get (5), but they do not decide borrowing at the prior stage in (6). Instead, the loan is defined in (8). The gap between actual borrowing and the feasible borrowing desired by the private sector is non-negative,

\[ b^e - b^* \geq 0, \]  

(9)

and it is strictly positive when (3) is non-binding in the benchmark case, that is, when agents would prefer to borrow less than the credit ceiling. I will use the left hand side of (9) as a formalization of “odious debt”, commonly understood as debt incurred by ruling elites to satisfy personal as opposed to social objectives and for which the residents of the country are liable. Suggestions to forgive odious debt or regulations against lending to rulers imposing it, as proposed for example in Jayachandran, Kremer, and Shaffer (forthcoming), correspond to decreasing \( \lambda \) for countries whose \( \lambda / \alpha \) ratio is sufficiently high to make (9) a strict inequality. A fall in \( \lambda \) would allow default without penalty on existing debts and discourage future lending. In practice, this may be done by proper design of the international financial system (Jayachandran and Kremer 2006). I now consider the comparative statics with respect to democracy, borrowing costs, and productivity growth.

**B3.1. A rise in democracy**

Suppose first that \( \theta f''(k_{t+1}^e) > R \). In this case, a rise in democracy raises first period loan income \( ab \) in (4) and in turn domestic investment, by (5), so that

\[ \partial k_{t+1}^e / \partial \alpha > 0 \]  

(10)

and in turn

\[ \partial b^e / \partial \alpha = \frac{\lambda \theta f''(k_{t+1}^e) \partial k_{t+1}^e / \partial \alpha}{R} > 0 \]  

(11)
Second, suppose that investment returns are already equated internationally, \( \theta^r(k^r_{t+1}) = R \). In this case, more or less taxation will only change the stock of funds held abroad, leaving collateral unchanged, so that

\[
\frac{\partial k^r_{t+1}}{\partial \alpha} = \frac{\partial b^r}{\partial \alpha} = 0 \quad (12)
\]

Finally, since the debt only rises by a fraction \( \lambda \) of the second period output increase, and \( ab \) rises, agents will consume more in both periods and welfare rises:

\[
\frac{\partial V^e}{\partial \alpha} > 0 \quad (13)
\]

### B3.2. A fall in the world interest rate

A fall in the world interest rate raises the credit ceiling in (8), which raises private first period income and also makes domestic investment more attractive - raising the credit ceiling, borrowing, and investment further. Formally

\[
\frac{\partial k^e_{t+1}}{\partial R} < 0 \quad (14)
\]

because if borrowing rises so does investment, by (5), and I show now that a fall in the interest rate raises borrowing:

\[
\frac{\partial b^e}{\partial R} = \frac{R \lambda \theta^r(k^e_{t+1}) \frac{\partial k^e_{t+1}}{\partial R} - \lambda \theta^r(k^e_{t+1})}{R^2} < 0 \quad (15)
\]

(15) follows because suppose first that investment does not change in response to, say, a fall in the interest rate: \( \frac{\partial k^e_{t+1}}{\partial R} = 0 \). Then the numerator is negative, so that by (8) borrowing and therefore first period consumption increases when the interest rate falls. However, second period consumption stays constant since the left and right hand sides of (3) are unchanged. This violates consumption smoothing in (5). Instead, agents will shift consumption to the second period by investing more, making \( \frac{\partial k^e_{t+1}}{\partial R} \) and therefore (15) negative.

In terms of welfare,

\[
\frac{\partial V^e}{\partial R} < 0 \quad \text{unless } p > 0 \quad (16)
\]

because, again, when \( R \) falls the private sector has more funds available in the first period and the debt rises at most by a fraction \( \lambda \) of the second period output increase, so that second period consumption also rises. The only exception is if \( p > b \), in which case welfare can decrease (see (1)) as the private sector is a net creditor to the world market. Thus, welfare rises when borrowing costs decline unless the private capital outflow in the first period is relatively large. \( p >> 0 \) and welfare rising with the interest rate is not entirely unlikely, however: Boyce and Ndikumana (2001) find that between 1970 and 1996 private external assets in 25 severely indebted Sub-Saharan African countries substantially exceeded public external debt, making this country group a net creditor. However, in practice there is heterogeneity within the private sector and the economically and politically advantaged are more likely able to put
funds abroad and avoid taxation. In a richer model, therefore, welfare could still fall when interest rates rise.

**B3.3. A rise in productivity growth**

We have

$$\frac{\partial k^e_{t+1}}{\partial \theta} > 0$$

(17)

because productivity growth raises the incentive to invest in (5). Collateral rises both directly with productivity and because of the rise in investment. In turn, borrowing in (9) rises,

$$\frac{\partial b^e}{\partial \theta} = \frac{\lambda f(k^e_{t+1}) + \lambda \theta \theta'(k^e_{t+1}) \frac{\partial k^e_{t+1}}{\partial \theta}}{R} > 0,$$

(18)

and also,

$$\frac{\partial V^e}{\partial \theta} > 0$$

(19)

because a rise in future productivity raises the credit ceiling and therefore the loan. In turn, agents consume more in the first period. Since again debt rises only by a fraction of the second period output increase, second period consumption also rises.

**B3.4. Odious debt and private capital flight**

A private capital outflow, $p^e > 0$, always implies odious debt in the model. However, the absence of a private outflow, $p^e = 0$, is still consistent with odious debt. This is because the private sector may prefer to borrow below the ceiling until the capital stock solves (7b), $\alpha \theta'(k^e_{t+1}) = 1 + r$, but once the ruler has brought funds into the country, agents invest domestically until $\theta'(k^e_{t+1}) = R$. Thus, capital stocks satisfying $\alpha \theta'(k^e_{t+1}) < R \leq \theta'(k^e_{t+1})$ imply odious debt but no private capital outflow. However, if the ruler buys foreign assets with the borrowed funds, so she can consume after leaving office, this alone will generate a private capital outflow entry in the official balance of payments statistics. Perhaps interestingly, the driving force for any “true” private capital flight is neither diversification nor differential expropriation risk, as assumed in much of the capital flight literature (Khan and Haque 1985; Dooley 1988; Sheets 1995). Instead, it is the ruler’s desire to get capital to “turn around” in her country so she can tax it. A similar ability to socialize the repayment burden does appear in Eaton (1987) and Alesina and Tabellini (1989), giving rise to flight. However, in these models it is the individual desire to escape the repayment burden which prompts capital flight while here, due to the default penalty, flight is useless for the private sector. The reason, instead, is the return differential after the loan has been taken out.

**Proposition 2** When the ruler decides borrowing and democracy is fixed
(i) The first best outcome never occurs and the country either borrows less than the private sector would like without the credit constraint or there is odious debt. There may be private capital flight.

(ii) If there is no private capital outflow \((b^e > 0, p^e = 0)\), then a rise in democracy, a fall in the world interest rate, or a rise in productivity growth raises investment, borrowing and welfare, while leaving the private capital outflow unchanged. There may be odious debt.

(iii) If there is a private capital outflow \((b^e > 0, p^e > 0)\), then a rise in democracy leaves investment and borrowing unchanged, raises the private capital outflow, and raises welfare. A fall in the world interest rate raises investment and borrowing, lowers the private capital outflow, and raises (lowers) welfare if private wealth holdings abroad are small (large and exceeding the country’s debt). A rise in productivity growth raises investment and borrowing, lowers the private capital outflow, and raises welfare. There is odious debt.

C. Endogenous democracy

So far, the ruler has been allowed to borrow on behalf of the country up to the credit limit, but I have assumed that the ruler appropriates an exogenous share \(1 - \alpha\), determined simply by her ability to appropriate. However, notice that the ruler earns \((1 - \alpha)b^e\) and \(b^e\) is rising in \(\alpha : \partial b^e / \partial \alpha > 0\) by (5), as long as returns are not equated internationally. This creates a trade-off between the tax rate and the tax base. Nonetheless, without self-imposed constraints or repeated interactions, the only time-consistent outcome is for the ruler to appropriate the entire loan once extended by creditors. However, suppose now, as in Acemoglu and Robinson (2000), that the ruler can extend democracy at will and that democracy once extended is not reversible. The ruler can then commit to \(\alpha\). The new sequence of events is described in figure 3. \(\alpha\) may also be read as the extent of irreversible economic, rather than political, reforms curtailing ruler discretion, such as privatization, deregulation, or central bank independence). The new sequence of events is depicted below.

![Figure 3. Endogenous democracy](image)

The ruler sets democracy \(\alpha\) to borrow \(b\) at home, \(k_{i+1}\), and abroad, \(p\) is realized:

\[
\max_{\alpha} (1 - \alpha)b^e(\alpha,.)
\]

While maximum democracy \((\alpha = 1)\) is not optimal, since the ruler would earn no revenue, the minimal democracy corner solution \((\alpha = \hat{\alpha})\) may be selected: under the Inada condition on the production function, the private sector always invests, so there
is always some collateral. For brevity, however, I focus on the interior solution. The first order condition, implicitly defining the optimal democracy level $\alpha^e$, is therefore

$$(1 - \alpha^e) (\partial b^e / \partial \alpha) = b^e (\alpha^e, .)$$  \hspace{1cm} (23)$$

where $\partial b^e / \partial \alpha$ is given by (11).

(23) sets the marginal benefit of further democracy equal to the marginal cost. This gives an income maximizing democracy level because $\partial^2 b^e / \partial \alpha^2 < 0$ due to strictly diminishing returns to investment: a rise in $\alpha$ raises investment in (5) but by increasingly less. If we interpret $\alpha$ as the degree of economic reforms, the equilibrium can also account for the apparent ability of conditional aid and lending to developing countries to promote partial reforms but not full reforms – partial reforms are worthwhile since they bring the reward of increased lending or aid, but full reforms cause too much loss of rents. Notice also that democratization (or reforms curtailing the ruler’s discretion) occur if and only if they are Pareto-improving and that the ruler never allows enough democracy to induce private capital flight: with private capital flight, $\partial b^e / \partial \alpha$ would be zero as any marginal private income increase would leave the country instead of raising collateral. The graph below sketches the left hand side of (23), labeled the MB curve, against the right hand side, labeled the MC curve.

![Graph](https://example.com/graph.png)

Figure 4. Marginal costs and benefits of democracy

**C1. A fall in the world interest rate**

If condition (*) below is satisfied then the marginal benefit of increasing democracy is greater when the world interest rate falls, that is, a higher $\alpha^e$ solves (23). Formally,

$${\partial \alpha^e} / {\partial R} < 0$$  \hspace{1cm} (24)$$
if and only if
\[ f^*_{R,t+1}(k^t_{t+1}) - \alpha f^*_{F,t+1}(k^t_{t+1}) / R < f^*_{F,t+1}(k^t_{t+1}) \]  

(*)

with one and two primes in the superscripts shorthand for derivates with respect to the variables in the subscript.

(*) is necessary for a falling world interest rate to promote democracy because, when the interest rate declines, the loan increases for a given level of democracy by (15). This rise occurs for two reasons. First, there is a direct present value effect, captured in the second term in the numerator in (15): the present value of a given future output level increases. Second, there is an indirect effect on collateral, captured in the first term in the numerator: because the private sector receives a share of the direct loan increase, it raises investment and in turn the future output level, making possible a further rise in the loan. This second effect on collateral is larger when there is more democracy, \( \alpha \), since any loan increase \( db^t \) implies a rise in private sector first period income of \( adb^t \) and investment and future output are increasing in first period income by (5). Intuitively, a lower interest rate makes the private sector a more valuable source of collateral for the ruler, raising \( \partial b^t / \partial \alpha R < 0 \). The ruler would like to increase democracy for this reason. However, because a lower interest rate also raises the loan (tax base) for a given level of democracy, the infra-marginal cost of democratization on the right hand side of (23) rises as well, by (15). Overall, the ruler chooses more democracy if and only if the marginal benefit effect dominates the infra-marginal cost effect:

\[ (1 - \alpha^t) \partial^2 b^t / \partial \alpha \partial R < \partial b^t / \partial R \]

which, after substituting (15) on the right hand side, substituting its derivative with respect to \( \alpha \) on the left hand side, using (23), and simplifying gives (*). Graphically, (*) says that the MB curve must shift sufficiently to the right when \( R \) falls to dominate the leftward shift in the MC curve. If it does, the optimal democracy level rises. (24) is consistent with the argument that financial integration that lowers the price of borrowing promotes institutional reform.

Finally, private welfare increases when the interest rate falls and the ruler responds with more democracy:

\[ \partial V_e / \partial R < 0 \]  

if (*) holds. The private sector receives more funds for the same second period debt and the debt only rises by a fraction of the rise in output in the second period.

C2. A rise in productivity growth

More rapid productivity growth also promotes democracy under a condition similar to (*) : 

\[ \partial \alpha^t / \partial \theta > 0 \]  

if and only if
\[ \frac{\partial \theta}{\partial \alpha} (k^e_{t+1}) + \alpha f'(k^e_{t+1}) > \theta f'(k^e_{t+1}) \]  

(**) is necessary for reasons paralleling the case of (*): when future productivity rises, the loan increases given democracy by (18). This rise again is due to a direct present value effect, captured in the first term in the right hand side numerator in (18), and an indirect investment effect on collateral, captured in the second term. The indirect effect is larger when there is more democracy, as before, since then the effect on private sector first period income is larger. Again, the private sector becomes a more valuable source of collateral, raising \( \frac{\partial^2 b^e}{\partial \alpha \partial \theta} \) in (31), so that \( \frac{\partial^2 b^e}{\partial \alpha \partial \theta} > 0 \). However, the rise in productivity growth also raises the infra-marginal cost of democratization on the right hand side of (23). Overall, democracy rises if and only if the marginal benefit effect dominates the infra-marginal cost effect:

\[ (1 - \alpha^e) \frac{\partial^2 b^e}{\partial \alpha \partial \theta} > \frac{\partial b^e}{\partial \theta} \]

which, after substituting (18) on the right hand side, substituting its derivative with respect to \( \alpha \) on the left hand side, using (23), and simplifying gives (**). Graphically, (**), says that the MB curve must shift sufficiently to the right when \( \theta \) rises to dominate the leftward shift in the MC curve. If it does, the optimal amount of democracy rises.

Finally, private welfare increases when the productivity growth increases and the ruler responds with more democracy:

\[ \frac{\partial V^e}{\partial R} < 0 \]

if (**) holds. Again the private sector receives more funds for the same second period debt and the debt only rises by a fraction of the rise in output.

**C3. A lower bound on democracy**

I finally consider a spontaneous force for democracy in the sense that a binding lower bound on democracy \( \alpha \) is imposed on the ruler and

\[ \alpha > \alpha^e \]

If \( \theta'(k^e_{t+1}) > R \) then, by (10) and (11), investment and borrowing increase. Otherwise, investment and borrowing stay the same by (12). Welfare grows in any case by (13), but the ruler is worse off since originally she preferred less democracy. Graphically, \( \alpha > \alpha^e \) implies that the MC curve is above the MB curve at the equilibrium democracy level.

**Proposition 3** When the level of democracy is chosen by the ruler

(i) The first best outcome never occurs and the country either borrows less than the private sector would like without the credit constraint or there is odious debt. There is no private capital flight.

(ii) Democratization occurs precisely up to the point at which it is no-longer Pareto-improving.
(iii) An exogenous binding lower bound on democracy has the same effects as described in proposition 2 part (ii). A fall in the world interest rate under condition (*) (a rise in productivity growth under (**)) raises democracy. It therefore has the same effects as described in proposition 2 part (ii) when, first, democracy rises and, second, the world interest rate falls (productivity growth increases).

D. Preliminary evidence

This section offers preliminary tests for whether democracy depends on external borrowing costs and productivity growth. Specifically, I run country panel regressions (176 countries, 1972-2004) of the political rights score assigned annually to each country by Freedom House (ranging 1 to 7, with 1 maximal democracy) on the US real interest rate and the growth rate of US real GDP per capita. The Freedom House score is used to measure democracy ($\alpha$) and the US real interest rate to proxy the world real interest rate ($R-1$). The summary statistics are in Appendix 1. Since Atkeson and Ohanian (2001) show that past inflation reasonably predicts future inflation in the US, I use current inflation to measure expected inflation when computing the US real interest rate. The US growth rate proxies exogenous growth in productivity ($\theta$) as perceived by other countries and may also reflect an international business cycle component. Additionally, I interact each country’s external debt-to-GNI ratio with the US real interest rate and the US growth rate. Since countries with a revealed preference for borrowing should be more sensitive to changing borrowing costs or productivity growth, I should expect these interaction terms to be significant. Moreover, if (*) and (**) are satisfied, then the interaction term for the US interest rate should be positive and that for the US growth rate negative. Since the US variables do not vary across countries by year, the cross-country errors are correlated and I cluster them by year. Also, since the right hand side variables can be volatile, I use the moving average over the current and two preceding years (Pattillo, Poirson, and Ricci 2002).

While likely democracy depends on both domestic and international factors, a full test of its determinants is beyond the scope of this paper and simply adding domestic variables to the right hand side could lead to endogeneity. Although US real interest rate and growth shocks may fail to transmit abroad, this should push the coefficients toward zero, biasing the tests against the theory. The panel data allows me to control for time-invariant, country specific determinants of democracy, such as ethnic fractionalization and resource endowments. The US variables are unlikely to be affected by democracy abroad and the results are not sensitive to excluding the OECD countries. A more serious concern is that the debt-to-GNI ratio of a country could be endogenous to democracy. To address this concern, I also present results using one-year lags of the right hand side variables and instrumental variable estimates using the

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1 Dailami, Masson and Padou (2005) find that, among three measures of US interest rate policy (the 1- and 10-year Treasury bond rates and the spread between low-and high risk corporate bonds), the Treasury rates have no effect on emerging market spreads during non-crisis times, but the interaction between the 1-year rate and country debt-GDP ratios is positive and significant: a 200 basis point rise in the US 1-year rate implies 6 (65) basis points rise in spreads for countries with debt ratio below 40% (above 90%). US rates interacted with debt ratios do not matter for spreads during crisis times in their sample. However, a zero effect on the spread implies a one-to-one effect on the absolute borrowing cost.

2 I am very grateful to an anonymous referee for this point.
lags as instruments. The results are almost the same. The results also do not change much when I use an indicator variable for a debt-to-GNI ratio over 60 percent rather than a continuous debt variable, although without lagging the right hand side the debt-US growth interaction becomes insignificant.

**D1. Results**

The benchmark column (1) shows no clear association between recent US real interest or growth rates and democracy abroad, but a higher recent debt-to-GNI ratio is associated with a rise in democracy. The standard deviations of democracy and debt-to-GNI in my sample are about 2.22 and 78.7, respectively, so a one standard deviation increase in the debt ratio is associated with 0.089 standard deviations improvement in democracy or almost 0.2 points on the Freedom House scale. Column (2) adds the debt-US interest and debt-US growth interaction terms. These are significant at the 1% level and have the predicted sign under (*) and (**). In terms of magnitudes, a one standard deviation increase (2.14 percentage points) in the three-year moving average of the US real interest rate has a direct positive effect on democracy of 0.075 standard deviations. However, at the mean debt-to-GNI ratio (72.4), there is an additional and negative effect on democracy of 0.09 standard deviations. This suggests that, for highly indebted countries, democracy improvements may be more likely to follow real US interest rate decreases rather than increases. If so, while consistent with the theory under (*), this would contrast with a common view that rising interest rates promote democracy by causing indebted non-democracies to fall. However, a richer analysis would be required for firm conclusions.

The direct effect of the US growth rate is not significant, but a one standard deviation rise in the growth rate (1.19 percentage points) is associated with an additional 0.039 standard deviations increase in democracy for a mean indebted country compared to a non-indebted country. This is consistent both with common (if controversial) wisdom that growth promotes democracy and the model prediction that more rapid productivity growth raises the ruler’s net benefit to democratizing. As with the interest rate, the debt level where the indirect, positive association of US growth with democracy begins to dominate the direct, negative association is about the sample mean debt-GNI ratio of 78.7 (although as mentioned the direct association is not significant).

Finally, column (3) shows that the significance of the debt-US interest rate interaction term still holds when I use an indicator for a debt-GNI ratio over 60 rather than the continuous variable. However, the debt-US growth rate interaction is no longer significant. Likely, the US growth rate is a worse proxy for productivity growth abroad than the interest rate is for borrowing costs abroad. Table 3 shows that the results are almost unchanged when I use lagged values of the right hand side variables and using the lagged right hand side variables as instruments for contemporaneous values (table 4) also has a minor impact. The instrumental variables estimates for the interaction terms are (insignificantly) higher, consistent with the idea that democracy raises a country’s achievable debt level.

<table>
<thead>
<tr>
<th>Democracy:</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US real interest</td>
<td>-0.0103</td>
<td>-0.0783**</td>
<td>-0.0453*</td>
</tr>
<tr>
<td></td>
<td>(0.0314)</td>
<td>(0.0378)</td>
<td>(0.0227)</td>
</tr>
</tbody>
</table>
T. Janus

<table>
<thead>
<tr>
<th>US real growth</th>
<th>1.3683 (4.409)</th>
<th>6.3976 (4.5394)</th>
<th>2.0323 (3.0753)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt/GNI</td>
<td>-0.00250***</td>
<td>-0.003548***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00049)</td>
<td>(0.00081)</td>
<td></td>
</tr>
<tr>
<td>US int* debt/GNI</td>
<td></td>
<td>0.0129***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00028)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US growth* debt/GNI</td>
<td></td>
<td>-0.10207***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.03214)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debt/GNI&gt;60</td>
<td></td>
<td>-.92377***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.14383)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US int* (debt/GNI&gt;60)</td>
<td></td>
<td>.17460***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.03538)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US growth* (debt/GNI&gt;60)</td>
<td></td>
<td>-7.0665</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5.2769)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>2942</td>
<td>2942</td>
<td>2942</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.6751</td>
<td>0.6788</td>
<td>0.6882</td>
</tr>
</tbody>
</table>

Notes: *,**, and *** denote 10%, 5%, and 1% significance. Dependent Variable: Freedom House Political Rights, fixed effects panel estimation with heteroskedasticity-robust standard errors (in parentheses) clustered by year. The debt-to-GNI data is from the World Bank Global Development Finance dataset, democracy is from Freedom House, and the US data is from the IMF International Financial Statistics.

Table 1. Relationship between democracy, debt, and measures of borrowing costs and productivity growth.

<table>
<thead>
<tr>
<th>Democracy:</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lag US real Interest</td>
<td>-0.01993</td>
<td>-0.09148**</td>
<td>-0.04753*</td>
</tr>
<tr>
<td></td>
<td>(0.03007)</td>
<td>(0.03567)</td>
<td>(0.023498)</td>
</tr>
<tr>
<td>Lag US real Growth</td>
<td>1.050724</td>
<td>4.521474</td>
<td>0.9603</td>
</tr>
<tr>
<td></td>
<td>(4.079383)</td>
<td>(4.111238)</td>
<td>(3.0293)</td>
</tr>
<tr>
<td>Lag Debt/GNI</td>
<td>-0.00249***</td>
<td>-0.00426***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00046)</td>
<td>(0.00075)</td>
<td></td>
</tr>
<tr>
<td>Lag US int* debt/GNI</td>
<td></td>
<td>0.00144***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000335)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lag US growth* debt/GNI</td>
<td></td>
<td>-0.08601**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.03265)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lag debt/GNI&gt;60</td>
<td></td>
<td>-0.90183***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.15437)</td>
<td></td>
</tr>
<tr>
<td>Lag US int* (debt/GNI&gt;60)</td>
<td></td>
<td>0.17735***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.04554)</td>
<td></td>
</tr>
<tr>
<td>Lag US growth* (debt/GNI&gt;60)</td>
<td></td>
<td>-7.0942</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(6.0101)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>2825</td>
<td>2825</td>
<td>2825</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.6836</td>
<td>0.6870</td>
<td>0.6934</td>
</tr>
</tbody>
</table>
Table 2. Relationship between democracy, debt, and measures of borrowing costs and productivity growth, lagged right hand side variables.

<table>
<thead>
<tr>
<th>Democracy:</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US real interest</td>
<td>-0.0167 (0.03185)</td>
<td>-0.0988*** (0.03754)</td>
<td>-0.04703* (0.02645)</td>
</tr>
<tr>
<td>US real growth</td>
<td>0.3945117 (7.465105)</td>
<td>6.433168 (7.603065)</td>
<td>-0.63401 (5.5613)</td>
</tr>
<tr>
<td>Debt/GNI</td>
<td>-0.00273*** (0.0005)</td>
<td>-0.00352*** (0.00118)</td>
<td></td>
</tr>
<tr>
<td>US int* debt/GNI</td>
<td></td>
<td>0.00162*** (0.00037)</td>
<td></td>
</tr>
<tr>
<td>US growth* debt/GNI</td>
<td></td>
<td>-0.15133*** (0.05275)</td>
<td></td>
</tr>
<tr>
<td>Debt/GNI&gt;60</td>
<td></td>
<td></td>
<td>-0.95523*** (0.19595)</td>
</tr>
<tr>
<td>US int* (debt/GNI&gt;60)</td>
<td></td>
<td></td>
<td>0.18786*** (0.05466)</td>
</tr>
<tr>
<td>US growth* (debt/GNI&gt;60)</td>
<td></td>
<td></td>
<td>-6.7938 (10.506)</td>
</tr>
<tr>
<td>N</td>
<td>2819</td>
<td>2819</td>
<td>2819</td>
</tr>
<tr>
<td>Adj. R^2</td>
<td>0.6966</td>
<td>0.6998</td>
<td>0.7078</td>
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</tbody>
</table>

Notes: See table 1

Table 3. Relationship between democracy, debt, and measures of borrowing costs and productivity growth, lagged right hand side variables used as instruments for contemporaneous values.

E. Conclusion

This paper supports the conjecture that when undemocratic rulers can borrow freely against the future income of their subjects, then better access to global capital markets can decrease a country’s welfare. However, I also argue that cheaper international credit and more rapid productivity growth, perhaps due to globalization, can lead self-interested rulers to curtail their own discretion by democratizing. Intuitively, due to the difficulty of enforcing sovereign debt contracts rulers need the private sector to provide collateral on their behalf. However, the only way to commit to passing borrowed funds on to private agents ex-post in the model is to democratize ex-ante. Since lower interest rates or more rapid productivity growth can make the private sector an even more valuable source of collateral, the ruler’s net marginal gain to democracy may increase. Conversely, spontaneous democratization can raise the international borrowing of a country, so that democracy can lead to globalization as measured by capital flows. The predicted effects of lower borrowing costs and greater productivity growth are consistent with evidence from a global panel for recent decades and with the general trend since the early 1980s toward lower interest rates, more democracy, and more private sector borrowing in the world.
References


### Appendix 1. Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. obs.</th>
<th>Mean</th>
<th>s.d.</th>
<th>min</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political rights</td>
<td>4874</td>
<td>3.831966</td>
<td>2.223108</td>
<td>1</td>
<td>7</td>
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<tr>
<td>US real interest rate</td>
<td>33</td>
<td>1.962424</td>
<td>2.441753</td>
<td>-2.84</td>
<td>6.59</td>
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<tr>
<td>US growth of real GDP/cap.</td>
<td>32</td>
<td>.0207621</td>
<td>.0205054</td>
<td>-.0294714</td>
<td>.0608454</td>
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<tr>
<td>Debt-to-GNI</td>
<td>3258</td>
<td>71.18185</td>
<td>80.94902</td>
<td>.1436549</td>
<td>1209.303</td>
</tr>
</tbody>
</table>

### Appendix 2. First-best outcome given democracy, Proof of proposition 1, and derivation of (*) and (**)

#### First-best outcome given democracy

The first-best outcome given democracy occurs when there is perfect international contract enforcement. First best borrowing, investment, and private capital outflows solve

\[
\max_{b,h_{t+1},p} u(f(k_t) + \alpha b - k_{t+1} - p) + \delta u'(\theta f(k_{t+1}) - R(b - p)) + V((S + (1-\alpha)b)
\]

(A1)

implying

\[
\alpha u'(f(k_t) + \alpha b - k_{t+1} - p) \leq \delta(1 + r)u'(\theta f(k_{t+1}) - R(b - p))
\]  \hspace{1cm} (A2)

\[
u'(f(k_t) + \alpha b - k_{t+1} - p) \geq \delta u'(\theta f(k_{t+1}) - R(b - p))\theta'
\]

(A3)
Since (A2) and (A4) cannot both be equalities, either there is borrowing, \( b > 0 \), and the private capital outflow is \( p = 0 \), in which case (A2)-(A3) are equalities and (A4) is an inequality, or \( b = 0 \) and \( p > 0 \), in which case (A3)-(A4) are equalities and (A2) is an inequality, or \( b = p = 0 \). The last does not occur except as a knife-edge case, however, so to simplify I will focus on the other cases. Thus, the discounted after-tax marginal utilities of the private sector across time are equated as follows

\[
au_i' = δRu_2' \quad \text{if } b^b > 0
\]

\[
u_i' = δRu_2' \quad \text{if } b^b = 0
\]

where “fb” denotes the first-best outcome. In turn,

\[αθ∫^∗_i(k^b) = R \quad \text{if } b^b > 0\]

\[θ∫^∗_i(k^b) = R, \quad \text{if } b^b = 0\]

Proof of proposition 1

A rise in democracy

We have

\[
\frac{∂b^*}{∂α} > 0 \quad \text{if } (1 + r)b^* = λθ∫^∗_i(k^b) \text{ so that (3) binds}
\]

\[
\frac{∂b^*}{∂α} = 0 \quad \text{if } b^* = 0
\]

\[
\frac{∂b^*}{∂α} > 0 \quad \text{if } 0 < b^* < θ∫^∗_i(k^b)
\]

provided \( ∂au_i'(f(k_i) + ab^* - k^*_i) / ∂α > 0 \)

The first inequality follows since a rise in \( α \) when the credit ceiling binds raises the first period borrowed funds of the private sector \( ab \), raising investment in (5) and in turn collateral on the right hand side of (3). Therefore, the private sector can borrow more if it wants to. This is the case when (3) binds initially. The equality when \( b^* = 0 \) follows because first period income is independent of democracy when there is no borrowing. Lastly, (A7c) arises because although a given loan faces less taxation when democracy increases, it also becomes less necessary to borrow \((0 < b^* < θ∫^∗_i)\) means that the country is not credit constrained to begin with); these are opposing substitution and income effects. Since the private sector is not credit constrained, it implements the first best given democracy. Then by (A6a) investment rises and the right hand side of (A5a) falls. Then to restore balance in (A5a) the loan must change. It must rise when the substitution effect of the lower tax rate dominates the income effect, \( ∂au_i'(f(k_i) + ab^* - k^*_i) / ∂α > 0 \). I make this technical assumption to limit the number of cases to study.
By (A7) and (5) in the main paper

$$\frac{\partial k^*_{t+1}}{\partial \alpha} > 0 \text{ if } b^*>0, =0 \text{ if } b^* = 0$$  \hspace{1cm} (A8)

and

$$\frac{\partial V^*}{\partial \alpha} > 0 \text{ if } b^*>0, = 0 \text{ if } b^* = 0$$  \hspace{1cm} (A9)

where the equalities for zero borrowing follow because then the private sector’s first period income does not depend on democracy. Finally, the private capital outflow $p^*$ does not depend on the level of democracy since either there is no borrowing ($b^* = 0, p^* > 0$), in which case more democracy makes no difference, or there is no outflow of private funds ($b^* > 0, p^* = 0$).

**A fall in the world interest rate**

By (6), (5), and (3)

$$\frac{\partial b^*}{\partial R} < 0 , = 0 \text{ if } b^* = 0$$ \hspace{1cm} (A10)

because if $\alpha \theta''(k_{t+1}) > R$ then (3) is binding, in which case a fall in the interest rate slackings (3) and raises borrowing, and if $\alpha \theta''(k_{t+1}) = R$ due to (3) not binding and $0 < b^* < \theta''(k_{t+1}) = R$ then again the optimal capital stock rises when the interest rate falls, and in turn borrowing must rise to smooth consumption. Finally if $\theta''(k_{t+1}) = R$ and $b^* = 0$ then again investment rises when the interest rate falls but borrowing does not: additional investment is now financed by reducing wealth held abroad. Notice that when (3) is binding a higher interest rate affects borrowing not via the price channel but via the balance sheet: the present value of the country’s collateral declines.

By this discussion

$$\frac{\partial k^*_{t+1}}{\partial R} < 0$$ \hspace{1cm} (A11)

and

$$\frac{\partial V^*}{\partial R} < 0 \text{ if } b^* > 0, < 0 \text{ if } b^* = 0$$ \hspace{1cm} (A12)

where I use that an interest rate fall lowers welfare when the private sector is a lender to the world market. Finally, a fall in the interest rate lowers the private capital outflow when initially positive and otherwise does not change it.

**A rise in productivity growth**

The desired feasible private borrowing level is also rising in productivity growth:
\[ \partial b^* / \partial \theta > 0 \quad \text{if} \quad b^* > 0, \quad \text{if} \quad b^* = 0 \]  \quad (A13)

The inequality follows since the marginal dollar invested must yield \( \alpha \theta f'(k_{t+1}) \geq R \) since otherwise it would be better to borrow less. A rise in \( \theta \) makes it worth to borrow and invest an additional dollar on the margin while the growing right hand side of (3) makes it possible. \( b^* = 0 \) implies \( \partial b^* / \partial \theta = 0 \) since a rise in productivity growth only changes the capital stock held abroad.

By (5)

\[ \partial k_{t+1}^* / \partial \theta > 0 \]  \quad (A14)

and clearly

\[ \partial V^* / \partial \theta > 0 \]  \quad (A15)

### Appendix 3. Punishment by loss of access to future borrowing

Much of the literature argues that countries repay sovereign debt to preserve access to future borrowing (Kletzer and Wright 2000; Eaton and Gersovitz 1981; Conklin 1998). This appendix shows that the results of the paper hold also with “reputation” incentives rather than the direct output loss incentives in (3). Thus, suppose that the country has a stochastic output sequence \( y \in [y_l, y_h], y_l < y_h \). Each state occurs with probability one half. The country borrows \( b \) in the low output state in order to smooth consumption and repays \( Rb \) in the high state, with \( R \) the gross interest rate. However, the private sector receives only a share \( \alpha \) of a loan. For simplicity, the ruler is in office forever, but otherwise we can set \( \alpha = 1 \) after she leaves office Default is followed by exclusion from the world credit market in all future and there is no private storage (in practice, countries cannot self-insure completely). Since default incentives can bind only in the high output state in this setup, no-default requires

\[
\begin{align*}
    u(y_h) - u(y_h) - Rb & \leq \sum_{i=1}^{\infty} \delta^i \left[ u(y_h - Rb) + u(y_i + \alpha b) \right] - \sum_{i=1}^{\infty} \delta^i \left[ u(y_h) + u(y_i) \right] \\
\end{align*}
\]

where the private sector discount factor is \( 0 < \delta < 1 \). (B1) shows immediately that default incentives are declining in \( \alpha \). Therefore, as long as the country is credit constrained, the loan \( b \) is rising in \( \alpha : b = b(\alpha), b' > 0, b'' < 0 \), where concavity follows because utility is concave. Thus, democracy allows more borrowing, as in the main part of the paper.

#### Private control of borrowing

If the private sector controls borrowing, it solves

\[
\max_b u(y_i + \alpha b) + \partial u(y_h - Rb) \]  \quad (B2)

subject to (B1), implying
\( au'(y_i + \alpha b^* (\alpha)) \geq \delta Ru'(y_h - Rb(\alpha)) \) \hspace{1cm} (B3)

with equality if (B1) is not binding (this is the efficient solution given democracy) and inequality otherwise. If (B1) is binding, desired borrowing rises in democracy \( \alpha \) and otherwise it rises in democracy still as long as the substitution effect on first period income dominates the income effect, so that the left hand side of (B3) is rising in \( \alpha \) given \( b \). This holds for example for \( y_i \) sufficiently low, under an Inada assumption, since

\[
\frac{\partial au'}{\partial \alpha} h^* = au'(y_i + \alpha b^*) + u''(y_i + \alpha b^*)b^* > 0
\]
as the first term grows arbitrarily large at low income levels.

**Ruler control of borrowing**

The ruler solves (B1) with equality. Denote this solution \( b^e \). Odious debt again occurs if

\[
b^e - b^* \geq 0 \hspace{1cm} (B4)
\]

holds with inequality. The ruler then borrows inefficiently much on behalf of residents in bad times and the residents must repay undesirably much in good times, decreasing welfare. Notice that the capital flows into and out of the country will be excessively volatile across time. As in the main paper, sufficiently undemocratic countries,

\[
\alpha < \alpha^{od} \hspace{1cm} (B5)
\]

where \( \alpha^{od} \) is a threshold changing (B4) from equality to inequality, have odious debt: as democracy falls, eventually the private sector does not want to borrow up to the ceiling, but the small amount it does care to borrow gives a surplus to continued borrowing over the entire future horizon. The ruler can borrow against this surplus. Formally, rewriting (B1) gives

\[
u(y_h) - u(y_h - Rb) \leq \sum_{t=1}^\infty \frac{\delta}{(1 - \delta)} ([u(y_h - Rb) - u(y_h)] + [u(y_i + \alpha b) - u(y_i)]) / 2 ,
\]

\[
l \leq \frac{\delta}{(1 - \delta)} (-l + g) / 2 ,
\]

\[
l \leq \frac{\delta g}{2 - \delta}
\]

where \( l > 0 \) is the loss in utility from having the contract in the good state and \( g > 0 \) the gain due to having it in the bad state. For \( \alpha \) sufficiently small we have
\[
\frac{\partial l}{\partial b} = -Ru'(y_h - Rb) > \frac{\partial g}{\partial b} = au'(y_i + ab)
\]

which says that the utility lost due to extra repayment in good states exceeds the gain to extra borrowing in bad states. Thus, eventually (B1) becomes non-binding for the desired borrowing level (given democracy) and there is odious debt.

**A fall in the interest rate**

A decrease in \( R \) raises the feasible loan by raising the ceiling in (B1). The larger loan in turn raises the gain to democracy on the margin, since the term \( ab \) rises more for a marginal rise in \( \alpha \) when \( b \) is larger. Thus, \( \partial^2 b / \partial \alpha \partial R < 0 \). As in the paper, however, the loan increase due to a lower \( R \) given democracy means that the infra-marginal loss to democratizing grows. Formally, the ruler again sets

\[
(1 - \alpha)\frac{\partial b^*}{\partial \alpha} = b^*
\]

and so on the margin

\[
(1 - \alpha)\frac{\partial^2 b^*}{\partial \alpha \partial R} < \frac{\partial b^*}{\partial R}
\]

is required for a falling interest rate to raise democracy. This depends on parameters.

**A rise in productivity growth**

A rise in productivity growth actually tends to lower the gain to democracy with reputation-based punishment. This is because future income growth makes it less necessary to smooth future consumption when utility is concave, or more precisely the loss from being unable to smooth consumption is less. Formally, letting productivity growth be \( \theta - 1 > 1 \), (B1) becomes

\[
u(y_h) - u(y_h - Rb) \leq \sum_{t=1}^{\infty} \delta^t [u(\theta' y_h - Rb) - u(\theta' y_h)] + [u(\theta' y_i + ab) - u(\theta' y_i)] / 2
\]

which lowers the right hand side given any loan \( b \). The ruler can therefore borrow less. The smaller loan makes for less marginal benefit to democratizing on the margin, since the term \( ab \) rises less for a marginal rise in \( \alpha \). Thus \( \partial^2 b / \partial \alpha \partial \theta < 0 \). However, the infra-marginal loss also decreases. The ruler raises democracy in response to productivity growth if and only if

\[
(1 - \alpha)\frac{\partial^2 b^*}{\partial \alpha \partial \theta} > \frac{\partial b^*}{\partial \theta}
\]

which says that the change in the marginal benefit is less negative than the change in the marginal cost.

However, a more realistic assumption than exogenous productivity growth is that productivity is a function of access to international capital markets. If so, then supposing for simplicity constant productivity in autarky, (B1) gives
$$u(y_h) - u(y_h - Rb) \leq \sum_{i=1}^{\infty} \delta^i [u(\theta^i y_h - Rb) - u(y_h)] + [u(\theta^i y_i + \alpha b) - u(y_i)] / 2,$$

where the right hand side is clearly rising in $\theta$. Since the loan, and therefore the marginal gain to democracy, are rising in $\theta$, $\partial^2 b / \partial \alpha \partial \theta > 0$. However, the loan is also larger, and so we again require

$$(1 - \alpha) \partial^2 b^\varepsilon / \partial \alpha \partial \theta > \partial b^\varepsilon / \partial \theta$$

where now both terms are positive, for productivity growth to promote democracy. This again depends on parameters.