Version 0.7 / Date: Apr 2010

CREDIT AND COUPS: A MODEL OF POGGE'S (2002) PROPOSAL TO REFORM THE 'INTERNATIONAL BORROWING PRIVILEGE'

David Wiens

CONTENTS

1. THE PROBLEM

1.1. Motivation. Fledgling (i.e., unconsolidated) democratic governments face the problem of establishing a working democratic government and consolidating reforms in the face of destabilizing pressures. On the one hand, they must come to terms with their authoritarian predecessors. If they don't adequately address the injustices of the past, the victims retain suspicion about the sincerity of the reformers; if they punish past perpetrators too harshly, they risk rousing resistance from some who may still be in a position to threaten the regime.

On the other hand, fledgling democracies must figure out how to consolidate democratic reforms. Three sets of considerations guide this effort. First, they must anticipate the amount of immediate resistance and support with which the new policies will meet. Second, they must consider the incentive structure created by the new policies. Third, they must consider the 'neighbourhood effects' generated by the new policies — i.e., what sorts of precedents do the policies set for governments in a similar situation?

Pogge claims that the greatest threat faced by fledgling democracies are potential coups. To avert this threat, new governments must navigate the dilemma posed by attempts to deal with former military authoritarian leaders: punishments are likely to promote resistance, but leniency is likely to encourage coups (because leniency signals the opportunity to rule badly and get away with it).

1.2. Puzzle. How can fledgling democratic governments consolidate democratic reforms while splitting the horns of the dilemma posed by attempts to deal with former authoritarian leaders? The solution must dissuade undemocratic acquisition of power by a mechanism that survives such acquisition. (Otherwise, the deterrent mechanism could simply be overridden once power is unconstitutionally seized.) Pogge's solution is to decrease the utility of unconstitutional power (rather than decrease the probability of successfully seizing power unconstitutionally).

1.3. Pogge's proposal. *Enact an* Odious Debt Amendment*, i.e., a constitutional amendment to require that debts incurred by future unconstitutional governments (i.e., governments who acquire power by unconstitutional means) not be serviced at public expense.*

1.4. Anticipated effect. Lenders will reduce the amount of credit available to authoritarian governments and raise the interest rates at which authoritarian governments can borrow money. This makes the undemocratic acquisition and exercise of power less lucrative, thereby deterring future unconstitutional power acquisition.

2. THE MODEL

An important question from the perspective of institutional design is whether Pogge's amendment is likely to have the deterrent effect he anticipates. Since Pogge's claim is about the effect on the incidence of coups of switching from a world without the amendment to one with the amendment, I compare the outcomes of two games, one with the amendment in place, the other without. Whether to sign the amendment is not a strategic decision in the model. I simply treat the signing of the amendment as an exogenous shock. I also assume that, if enacted, the amendment is credibly enforced. This presents the best case scenario for Pogge's proposal.

To test Pogge's proposal, I model the interaction between two players, a *challenger* (C) and a *lender* (L). (To distinguish between the two, I refer to the challenger using male pronouns and the lender using female pronouns where convenience dictates.) At the start of the game, a fledgling democratic government is in place. The challenger poses a potential threat to undertake a coup against the democratic government. If the challenger attempts to seize power, I assume (for simplicity) that he succeeds and establishes an autocratic government. (Hence, I will use 'challenger' and 'autocrat' interchangeably to refer to C once he assumes office.) The lender is a foreign creditor in the business of extending loans to foreign governments. I assume (for simplicity) that the lender is the challenger's only available source of credit.

The game proceeds according to the following timeline.

(1) The players observe whether the amendment is in force or not.

(2) The challenger chooses whether to seize power. If he seizes power, the game moves to phase 3. If he refrains, the game ends with the status quo in place. The challenger gets a payoff of 0 and the lender gets a payoff of 1.

(3) C chooses whether to request a loan.

(4) The lender chooses whether to grant a loan to C.

(5) C spends the optimal amount of total income in an attempt to maintain political support.

(6) There is an exogenous challenge to C's power. C remains in office with probability $p(c)$ and is ousted with probability $1-p(c)$. If C remains in power and received a loan, he repays the loan with probability $1-\gamma$.[1] If C is ousted, he pays a fixed cost k. If L lent to C and the amendment is not in force, C's successor repays the loan. The players receive their payoffs.

The payoffs are as follows. Following Pogge, I assume that coups are motivated by 'greed' rather than 'grievance'.[2] Accordingly, C's payoff for any outcome is an increasing function

1 γ is defined below.

2 Cf. Collier and Hoeffler 1998; Collier and Hoeffler 2004.

of the total amount of revenue at his disposal and the probability he remains in office and a decreasing function of the cost of maintaining political support—i.e., the amount of the revenue he must spend to maintain political support. Once C seizes power, his objective is to choose a spending level c that maximizes his payoff given some value for λ, the amount of loan revenue he receives. C's objective function is formalized in (1).

$$\begin{aligned} U_C(c,\lambda) &= p(c)\left[R(y)+V(\lambda)-c-\lambda(1+r)\right]+\left[1-p(c)\right](-k) \\ &= p(c)\left[R(y)+V(\lambda)-c-\lambda(1+r)+k\right]-k \end{aligned} \tag{1}$$

Since C receives a payoff of 0 if he refrains from seizing power, C attempts a coup if and only if $U_C(c,\lambda) \geq 0$.

$R(y)+V(\lambda)$ is the total income at C's disposal when in office. $R(y)>0$ is the 'extra-credit' revenue; that is, the government revenue generated from non-loan income sources, y, such as resource extraction or taxation. For notational simplicity, $R(y)=R$ hereafter. $V(\lambda)$ is the credit-related revenue generated from the loan income. I assume that $V(\lambda)$ is instantaneously realized; that is, current-period credit-related revenue is generated from current-period loan income. (For symmetry, I assume that $R(y)$ is also instantaneously realized.) $V'(\lambda)>0$ and $V''(\lambda)<0$; that is, loan income yields diminishing marginal revenue. For simplicity, $\lambda=1$ if C receives any loans and $\lambda=0$ if C receives no loans. If C receives a loan, it must repay the lender the amount of the loan plus interest $(1+r)$, with $r>0$. $V(1)$ can be less than, equal to, or greater than $1+r$. If $V(1)\leq 1+r$, I call C 'unproductive'. If $V(1)>1+r$, I call C 'productive'. An unproductive C parlays the loan income into a net revenue decrease or (at best) net revenue stagnation. A productive C parlays the loan income into net revenue growth. For notational simplicity, $V(0)=0$ and $V(1)=V$ hereafter. $k\geq 0$ is the fixed cost to C of being removed from office.

$p(c)$ is the probability that C remains in office as a function of the amount $c>0$ that C spends on maintaining political support. c is subject to the budget constraint $c\leq M=R+V(\lambda)-\lambda(1+r)$. I assume that $p'(c)>0$ and $p''(c)<0$; i.e., c yields diminishing marginal probability. I also assume that $p(0)=0$ (i.e., if C spends nothing, he is guaranteed to be ousted) and $p(M)<1$ (i.e., even if C spends everything, he can't guarantee survival). Thus, $p(c)\in[0,1)$. Finally, $\operatorname{argmax}_c p(c)=M$; that is, spending everything yields the maximum survival probability.

I assume C spends the optimal amount once in office. There are two distinct optimal spending levels. If C obtains a loan $(\lambda=1)$, I denote the optimal spending level c^1 and define it as follows:

$$c^1 \equiv \underset{c}{\text{argmax}}\, p(c)\,(R + V - c - 1 - r + k) - k, \tag{2}$$

which means that

$$p'(c^1)(R + V - c^1 - 1 - r + k) - p(c^1) = 0. \tag{3}$$

If C does not obtain a loan $(\lambda = 0)$, I denote the optimal spending level c^0 and define it as follows:

$$c^0 \equiv \underset{c}{\text{argmax}}\, p(c)\,(R - c + k) - k, \tag{4}$$

which means that

$$p'(c^0)(R - c^0 + k) - p(c^0) = 0. \tag{5}$$

If we assume that $k < \frac{p(M)}{p'(M)}$, then we can see that c^1 and c^0 are interior solutions — i.e., $c^1, c^0 \in (0, M)$ — by examining (3) and (5). (The proof is in the appendix.) Since C can't credibly commit to spending a suboptimal amount once in office, the optimal c is fixed by (2) or (4). Once the optimal spending level is fixed, this fixes $p(c)$. For notational simplicity, $p(c^1) = p^1$ and $p(c^0) = p^0$ hereafter.

I assume that the lender's decision to lend or not is motivated solely by expected profit. If L chooses not to lend, she keeps her money and receives a payoff of 1; i.e., $U_L(\lambda = 0, c) = 1$. Whether the amendment is in force matters to L. If L lends and the amendment is not enacted, then she is able to extract repayment from C's successor. If L lends and the amendment is enacted, then she cannot extract repayment from C's successor and loses her money if C is removed from office. I assume that there is a general risk of default γ — i.e., that all debtors default with probability γ. L's payoffs for lending are formalized in (6).

$$U_L(\lambda = 1, c) = \begin{cases} (1-\gamma)(1+r) + \gamma 0 & \text{if no amendment} \\ p(c)[(1-\gamma)(1+r) + \gamma 0] + [1 - p(c)]0 & \text{if amendment} \end{cases} \tag{6}$$

r and $p(c)$ are defined as above. Although I assume that L is the only available source of credit for C, I can capture the effect of competition among multiple lenders by assuming that L is a 'price-taker' and that competition drives the market interest rate down to the minimum acceptable rate for all lenders given γ. Any lender lends if and only if doing so yields a greater payoff than not lending. Since this is true when $(1-\gamma)(1+r) + \gamma 0 \geq 1$, the market rate is set to $\underline{r} = \frac{\gamma}{1-\gamma}$.

3. NO AMENDMENT

I now characterize the outcome when the amendment is not in place. This serves as the baseline for assessing Pogge's claims about the effect of switching to a world where the amendment is enacted. In the base model, I assume C has no special difficulty borrowing money, so C borrows on the same terms as any other candidate for a loan.

Lemma 1. *Given $\underline{r}$, L always lends to C.*

This follows from the fact that $U_L(\text{lend}) \geq U_L(\text{no lend})$ when $r \geq \frac{\gamma}{1-\gamma}$.

For the purpose of assessing Pogge's prediction about the amendment's effect, it doesn't matter how well-off C is when in power — that is, whether C gets a loan (or not) when he prefers receiving one (or not). Consequently, I don't try to determine whether C requests a loan or not in equilibrium. Instead, given lemma 1, I solve for C's *seize threshold* for both cases, loan and no loan. These thresholds identify the cutpoints on the unit interval where C is indifferent between seizing power and refraining for both cases. For all probabilities greater than or equal to a threshold π, C seizes power. Call the interval from π to 1 inclusive the *coup space*. Pogge's claim is that the amendment will reduce C's coup space. Thus, to evaluate Pogge's claim, the relevant comparison is between the size of the coup space in the no amendment world and that in the amendment world. In this section, I characterize the coup space in the no amendment world. In the next section, I characterize the effect of the enacting the amendment on the size the coup space.

Note that C seizes power if and only if $U_C(\text{seize} \mid c, \lambda) \geq U_C(\text{refrain} \mid c, \lambda)$. Suppose C receives a loan. Then this is true when $p^1 \geq \frac{k}{R+V-c^1-1-r+k}$. To avoid notational confusion between the probability p^1 and the threshold, we can define the loan threshold as

$$\pi^1 = \frac{k}{R+V-c^1-1-r+k}. \tag{7}$$

Now suppose C does not receive a loan. Then the above inequality is true when $p^0 \geq \frac{k}{R-c^0+k}$. Again, to avoid notational confusion, we can define the no loan threshold as

$$\pi^0 = \frac{k}{R-c^0+k}. \tag{8}$$

Note that p^1 (p^0) is allowed to change depending on the definition of $p(\cdot)$, while π^1 (π^0) is fixed once c^1 (c^0) is determined and is therefore the same for all $p(\cdot)$. Thus, there is no necessary relationship between p^1 (p^0) and π^1 (π^0). This is summarized in the following propositions. (The proofs are left to the appendix.)

Proposition 1. *If C receives a loan, then: C seizes power if and only if C's probability of remaining in office is greater than or equal to the seize threshold for the loan case.*

Proposition 2. *If C does not receive a loan, then: C seizes power if and only if C's probability of remaining in office is greater than or equal to the seize threshold for the no loan case.*

The relationship of these cutpoints to each other differs depending on C's type, i.e., whether C is productive (C_P) or unproductive (C_U). To establish this, I first establish a series of lemmas that show the relationship between c^1 and c^0 as well as p^1 and p^0 for both types. I then use these lemmas to show the relationship between the seize thresholds for both types. (The proofs for lemmas 2 and 4 are left to the appendix.)

First, I treat the case when C is unproductive.

Lemma 2. *If C is unproductive, then C spends no less without a loan than with a loan ($c^0 \geq c^1$).*

Lemma 3. *If C is unproductive, then C is at least as likely to remain in office without a loan as with a loan ($p^0 \geq p^1$).*

This follows from lemma 2 and the fact that $p(c)$ is monotonically increasing in c. Now, the case when C is productive.

Lemma 4. *If C is productive, then C spends less without a loan than with a loan ($c^0 < c^1$).*

Lemma 5. *If C is productive, then C is less likely to remain in office without a loan than with a loan ($p^0 < p^1$).*

Now that we know the relationships between the optimal spending levels, we can determine the relationship between C's thresholds for both types of C. (The proofs are left to the appendix.)

Proposition 3. *If C is unproductive, then the loan threshold is no lower than the no loan*

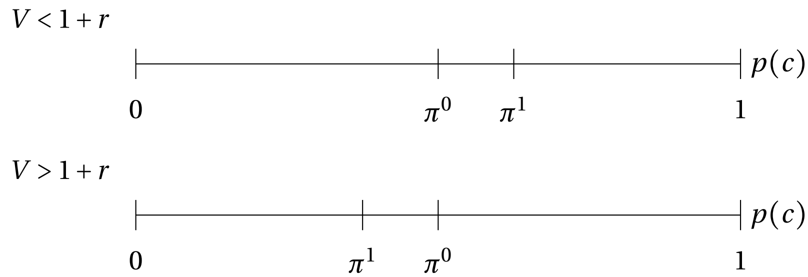

Figure 1. Relative thresholds for unproductive and productive types

threshold $(\pi^0 \leq \pi^1)$.

Proposition 4. *If C is productive, then the no loan threshold is higher than the loan threshold* $(\pi^0 > \pi^1)$.

Figure 1 depicts the key results of this section by showing the coup space for both types of challenger. The top line represents proposition 3, whereas the bottom line represents proposition 4. Note that the location of π^0 and π^1 along the interval is not important. π^0 is in the same location for each type because it's not a function of V, whereas π^1 is a decreasing function of V (see props. 3 and 4 above). The point here is to illustrate the location of the two thresholds *relative to each other*. The key question now is how introducing the amendment affects these coup spaces.

4. AMENDMENT

As is the case without the amendment, L lends if and only if doing so yields a greater payoff than not lending. Given the amendment, this is true when $r \geq \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)}$. Define $\hat{r}$ as the minimum acceptable rate for lending to C given the amendment.

Lemma 6. *Given the amendment,* γ*, and* p^1*,* L *lends to* C *if and only if* $r \geq \hat{r} = \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)}$.

Recall that the market rate is $\underline{r} = \frac{\gamma}{1-\gamma}$. Note further that $\underline{r} < \hat{r}$ for all $p^1 < 1$. Since C could agree to borrow at a rate greater than $\underline{r}$ if doing so benefited him, r could be greater than,

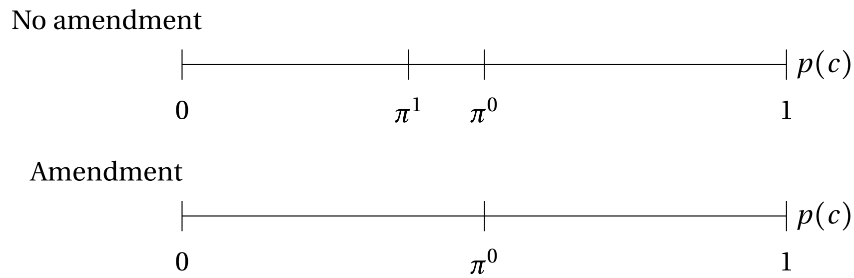

Figure 2. Threshold change for productive type

equal to, or less than $\hat{r}$ in the amendment world. However, C wouldn't agree to borrow at a rate greater than $\hat{r}$, since doing so harms him unnecessarily. Thus, in the amendment world, $r \in [\underline{r}, \hat{r}]$.

Suppose for now that L doesn't lend to C. If L doesn't lend, the effect of the amendment is fairly straightforward. When there was no amendment in force, the lower bound of C's coup space was defined by the lower of π^0 and π^1. When L doesn't lend, the effect of the amendment is to remove the option of seizing power and receiving a loan. Accordingly, with the amendment in place, the lower bound of C's coup space is now defined by the location of π^0. From proposition 3, it follows that, if C is unproductive, the size of the coup space is unchanged, since $\pi^0 \leq \pi^1$. However, from proposition 4, we see that the amendment reduces C's coup space if C is productive. This is depicted in fig. 2. Now that loans are no longer available, π^1 is no longer relevant.

Now suppose that L lends to C; that is, suppose the interest rate is set to $\hat{r} = \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)}$. Substituting $\hat{r}$ into (7) and solving for p^1, we see that C's seize threshold when it receives a loan is now

$$\pi^a \equiv \frac{1+k(1-\gamma)}{(R+V-c^1+k)(1-\gamma)} > \pi^1. \tag{9}$$

Thus, even if L lends to C, we can see that the amendment decreases C's coup space when C is productive.

The preceding is summarized in the following proposition. (The proof is left to the appendix.)

Proposition 5. *(1) If $r < \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)}$, then: (a) When C is unproductive, C's coup space is unchanged; (b) When C is productive, C's coup space is reduced to $p^0 \geq \pi^0$.*

(2) *If* $r \geq \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)}$*, then: (a) When C is unproductive, C's coup space is unchanged; (b) When C is productive, C's coup space is reduced to* $p^1 \geq \pi^a > \pi^1$.

Thus, we see that the amendment leaves the coup space of some challengers unaltered — viz., unproductive challengers — while it reduces the coup space of at least some types of challengers — viz., those challengers who profit from receiving a loan.

5. ANALYSIS

Proposition 5 partially confirms Pogge's conjecture. Under certain conditions, his proposed *Odious Debt Amendment* would reduce the threat of coup from challengers who receive net benefit from obtaining a loan. But we should hesitate to endorse Pogge's proposal. First, the outcome summarized by proposition 5 depends upon stringent best-case assumptions. Central among these are that the challenger poses no special lending risk without the amendment, and that the amendment is unproblematically enforced. Intuitively, if the challenger posed an additional lending risk in the absence of the amendment, then the minimum acceptable rate at which the lender would be willing to lend to the challenger would increase, perhaps as high as $\hat{r} = \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)}$. If this were the case, then the amendment would leave the coup space of all types of challengers unchanged. The effect of problematizing enforcement is straightforward. If the amendment is not credibly enforced, then the amendment fails to affect the lender's lending decision, in which case, the challenger's coup space remains unchanged.

The second reason we should hesitate to endorse the proposed amendment illuminates the advantages of modeling design prescriptions formally. By formalizing our premises, we're able to keep better track of a larger set of the proposed amendment's implications. Pogge's (and our) intuition (partially) tracks the effect of the amendment on the central issue: the number of coups undertaken against fledgling democracies. But intuition is incapable of keeping track of the numerous 'peripheral' consequences, many of which are are simply unanticipated. A formal model can act as a 'bookkeeping device' that enables us to examine these unanticipated consequences.

What follows is a framework for the rest of the analysis. While (3) is true in the model, I need to read some more empirical literature to vindicate (2) and (3).

Unanticipated consequences.

- The amendment doesn't deter unproductive challengers.
- The amendment increases the stability of unproductive challengers (see lemma 3).
- The amendment deters a subset of productive challengers, viz., the least stable among them $(\pi^1 \leq p^1 < \pi^0)$. The most stable productive challengers — $\pi^0 \leq p^0 < p^1$ — are undeterred.
- The amendment decreases the stability of undeterred productive challengers (see lemma 5).

So what?

(1) Unproductive autocrats produce less growth than productive ones (by definition).

(2) Unstable autocrats produce less growth than stable ones.

(3) Unproductive autocrats are less stable than productive ones.

Assessment.

- The amendment doesn't deter the worst kind of autocrat, viz., the least stable and least productive. Thus, the amendment increases the proportion of unstable and unproductive autocracies.
- The amendment makes it more difficult to remove the worst kind of autocrat.
- The amendment deters the least stable among the best kind of autocrat, viz., the most stable and most productive.
- The amendment doesn't deter the most stable among the best kind of autocrat.
- The amendment makes it easier to remove the best kind of autocrat and thereby diminishes the incentive to implement good economic policies.

6. APPENDIX

Claim. If $k < \frac{p(M)}{p'(M)}$ then $c^1, c^0 \in (0, M)$.

Proof. Assume that $p'(M)k - p(M) < 0$, which implies that $k < \frac{p(M)}{p'(M)}$. We can see that $c^1, c^0 \in (0, M)$ by examining (3) and (5). For notational simplicity, let $f_0(c) = p'(c^0)(R - c^0 + k) - p(c^0)$. First, notice that $R - c + k$ is positive and at its maximum when $c = 0$ and $p(0) = 0$. Second, both $p'(c)$ and $R - c + k$ are continuous and monotonically decreasing in c, while $p(c)$ is continuous and monotonically increasing in c. These two points, along with the assumption that $p'(M)k - p(M) < 0$, imply that $f_0(0) > 0$[3] and $f_0(M) < 0$. Since $f_0(c)$ is continuous on $[0, M]$ and $f_0(0) > 0 > f_0(M)$, it follows (by the Intermediate Value Theorem) that there exists some $c^0 \in [0, M]$ such that $f_0(c^0) = 0$.

If we let $f_1(c) = p'(c^1)(R + V - c^1 - 1 - r + k) - p(c^1)$, it follows by the same reasoning that there exists some $c^1 \in [0, M]$ such that $f_1(c^1) = 0$. □

Proposition 1. *If C receives a loan, then: C seizes power iff $p^1 \geq \pi^1 = \frac{k}{R+V-c^1-1-r+k}$.*

Proof. Assume C requests a loan. Then C spends c^1 once in office and remains in office with probability p^1. The threshold is identified by the cutpoint on the unit interval where C is indifferent between seizing power and refraining.

$$U_C(c^1, 1) = U_C(\text{refrain})$$
$$p^1\left(R + V - c^1 - 1 - r + k\right) - k = 0$$
$$p^1 = \frac{k}{R + V - c^1 - 1 - r + k}$$

To avoid notational confusion between the probability p^1 and the threshold, define the threshold as

$$\pi^1 \equiv \frac{k}{R + V - c^1 - 1 - r + k}.$$

Since C seizes power iff $U_C(c^1, 1) \geq U_C(\text{refrain})$, C seizes power iff $p^1 \geq \pi^1$. □

Proposition 2. *If C does not receive a loan, then: C seizes power iff $p^0 \geq \pi^0 = \frac{k}{R-c^0+k}$.*

3 Or, if we assume $p'(0)$ is undefined, $f_0(\varepsilon) > 0$ for some arbitrarily small $\varepsilon > 0$.

Proof. Assume C does not request a loan. Then C spends c^0 once in office and remains in office with probability p^0. The threshold is defined as the cutpoint on the unit interval where C is indifferent between seizing power and refraining.

$$U_C(c^0, 0) = U_C(\text{refrain})$$
$$p^0\left(R - c^0 + k\right) - k = 0$$
$$p^0 = \frac{k}{R - c^0 + k}$$

To avoid notational confusion between the probability p^0 and the threshold, define the threshold as

$$\pi^0 \equiv \frac{k}{R - c^0 + k}.$$

Since C seizes power iff $U_C(c^0, 0) \geq U_C(\text{refrain})$, C seizes power iff $p^0 \geq \pi^0$. □

Before proving the next lemmas, define $f_0(c)$ and $f_1(c)$ as above.

$$f_0(c) \equiv p'(c)(R - c + k) - p(c)$$
$$f_1(c) \equiv p'(c)(R + V - c - 1 - r + k) - p(c)$$

Comparing $f_0(c)$ and $f_1(c)$, we see that

$$f_1(c) = f_0(c) + p'(c)(V - 1 - r).$$

From (3) and (5), we know that $f_0(c^0) = 0$ and $f_1(c^1) = 0$.

Lemma 2. *If $V \leq 1 + r$ then $c^0 \geq c^1$.*

Proof. Suppose $V = 1 + r$. Then $p'(c^0)(V - 1 - r) = 0$ and $f_1(c^0) = 0$. It follows that $c^0 = c^1$.

Suppose $V < 1 + r$. Since $p'(c) > 0$, $p'(c^0)(V - 1 - r) < 0$. Thus, $f_1(c^0) < 0$. Since c^1 is an interior maximum, it follows that c^0 is to the right of c^1, which means that $c^0 > c^1$.

Thus, if $V \leq 1 + r$, $c^0 \geq c^1$. □

Lemma 4. *If $V > 1 + r$ then $c^0 < c^1$.*

Proof. Suppose $V > 1 + r$. Since $p'(c) > 0$, $p'(c^0)(V - 1 - r) > 0$. Thus, $f_1(c^0) > 0$. Since c^1 is an interior maximum, it follows that c^0 is to the left of c^1, which means that $c^0 < c^1$. □

Proposition 3. *If* $V \leq 1 + r$ *then* $\pi^0 \leq \pi^1$.

Proof. Suppose $V = 1 + r$.

$$\begin{aligned} U_C(c^1, 1) &= p(c^1)\left[R - c^1 + k + V - 1 - r\right] - k \\ &= p(c^1)\left[R - c^1 + k\right] - k \end{aligned}$$

Since $c^1 = c^0$ (from lemma 2), $U_C(c^1, 1) = U_C(c^0, 0)$ [from (1)], which means that C is indifferent between seizing power with a loan and seizing power without a loan. If follows that $\pi^1 = \pi^0$.

Now suppose $V < 1 + r$. Recall the definitions of π^0 and π^1 [given above in (7) and (8)].

$$\begin{aligned} \pi^0 &\equiv \frac{k}{R - c^0 + k} \\ \pi^1 &\equiv \frac{k}{R + V - c^1 - 1 - r + k} \end{aligned}$$

$\pi^0 < \pi^1$ iff $c^0 - c^1 < 1 + r - V$.

$$\begin{aligned} \pi^0 &< \pi^1 \\ \frac{k}{R - c^0 + k} &< \frac{k}{R + V - c^1 - 1 - r + k} \\ c^0 - c^1 &< 1 + r - V \end{aligned} \tag{10}$$

From (3), it follows that $c^1 = R + V - 1 - r + k - \frac{p^1}{p'(c^1)}$. From (5), we get $c^0 = R + k - \frac{p^0}{p'(c^0)}$. Substituting into (10), we get

$$\begin{aligned} R + k - \frac{p^0}{p'(c^0)} - \left[R + V - 1 - r + k - \frac{p^1}{p'(c^1)}\right] &< 1 + r - V \\ \frac{p^1}{p'(c^1)} &< \frac{p^0}{p'(c^0)} \end{aligned} \tag{11}$$

Given that $V < 1 + r$, it follows from lemma 3 that $p^0 > p^1$. From the concavity of $p(\cdot)$, it follows that $p'(c^0) < p'(c^1)$. Thus, (11) holds. Consequently, (10) holds, from which it follows that $\pi^0 < \pi^1$.

Thus, if $V \leq 1+r$, $\pi^0 \leq \pi^1$. □

Proposition 4. *If* $V > 1+r$ *then* $\pi^0 > \pi^1$.

Proof. The proof follows the same reasoning as in the case when $V < 1+r$. The difference is that I must now show that $\frac{p^1}{p'(c^1)} > \frac{p^0}{p'(c^0)}$, which follows from lemma 5 and the concavity of $p(\cdot)$. □

Proposition 5.

(1) If $r < \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)}$, then: (a) When $V < 1+r$, C's coup space is unchanged; (b) When $V > 1+r$, C's coup space is reduced to $p^0 \geq \pi^0$.

(2) If $r \geq \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)}$, then: (a) When $V < 1+r$, C's coup space is unchanged; (b) When $V > 1+r$, C's coup space is reduced to $p^1 \geq \pi^a > \pi^1$.

Proof. **Case 1.** Suppose $r < \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)}$. Accordingly, the effect of the amendment is to remove the option of seizing power and receiving a loan. Now that loans are no longer available, π^1 is no longer relevant. Thus, the lower bound of C's coup space is now defined by the location of π^0. If C is unproductive, it follows from proposition 3 that the size of the coup space is unchanged. If C is productive, it follows from proposition 4 that the amendment reduces C's coup space.

Case 2. Suppose $r = \hat{r}$. If C is unproductive, it follows from proposition 3 that the size of the coup space is unchanged.

If C is productive, it follows from prop. 4 that the lower bound of C's coup space is defined by π^1. To see the effect of the amendment on π^1 when C is productive, substitute $\hat{r} = \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)}$ into (7). Solving for p^1, we see that C's seize threshold when it receives a loan is now

$$\pi^a \equiv \frac{1+k(1-\gamma)}{(R+V-c^1+k)(1-\gamma)}. \tag{12}$$

Now notice that $\underline{r} < \hat{r}$ for all $p^1 < 1$.

$$\begin{aligned} \frac{\gamma}{1-\gamma} &< \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)} \\ p^1\gamma &< 1-p^1+p^1\gamma \\ p^1 &< 1 \end{aligned}$$

Since

$$\frac{\partial \pi^1}{\partial r} = \frac{k}{(R+V-c^1-1-r+k)^2} > 0 \tag{13}$$

and $\underline{r} < \hat{r}$ for all $p^1 < 1$, it follows that $\pi^1 < \pi^a$. Thus, even if $r \geq \frac{1-p^1(1-\gamma)}{p^1(1-\gamma)}$, we can see that the amendment decreases C_P's coup space. □

REFERENCES

COLLIER, PAUL and ANKE HOEFFLER. 1998. 'On Economic Causes of Civil War'. *Oxford Economic Papers* 50: 563–573.

— 2004. 'Greed and Grievance in Civil War'. *Oxford Economic Papers* 56 (4): 563–595.