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A GAME-THEORETIC MODEL OF THE COUP D'ÉTAT

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I explore the comparative vulnerability of regimes to a coup d'état using a game-theoretic model. Analysis centers on leaders of groups capable of intervening at the time of a coup. I prove the existence of an equilibrium in which a coup is attempted without restrictions on current government policy, the breadth of participation in politics, or the relative size of the conspiracy. Comparative statics results concerning the willingness of plotters to stage a coup and other leaders to join a coup once under way are established. Differences in comparative regime vulnerability stem from differences in the amount of organization required to attempt a coup.

> Instead of asking why the military engage in politics, we ought surely ask why they do otherwise. For at first sight the political advantages of the military vis-à-vis other and civilian groups are overwhelming. The military possess vastly superior organization. And they possess *arms*.
>
> (S. E. Finer, 1988, p. 5)

1. INTRODUCTION

PUBLIC CHOICE provides a positive theory of the political process. Most public choice scholarship analyzes democratic decision-making, resulting in theories of elections, committees and legislatures, and bureaucracy. But historically democracy has prevailed in only a minority of the world's nations. The most prevalent form of non-democratic regime change is the coup d'état, more common than elections in many nations.[1]

A coup d'état is not a revolution; instead it involves "the infiltration of a small but critical segment of the state apparatus, which is then used to displace the government from its control of the remainder" (Luttwack, 1969, p. 12). An extensive political science and sociology literature on military intervention flourished in the 1960s and 1970s. Theories of coup causation focused on the military's "disposition to intervene" and the "opportunity to intervene," respectively the goals of and capacity for intervention (Finer, 1988). Motives

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[1] Nordlinger (1977, p. 78) reports 229 successful and unsuccessful coup attempts between 1946 and 1970 while David (1987, pp. 1, 9) counts 183 successful and 174 unsuccessful coups in the Third World between 1945 and 1985, with over two-thirds of these nations experiencing at least one coup attempt.

include the self-interest of individual officers, the corporate interests of the officer corps, protection of the middle class, and economic development (Decalo, 1976; Nordlinger, 1977, pp. 19–85). The level of political development and the strength of political institutions determine the opportunity for intervention (Huntington, 1968; Finer, 1988). I seek to explain the vulnerability of regimes to a coup, since the motives of plotters will be many and varied.

Public choice scholars have examined revolution, beginning with Tullock (1971). The economic model of revolt allows only the winning side to impose rewards or punishments.[2] Tullock (1974, pp. 60–88) presents the elements of a model of the coup, but focuses on the timing of the decision to support a coup once the attempt is under way. Public choice has paid little attention to the coup.[3]

I develop a very general game-theoretic model of the execution of the coup.[4] I prove a coup feasibility result (Proposition 1) which suggests the vulnerability of all nations to organized plots. If no player possesses too much of the overall strength, an equilibrium exists where all join the coup attempt. I then consider the organization of a conspiracy. Complications such as the size of a nation, complementary inputs in the production of power, and regime legitimacy greatly increase the difficulty of staging a coup. I argue that differences in comparative vulnerability to the coup d'état stem from differences in the amount of formal planning necessary to organize a coup. I do not investigate the efficiency properties of the coup, but do presume that coups lower national welfare.[5]

The remainder of this paper proceeds as follows. Section 2 presents the basic coup execution game. Section 3 analyzes the game and the determinants of regime vulnerability. Section 4 considers organization of the coup, and how development increases the amount of planning required to stage a coup. Section 5 discusses how my model illuminates aspects of actual coups d'état. The final section considers implications of the results.

[2] The economic model of revolt actually lends itself more readily to an analysis of coups, where the outcome is determined in a matter of hours or days, than revolutionary wars. Many "revolutions" actually resemble wars between nations more than the model of revolt since intermediate goals (as opposed to final victory) and coercion motivate individual participation. Contributions to the economics of revolution literature include Roemer (1985), Kuran (1989), and Grossman (1991).

[3] Other related papers include: Usher and Engineer (1987) who examine a dictator's choice of a distribution of wealth among subordinates which deters revolt; Grossman and Noh (1990) who examine the tax rate choice of a ruler facing potential revolt; and Wantchekon (1994) who examines voting when competing parties possess an outside (possibly a coup) option.

[4] Analysts often simply assume the impossibility of military intervention in a modern democracy; this should be demonstrated, not assumed. Ironically the vulnerability of European democracies was the major concern of Curzio Malaparte (1932), an early theorist of the coup. The fall of the Fourth Republic in France in 1958 and the serious threat to de Gaulle's regime in the April 1961 Algerian uprising suggest that "modern" democracies are not invulnerable.

[5] Nordlinger (1977) documents the poor performance of many military governments. Londregan and Poole (1990), Barro (1991), and Murphy et al. (1991) present empirical evidence that coups lower economic growth. Coups may have beneficial effects: Huntington (1968) suggests occasional coups prevent more cataclysmic upheavals, while Snyder (1992) considers the coup as an efficient means of ousting dictators.

2. A MODEL OF THE COUP D'ÉTAT

2.1 Modelling Political Competition in a Praetorian Society

Construction of a formal model must consider three phases of the coup. In the first phase plotters recruit conspirators and plan the technical details of the coup. The second involves the execution of the coup, when the tanks roll and other leaders react. The third consists of possible accommodation of plotters by the current regime. A full understanding of the coup on politics requires examination of all three phases. The execution phase seems the reasonable place to begin. Potential conspirators must estimate prospects of success for a coup plot; formation of these expectations requires a model of the execution phase. On the other hand, a regime will estimate the probability of overthrow, as in Grossman and Noh's (1990) model of kleptocracy, before negotiating with conspirators. Determining the plausible properties of a coup probability function requires a model of the execution phase.

Two features of the game reflect my focus on the execution phase. First, I model the "coup leader" as a single player, though this may in reality be a group of conspirators. The recruitment of conspirators occurs in the organization phase, considered in section 4. Second, the current regime is not a player; status quo policy is exogenous. The government must be an active player to accommodate dissidents. The present model actually provides greater insight into comparative regime vulnerability than a game between the current government and a coup leader. The equilibrium probability of a coup in a game between the regime and its opponents does not reveal the regime's vulnerability if it fails to accommodate the opposition.

2.2 Players, Strategies, and Outcomes

The coup game has $m+1$ players, the "leaders" of groups and organizations in the nation. Each group is a single player, implying that all members follow orders; I use the terms leader and group interchangeably. Capacity for collective action in a potential conflict situation and ability to act in a timely fashion are criteria for inclusion as players. The model considers only the key hours and days of the coup, which rules out organization of new groups. The armed forces certainly possess such capacity for action, but trade unions, political parties and key technicians can also affect the outcome of a coup.[6] Groups unable to intervene in time due to physical distance or technical immobilization are excluded (Luttwack, 1969). I model only a single play of the game because a coup attempt can result in a significant turnover of leadership positions.

The coup leader, who represents all those participating by prior agreement, is the key player. If the coup is staged, the m other leaders simultaneously decide to join the coup (j), oppose the coup (o), or remain neutral (n). Superscripts reference the players: c refers to the coup leader, i the other leaders, and g the

[6] Other leaders can include relevant foreign interests.

status quo government. Let v^i, $i = 1, \ldots, m$, equal 1 if i joins the coup and 0 otherwise. Let w^i equal 1 if i opposes the coup and 0 otherwise; $v^i = w^i = 0$, indicates i remains neutral.

The game has three outcomes: the coup can succeed with the coup leader taking power, the status quo government can remain in power (either because the coup fails or the coup leader aborts the attempt), or a civil war could result. Civil war represents any extended struggle beyond the scope of my model, where the number and strength of groups can vary.

2.3 *Payoffs*

Leaders receive utility from government policies and from rents (or punishments). Let Y be the policy space with y^q and y^c the policies of the status quo government and the coup leader. (Table 1 contains a summary list of variables.) I consider only policies, not the decision-making structure of the status quo or post-coup governments. The typical leader's payoff is[7]

$$U^i + z^i + u^i(y).$$

Utility from government policy is given by $u^i(\cdot)$. The z component of utility represents a rent from a leadership position (if positive) or punishment (if

TABLE 1 SUMMARY DESCRIPTION OF VARIABLES

Symbol	Description
v^i	indicates if leader i joins the coup
w^i	indicates if leader i opposes the coup
y	government policy
y^g	policy of the prior government
y^c	policy proposed by the coup leaders
$u^i(y)$	utility for leader i from policy y
S^i	strength of forces under leader i
S^c	strength of forces in the coup coalition
S^g	strength of forces directly loyal to government
$S(c)$	total strength of the coup forces
$S(q)$	total strength of forces opposing the coup
$Z(y)$	total amount of rent obtained by government with policy y
ζ^i	initial amount of rent received by leader i
W	probability of a civil war
F	probability the coup will fail, given no civil war
$P(c)$	punishment profile of coup leaders
$P(q)$	punishment profile of current government

[7] The expected duration of policy resulting from the coup does not depend on the winning side.

negative). Negative payoffs can result from imprisonment, torture, exile, and execution. The payoff of dismissal from leadership is normalized to zero. Assume $-K < 0$ is a lower bound on punishments.

Let $Z(y)$ be the total amount of rent available as a function of policy; this constitutes a budget constraint for the punishment profiles. Rent cannot be collected in case of civil war. Let $\zeta^i, i = 1, \ldots, m, \zeta^g$, and ζ^c (all ≥ 0) be the status quo rent distribution. Assumption I requires that the coup leader initially receives less rent than the current government. The relative low pay of military officers, who often plot coups, and the ego rents of top government positions justify this assumption.

Assumption I. $\zeta^g > 0$ and $\zeta^g \geq \zeta^c$.

Let $u^i(cw)$ be the policy utility of civil war. I assume all leaders prefer any policy outcome to civil war, a preference revealed by many leaders. For example, loyalist forces in Poland in 1926 explicitly chose not to continue the struggle after Pilsudski's forces captured Warsaw (Rothschild, 1966).

$$u^i(y) \geq u^i(cw) \quad \text{for every } y \in Y, i = 1, \ldots, m, c. \tag{1}$$

2.4 *The Technology of Coups and Their Suppression*

Let S^i (> 0) be the strength of leader I's forces. Let S^c (S^g) be the strength of the coup leader's (government's) forces. The government's forces oppose any coup attempt.[8] Assumption II requires that the coup leader possesses some strength to stage a coup. A coup requires some type of act, like seizing the presidential palace, not simply an announcement.

Assumption II. $S^c > 0$.

Let $S(c)$ and $S(g)$ be the strength of the coup leader and regime after the other leaders decide to participate. These amounts are

$$S(c) = S^c + \sum_{i=1}^{m} v^i \cdot S^i; \quad S(g) = S^g + \sum_{i=1}^{m} w^i \cdot S^i.$$

I use two conflicting functions to represent the coup's three outcomes. Let $W(S(c), S(g))$ give the probability of civil war as a function of the strength of the opposing factions. Let $F(S(c), S(g))$ give the probability the coup fails, given that a civil war does not occur. Let $S_{-i}(c)$ and $S_{-i}(g)$ be the strengths of the coup and government factions given the strategies employed by all leaders except i. Let W^j and F^j be the probabilities which result if a leader joins the coup, for any strategy combination of the other leaders. Similarly let W^n, F^n and W^o, F^o be

[8] Declaring forces loyal to the regime is problematic; units assigned to defend the government often fail to do so. Section 4.3 relates S^c to the legitimacy of the current regime.

the probabilities if a leader remains neutral or opposes the coup. The probability the coup fails plausibly increases in $S(g)$ and decreases in $S(c)$, implying $F^j < F^n < F^o$. Evenly balanced forces and a larger proportion of forces engaged at a given balance plausibly increase the probability of civil war. I assume then that $W^j < W^o$ when $S_{-i}(c) \geq S_{-i}(g) + S^i$ while $W^o < W^j$ if $S_i(c) + S^i \leq S_{-i}(g)$. For technical reasons I impose several additional restrictions on W and F. The properties of these functions are summarized as follows:

Assumption III

(i) $W(0, \cdot) = W(\cdot, 0) = 0$;
(ii) For any group i, if $s_{-i}(c) \geq S_{-i}(g) + S^i$ for a given strategy profile for the other leaders, $W^j < W^n < W^o$;
(iii) For any group i, if $S_{-i}(c) + S_i \leq S_{-i}(g)$ for a given strategy profile for the other leaders, $W^o < W^n < W^j$.

Assumption IV

(i) $F(0, s) = 1$, $F(s, 0) = 0$ for any $s > 0$;
(ii) $F(s, s) = 0.5$ for any $s > 0$;
(iii) $F^j < F^n < F^o$.

Assumption V. $F(a, b) = 1 - F(b, a)$ and $W(a, b) = W(b, a)$ for all a, b.

Assumption VI. $W(\cdot, \cdot)$ and $F(\cdot, \cdot)$ are differentiable with

$$\frac{\delta(1-W)\cdot(1-F)}{\delta S(c)} > 0; \quad \frac{\delta(1-W)\cdot F}{\delta S(c)} < 0; \quad \frac{\delta(1-W)\cdot(1-F)}{\delta S(g)} < 0; \quad \frac{\delta(1-W)\cdot F}{\delta S(g)} > 0.$$

2.5 *Punishment Profiles*

A *punishment profile* lists the z payoff (punishment or reward) for each leader contingent on their decision to join or oppose the coup, and payoffs for the coup leader and current government. Let $P(c)$ and $P(g)$ be the punishment profiles offered by the coup leader and the government. $P(g)$ also includes an extra payoff to the coup leader if he aborts the coup, $p^a(g)$. I simplify the set of allowable punishment profiles by allowing each leader's punishment or reward to depend only on his action. This allows the profiles to be written:

$$\begin{aligned} P(c) &= \{[p_j^i(c), p_n^i(c), p_o^i(c)], i = 1, \ldots, m, p^c(c), p^g(c)\} \\ P(g) &= \{[p_j^i(g), p_n^i(g), p_o^i(g)], i = 1, \ldots, m, p^g(g), p^c(g), p^a(g)\}. \end{aligned} \tag{2}$$

I impose several further restrictions on punishment profiles. First, the government and the coup leader cannot receive a lower rent payoff if they "win," $p^g(g) \geq \zeta^g$ and $p^c(c) \geq \zeta^c$. Second, an action by leader i favoring the side in question does not lower i's payoff, condition (iii) in the definition below.

Finally, punishment profiles satisfy the rent constraint $Z(y)$. I assume a punishment imposed on one leader does not generate a transferable rent, which rules out confiscation of personal wealth. $p^c(c)$ and $p^g(g)$ can be defined residually on the other leaders' actions to satisfy rent constraints. Only the lower bound $-K$ constrains punishments. Given the other conditions, the budget constraint imposes on $P(g)$ and $P(c)$:

$$\sum_{i=1}^{m} \max(p_o^i(g), 0) + p^g + \max(p^c(g), 0) = Z(y^g); \tag{3}$$

$$\sum_{i=1}^{m} \max(p_j^i(c), 0) + p^c + \max(p^g(c), 0) = Z(y^c). \tag{4}$$

For any policy $y \in Y$, let $\Omega(y)$ be the set of *allowable* punishment profiles meeting the above conditions. I restrict the government and coup leader to using allowable profiles in Ω, $P(g) \in \Omega(y^g)$, $P(c) \in \Omega(y^c)$.

Definition. A punishment profile is *allowable* if (i) Leader i's payoff does not depend on other leaders' actions; (ii) $p^g(g) \geq \zeta^g$ and $p^c(c) \geq \zeta^c$; (iii) $p_j^i(g) \leq p_n^i(g) \leq p_o^i(g)$ and $P(c), p_j^i(c) \geq p_n^i(c) \geq p_o^i(c)$ for each i; (iv) $P(g)$ and $P(c)$ satisfy the rent constraint in (3), (4).

I am interested in regime vulnerability. Status quo government policy is exogenous in my model; y^g and $P(g)$ are implemented if the coup fails or is aborted. Government is not a player and cannot adjust policy to buy off a coup. When the tanks roll it is too late for the government to bargain with plotters [although $P(g)$ can reward loyalists]. An earlier attempt to accommodate coup plotters might include changing policy. The coup leader first announces his policy and punishment profile, y^c and $P(c)$, which are binding if the coup succeeds, and then chooses to stage the coup.[9]

The following preliminary result establishes that the coup leader can offer higher rent to each leader than the government. (All proofs are in the Appendix.)

Lemma 1. Given i, for any $P(g) \in \Omega(y^g)$ there exists $P(c) \in \Omega(y^c)$ such that $p_j^i(c) \geq p_o^i(g)$ and $p_n^i(c) \geq p_n^i(g)$ for each $i = 1, \ldots, m$.

3. ANALYSIS OF THE GAME

I consider coup games of the form

$$\Gamma = \{m, S, Y, \Omega(y), Z(\cdot), u^i(\cdot), i = 1, \ldots, m, u^c(\cdot), W(\cdot, \cdot), F(\cdot, \cdot), y^g, P(g)\}. \tag{5}$$

[9] This rules out a number of interesting but complicated possibilities, such as a change in the status quo regime due to a failed coup, like in the Soviet Union in 1991.

I employ subgame perfect equilibrium to rule out deterrence of a coup via a non-credible promise to support the government. I employ the following definition of regime vulnerability.

Definition. A coup is *feasible* for game Γ if there exists a subgame perfect equilibrium of Γ in which the coup leader stages the coup.

Feasibility implies only that the coup is staged in equilibrium, not that it succeeds. A much stronger vulnerability condition would require that the coup be staged in every SPE of Γ.

Each combination of the coup leader's policy and punishment profile specifies a proper subgame of Γ, $\Gamma'(y^c, P(c))$. Each subgame Γ' itself contains one proper subgame in which the coup leader chooses to stage the coup, $\Gamma''(y^c, P(c))$. Given W^j, F^j, W^n, F^n, W^o, and F^o, leader i's payoffs from joining the coup, remaining neutral, and opposing the coup in any subgame Γ'' are

$$EU^i(k) = [p_k^i(g) + u^i(y^g)] \cdot (1 - W^k) \cdot F^k + [p_k^i(c) + u^i(y^c)] \cdot (1 - W^k) \cdot (1 - F^k) + u^i(cw) \cdot W^k, \quad k = j, n, o. \tag{6}$$

Each Nash equilibrium (NE) of the subgame Γ'' defines probabilities W^* and F^*. These probabilities then determine the coup leader's net payoff from staging the coup in subgame Γ',

$$[p^c(g) + u^c(y^g)] \cdot (1 - W^*) \cdot F^* + [p^c(c) + u^c(y^c)] \cdot (1 - W^*) \cdot (1 - F^*) + u^c(cw) \cdot W^* - p^b(g) - u^c(y^g). \tag{7}$$

An NE of $\Gamma''(y^c, P(c))$ together with the coup leader's choice to stage or abort the coup constitutes an NE of $\Gamma'(y^c, P(c))$. A combination of NEs of the subgames Γ' together with the coup leader's utility maximizing choice y^c and $P(c)$ comprise an SPE of the entire game.

3.1 A Coup Feasibility Result

The coup game Γ is too complicated to solve for the entire set of equilibria. Rather, I demonstrate the feasibility of a coup for the class of coup games in (5), establishing conditions under which $v^i = 1, i = 1, \ldots, m$, is an equilibrium.

Proposition 1: Coup Feasibility Result. Assume I–V. If the forces directly loyal to the government are sufficiently small, a coup is feasible.

The factors not used in establishing Proposition 1, current government policy, initial distribution of rent, distribution of strength among the leaders, number of leaders, and size of the coup coalition, indicate the strength of the result. For instance, we might expect that a judicious choice of current government policy would make a coup impossible, but Proposition 1 demonstrates otherwise. Finer (1988, pp. 77–88) and Huntington (1968, pp. 229–232) argue that the coup d'état

requires narrow participation in politics. The breadth of participation corresponds to the number of leaders m, which Proposition 1 demonstrates is not a determinant of feasibility.

Proposition 1 resembles cycling results in majority voting models (Plott, 1967; McKelvey, 1976). Setting $y^c = y^g$ renders policy irrelevant so the rent distribution determines other leaders' preference between the coup and status quo. The coup leader can outbid the government for the support of each other leader since $\zeta^c \leqslant \zeta^g$. If the government has little strength, the support of all other leaders insures the coup's success.

3.2 *Further Analysis of the Coup Game*

The Coup Feasibility employs the fact that joining the coup is leader i's best response when $F \approx 0$. Two other equilibria seem likely: one in which all leaders oppose the coup, and one in which leaders remain neutral. An equilibrium in which all leaders support the government and the coup leader does not stage the coup generally exists if $S^c \approx 0$.

Consider a leader's decision to join a coup attempt in progress. Ignoring the effect of leader i's participation on the outcome of the coup, leader i's payoffs can be written

$$[p_k^i(g) \cdot F + p_k^i(c) \cdot (1 - F) + u^i(y^g) \cdot F + u^i(y^c) \cdot (1 - F)] \cdot (1 - W) + u^i(cw) \cdot W, \quad \text{where } k = j, n, o. \tag{8}$$

Figure 1 graphs these payoffs as functions of the probability the coup fails, F. $EU^i(j)$ is the highest payoff when $F \approx 0$ while $EU^i(o)$ is highest when $F \approx 1$. Remaining neutral is the best strategy when the outcome is uncertain, $F \approx 0.5$, and both the coup leader and government impose large punishments on their opponents.[10] The payoff curve $EU^i(n)'$ [$EU^i(n)''$] illustrates the case where remaining neutral is [is not] a best response for intermediate values of F. The exact location of $EU^i(n)$ determines the volatility of outcomes in the game. A small change in the expected outcome causes the leader to switch sides with $EU^i(n)''$, while bandwagon effects (Tullock, 1974: Kuran, 1989; Lichbach, 1995) can exist if many leaders' payoffs resemble $EU^i(n)''$. Outcomes are less volatile if most leaders remain neutral for a range of F-values, as with $EU^i(n)'$.

The simplified payoffs in (8) also provide insight concerning the coup leader's choice of $P(c)$. Let $\alpha_i = p_j^i(c) - p_n^i(c)$ and $\beta_i = p_n^i(c) - p_o^i(c)$ be the difference in payoffs the coup leader offers to leader i. Given $P(g)$ and F, (8) implies that leader i prefers remaining neutral to opposing the coup if

$$\beta_i \geqslant [p_o^i(g) - p_n^i(g)] \cdot F/(1 - F), \tag{9}$$

[10] Whether $EU^i(n)$ increases as F increases from 0 is indeterminate. Figure 1 could be drawn either way.

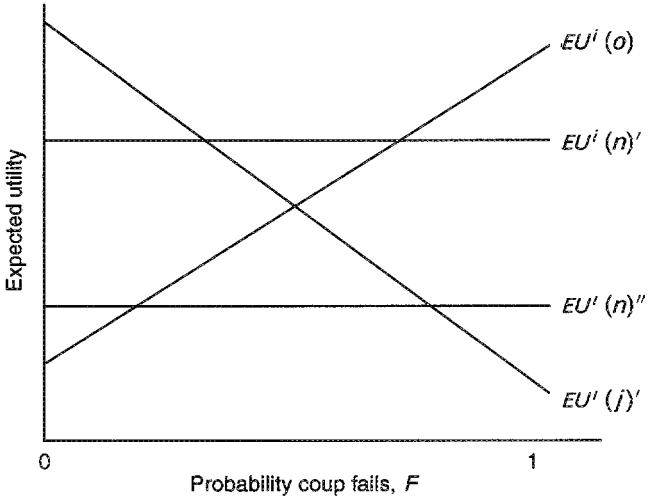

Figure 1. The decision to join the coup.

and that leader i prefers joining the coup to remaining neutral if

$$\alpha_i \geq [p_n^i(g) - p_j^i(g)] \cdot F/(1 - F). \tag{10}$$

Let α_i^* and β_i^* be the values of α_i and β_i for which (9) and (10) hold with equality. β_i^* is the minimum payoff leader i requires to not defend the government; α_i^* is the additional payoff required to support the coup. The coup leader benefits from an increased probability of success when a leader joins. But leader i's cooperation comes at the cost of a higher share of government rents. The coup leader can try to secure leader i's support by threatening punishment. Punishment is not costly in this model and succeeds if $\alpha_i^* + \beta_i^* \leq K$; if punishment works, the coup leader will set α_i, β_i to induce i's participation.

The coup leader can within limits choose which leaders to have support the coup. For instance, setting $\alpha_i = 0$ removes the incentive for leader i to join the coup. Let b be the punishment the coup leader avoids by aborting the coup, $b = p^a(g) - p^c(g)$. The coup leader stages the coup in any subgame Γ' (assuming $W^* < 1$) if and only if

$$F \leq 1 - \frac{b + W^* \cdot [p^c(g) + u^c(y^c) - u^c(cw)]}{(1 - W^*) \cdot [p^c(c) + u^c(y^c) - p^c(g) - u^c(y^g)]}. \tag{11}$$

Let F^c be the largest value of F for which (11) holds; $1 - F^c$ is the minimum probability of success for which the coup leader proceeds. When $F(S^c, S^g) \leq F^c$ the coup leader stages the coup if all leaders remain neutral. When

$F(S^c, S^g) > F^c$ the coup leader requires support from some leaders to attempt the coup. If this cooperation requires rent payments, the value F^c falls.

The coup leader's ideal policy is probably not y^g. The coup leader increases his payoff *given that the coup succeeds* by choosing a more preferred policy. Setting $y^c \neq y^g$ provides leaders preferring y^c (y^g) a greater incentive to join the coup (support the current regime). If all leaders prefer some y' to y^g, setting $y^c = y'$ raises the coup leader's payoff. A policy change can substitute for rent in inducing leader i to join the coup. Policy though is a public good; leader i benefits from y^c as long as the coup succeeds. A leader's effect on the coup outcome determines the impact of policy on their payoffs. Policy is a useful inducement only for relatively powerful leaders.

3.3 Comparative Statics

Multiple equilibria complicate the derivation of comparative statics results. We can, however, examine variables affecting the payoffs regardless of the values of W^* and F^* in a given subgame Γ'. Proposition 2 provides results for the coup leader and Proposition 3 for the other leaders.

Proposition 2. Assume III–VI. Each of the following makes the coup leader more likely to stage the coup for a given NE of subgame Γ'':

(a) an increase in the punishment if the coup fails ($p^c(g) \downarrow$);
(b) a decrease in the punishment the coup leader avoids by aborting the coup ($b \downarrow$);
(c) an increase in the coup leader's utility from civil war or a decrease in his utility from current government policy ($u^c(cw) \uparrow$ or $u^c(y^g) \downarrow$);
(d) an increase in the strength of the coup's forces or a decrease in the strength of the government ($S(c) \uparrow$ or $S(g) \downarrow$);
(e) an increase in initial rent received by the government and a decrease in the amount the coup leader initially receives ($\zeta^g \uparrow$ or $\zeta^c \downarrow$).

Proposition 3. Assume III–VI. Given the choices of each other leader, each of the following factors makes a leader more likely to join a coup if staged:

(a) an increase in the forces of the coup coalition or a decrease in the forces of the government ($S(c) \uparrow$ or $S(g) \downarrow$);
(b) a less harsh punishment by the government for joining a coup ($p_j^i(g) \uparrow$);
(c) an increase in the reward from the coup leader for joining the coup ($p_j^i(c) \uparrow$);
(d) an increase in the utility of the coup's policy or a decrease in the utility of the status quo policy ($u^i(y^c) \uparrow$ or $u^i(y^g) \downarrow$).

A harsh punishment for aborting the coup makes the coup leader more likely to proceed, as 2(b) shows. Once a plot exists, the government minimizes its risk of

being overthrown by "buying off" the plotters. Marginal deterrence requires that plotters receive a reduced penalty for aborting the coup. But buying off the coup leader might only encourage further plotting. Preston (1984) contends that the feeble penalties imposed on the planners of the aborted 1978 coup in Spain merely encouraged the unsuccessful February 1981 coup attempt. A regime faces a time-consistency problem. Before any plotting, the government threatens potential conspirators with severe punishment for plotting. Once a conspiracy forms though, the government wants to make a deal to prevent the coup attempt, which lowers the cost of conspiring and undermines the government's long-term stability.

4. ORGANIZING THE COUP PLOT

The Coup Feasibility Result suggests the vulnerability of all nations to a coup and raises the question why governments of coup-prone nations are not overthrown every month. The existence of two equilibria in the Coup Game, one where the coup occurs and succeeds with a high probability and a second where leaders support the government and the coup is aborted, provides a first explanation of comparative vulnerability. Historically vulnerable nations may simply be in the former equilibrium. Yet multiple equilibria will not establish a "coup impossibility" result; an "invulnerable" nation may shift to the successful coup equilibria.

The organization phase of the coup provides a stronger explanation of regime vulnerability. The coup leader in the execution phase represents any leaders explicitly joining the plot prior to the attempt. A potential coup-maker can recruit conspirators or hope others join during the coup (informal plotting). Given the potential for betrayal or discovery of a plot, a coup-maker will rely on informal support to the greatest extent possible. But staging a coup requires strength to seize the presidential palace and allow other leaders to join informally. Development increases the requirements for a coup coalition ($S^c > 0$) and hence diminishes regime vulnerability.

4.1 Several Inputs in the Production of Power

The production of strength may require several inputs such as military and political power, or infantry, armor, and aircraft instead of the Coup Game's single input. Each side's strength depends on the amount of each input controlled and the production function for power.

I show the extension to two inputs, A and B; extension to n inputs is straightforward. Let A^i and B^i be the amount of each input possessed by leader i. The amounts of A the coup leader and government control after the other leaders declare allegiance are

$$A(c) = A^c + \sum_{i=1}^{m} v^i \cdot A^i; \quad A(g) = A^g + \sum_{i=1}^{m} w^i \cdot A^i.$$

Define $B(c)$ and $B(g)$ accordingly. Each side's total strength is determined by

$$S(l) = H(A(l)), B(l)) \quad \text{where } l = c, g.$$

Assume the power production function $H(\cdot, \cdot)$ is non-decreasing in each argument. The further properties of H and the distribution of inputs across leaders determine the effect of multiple inputs. Several inputs do not alter the model if inputs are perfect substitutes or all leaders possess each in equal proportions. Specialized, complementary inputs, though, complicate the organization of a coup. Suppose the production of strength requires a positive amount of each input, $H(0, \cdot) = H(\cdot, 0) = 0$. Leaders possessing each input must join the conspiracy to form a coalition satisfying Assumption II. If all leaders with one input refuse to join the plot, the Coup Game never occurs. The coup feasibility result holds virtually unmodified once a conspiracy forms.[11]

4.2 Several Important Locations

The basic model contains no spatial dimension and thus presents a single target for the coup. I can incorporate a second location, which proxies a nation's size and development, as follows. Let m_1 (m_2) other leaders be at location 1 (2). The coup leader and government can have forces at either location, S_j^c and S_j^g for $j = 1, 2$. The strength of the coup forces at each location after the other leaders declare their allegiance is

$$S_1(c) = S_1^c + \sum_{i=1}^{m_1} v^i \cdot S^i; \quad S_2(c) = S_2^c + \sum_{i=m_1+1}^{m_1+m_2} v^i \cdot S^i.$$

Define $S_1(g)$ and $S_2(g)$ similarly. The success of the coup at each location is given by W and F. Suppose coup forces must be successful at each location for the coup to succeed; failure at one location results in civil war.

Multiple locations frustrate both the execution and organization of the coup. Several locations reduce the probability of success for a given probability of success in one location. Since the coup likely fails somewhere, civil war becomes the probable result. In the organization phase, the coup leader must balance his forces between the two locations. The coup plot may need to include members of the current high command to direct these forces to their required locations.

[11] Leader i's joining may not now increase the probability of a successful coup which weakens slightly the conditions on F and W: $F^j \leqslant F^n \leqslant F^o$ and either $W^i \leqslant W^n \leqslant W^o$ or $W^o \leqslant W^n \leqslant W^i$ according to whether $S_{-i}(c) \geqslant S_{-i}(g) + S^i$ or $S_{-i}(c) + S^i \leqslant S_{-i}(g)$

4.3 *The Legitimacy of the Existing Regime*

Many scholars emphasize legitimacy as a determinant of coup vulnerability (Finer, 1988; Nordlinger, 1977). Tullock (1987, pp. 79–114) describes legitimacy as support for the current regime without regard to expected utility calculations. I can incorporate legitimacy to the model by allowing two types of leaders: Type 1 believes the current regime is legitimate and automatically opposes any coup attempt; Type 2 maximizes expected utility as previously described. The fraction of Type 1 players measures the current regime's legitimacy.

A Type 1 leader's forces are directly loyal to the government, so the government's own strength S^g also measures the legitimacy of the regime. We can interpret Proposition 1 in terms of legitimacy: a coup is feasible when the government lacks legitimacy. A government with widespread legitimacy (S^g sufficiently large) is not vulnerable to a coup.

Legitimacy also complicates the organization of a coup. Suppose a leader's type is private information. A Type 1 leader reveals the plot to the government if asked to join the conspiracy. Recruiting leaders with specialized inputs or at key locations may be impossible. Uncertainty regarding leaders' types allows revelation of the plot to the government before the coup coalition satisfies Assumption II.

4.4 *The Comparative Vulnerability of Regimes*

A simple model of the organization phase illustrates the impact of these factors. Suppose M leaders exist prior to any planning. One of the M initial leaders seeks to organize a plot, and each period can attempt to add one leader to the plot. Let the probability of discovering a conspiracy during the organization phase be constant over time and across nations. A conspiracy must contain enough members so $S^c > 0$ to attempt a coup. Specialized, complementary inputs in the production of strength and multiple locations increase the minimum size of this coalition. Existence of Type 1 leaders reduces the set of potential conspirators. The combination of these factors may render a coup coalition impossible to organize; that is, all Type 2 leaders together may not yield $S^c > 0$. Control of a necessary input by regime loyalists can render a government invulnerable to a coup. By contrast, each of the M leaders has $S > 0$ when strength requires one input at one location, rendering plotting unnecessary.

Tullock (1974) argues that coups rely on informal coordination far more than formal plotting. The substitutability of informal coordination and formal plotting in a simple society breaks down in a developed nation with modern armed forces. Assembling the inputs to initiate the coup requires formal planning, even if execution of a sufficiently planned attempt remains feasible. Maintaining the secrecy of a plot with a large number of plotters and a competent security agency is nearly impossible. Tullock's intuition about informal cooperation in a coup provides the basis for a general explanation of regime vulnerability.

5. DISCUSSION

Most coups fall far short of the well-planned, clockwork efficiency described by Luttwack (1969). The requirements for a coup in a given nation increase over time. Spain witnessed many *pronunciamientos* in the nineteenth century; as late as 1923 Primo de Rivera seized power in this manner. The Nationalist uprising in 1936, by contrast, involved efforts in more than two dozen cities over the span of four days. The necessity of seizing so many targets made failure at some locations almost inevitable. Civil war ensued after the government armed the workers and defeated the rising in Madrid and Barcelona. Poor initial planning can be overcome in a less developed nation, as in the 1966 Ghana coup. But with greater requirements for a coup, as in Spain in 1981 or the Soviet Union in 1991, insufficient planning dooms the attempt.

Coups tend to produce only minor changes in policy. The relative simplicity of the equilibrium of Proposition 1 provides a possible answer: the policy choice is trivial ($y^c = y^g$), and all leaders receive increased rent and act symmetrically. Contrast this with an equilibrium in which punishment profiles are functions of the leaders' strengths and policy preferences. A complicated equilibrium generates confusion: which leaders will lose their positions, which groups must be rewarded, what policy will the new government implement? The equilibrium of Proposition 1 is likely to exist and be focal in a wide subset of the coup games in (5).

6. CONCLUDING REMARKS

The finding of multiple equilibria in the Coup Game has several implications for public choice in non-democracies. Kuran's (1995) argument concerning the unpredictability of revolution also applies to the coup. A nation might experience a coup d'état following a period of stability. Multiple equilibria also allow for "waves" of coup attempts both within and across nations. And the use of a probability of overthrow function, as in Grossman and Noh (1990), may be inappropriate.

My analysis concludes, as do previous scholars, that military intervention is unlikely in an established democracy, but improves our understanding of this result. My explanation of vulnerability based on the difficulty of organizing a coup implies that an established democracy becomes vulnerable *if* unusual circumstances allow plotting. Fighting a war requires allowing the military significant autonomy, but autonomy facilitates plotting. Military involvement in politics in developed nations has often followed wars.[12]

Developing nations should face decreasing vulnerability to the coup over time. Policy-makers interested in defending new democracies should focus on

[12] France by 1958 had been at war almost continuously for nearly 20 years. Ludendorff and Hindenburg were virtual dictators of Germany by the end of World War I. The 1991 Soviet coup followed the long war in Afghanistan.

"bottleneck" inputs for the coup. Denying plotters access to even one necessary input prevents the organization of a coup. The leader of the only group possessing such an input *must* be recruited into the conspiracy. The regime should allocate its most loyal, devoted supporters to command these inputs and use state security agents to carefully monitor these individuals. Sooner or later plotters must recruit these leaders.

APPENDIX

Proof of Lemma 1. With $y^c = y^g$, total rent available for $P(c)$, $P(g)$ is equal. Given $p_o^i(g)$, $i = 1, \ldots, m$ (assume each is non-negative for simplicity), (3) and (4) imply

$$\sum_{i=1}^{m} p_o^i(g) + p^g(g) = Z(y^g) \quad [\text{assuming } p^c(g) \leqslant 0]; \tag{A1}$$

$$\sum_{i=1}^{m} p_i^i(c) + p^c(c) = Z(y^g) \quad [\text{since } p^g(c) \text{ can be chosen} \leqslant 0]. \tag{A2}$$

Property (ii) of Ω imposes on $P(g)$ and $P(c)$ respectively

$$\sum_{i=1}^{m} p_o^i(g) \leqslant Z(y^g) - \zeta^g; \tag{A3}$$

$$\sum_{i=1}^{m} p_j^i(g) \leqslant Z(y^c) - \zeta^c. \tag{A4}$$

Since $\zeta^c \leqslant \zeta^g$, a set of rewards exist such that $p_j^i(c) > p_o^i(g)$ for each i. By if necessary setting $p_n^i(c) = p_j^i(c)$, (iii) of Ω implies the coup leader can insure $p_n^i(c) > p_n^i(g)$ for each i. The coup leader can also choose $p_o^i(c) \leqslant p_j^i(g)$ for each i.

Proof of Proposition 1. I prove existence of an equilibrium with $y^c = y^g$ and all leaders joining the coup, $v^i = 1$, $i = 1, \ldots, m$. I first show that if all other leaders join a coup in progress, leader i joins. This requires (a) $EU^i(j) - EU^i(n) \geqslant 0$ and (b) $EU^i(j) - EU^i(o) \geqslant 0$ for all i.

(a) The difference $EU^i(j) - EU^i(n)$ can be written

$$\begin{aligned}&\{p_i^i(g)\cdot(1-W^J)\cdot F^I - p_n^i(g)\cdot(1-W^n)\cdot F^n\} + \{p_j^i(c)\cdot(1-W^J)\cdot(1-F^J)\\ &\quad - ptp_n^i(c)\cdot(1-W^n)\cdot(1-F^n)\} + u^i(y^g)\cdot\{(1-W^I)\cdot F^J - (1-W^n)\cdot F^n\}\\ &\quad + u^i(y^c)\cdot\{(1-W^J)\cdot(1-F^I) - (1-W^n)\cdot(1-F^n)\} + u^i(cw)\cdot\{W^J - W^n\}.\end{aligned} \tag{A5}$$

Given $y^c = y^g$, the last three terms of (A5) simplify to

$$\{u^i(y^g) - u^i(cw)\} \cdot \{W^n - W^J\}. \tag{A6}$$

That this expression is non-negative follows from III(ii) and (1). by Lemma 1, the first two terms of (A5) are not less than

$$p_j^i(g) \cdot (1 - W^J) \cdot F^J + p_j^i(c) \cdot (1 - W^J) \cdot (1 - F^J) - p_n^i(c) \cdot (1 - W^n). \tag{A7}$$

The expression in (A7) is non-negative if and only if

$$F^J \leqslant \frac{p_j^i(c) - [(1 - W^n)/(1 - W^J)] \cdot p_n^i(c)}{p_j^i(c) - p_j^i(g)}. \tag{A8}$$

The coup leader can ensure that $p_j^i(c) > p_n^i(c)$ and Lemma 1 implies $p_j^i(c) > p_j^i(g)$. From III(ii) $W^n > W^J$, so $(1 - W^n)/(1 - W^J) < 1$. Consequently the term on the RHS of (A8) is positive. As $S^g \to 0, F^J \to 0$ so for S^g sufficiently small condition (A8) is satisfied.

(b) $EU^i(j) - EU^i(o)$ can be written using (A6) as

$$\begin{aligned}&\{p_j^i(g)\cdot(1-W^J)\cdot F^J - p_o^i(g)\cdot(1-W^o)\cdot F^o\} + \{p_j^i(c)\cdot(1-W^J)\cdot(1-F^J)\\ &\quad - p_o^i(c)\cdot(1-W^o)\cdot(1-F^o)\} + \{[u^i(y^g) - u^i(cw)]\cdot[W^o - W^J]\}.\end{aligned} \tag{A9}$$

Non-negativity of the last term in brackets follows from III and (1). Lemma 1 and $p_o^i(c) \leqslant p_j^i(g)$ imply the first two terms in brackets in (A9) are not less than

$$[p_j^i(c) - p_n^i(c)] \cdot [(1 - W^o) \cdot (1 - F^o) - (1 - W^J) \cdot F^J]. \tag{A10}$$

(iii) of Ω implies the first term of (A10) is non-negative. The second term of (A10) is non-negative iff

$$\frac{1 - F^o}{F^J} \geqslant \frac{1 - W^J}{1 - W^o}. \tag{A11}$$

As $S^g \to 0, F^J \to 0$, while II, III, and IV imply $F^o \leqslant 0.5$ and $W^J, W^o \to 0$; for S^g sufficiently small $(1 - F^o)/F^J$ is arbitrarily large and (A11) holds. $EU^i(j) = EU^i(o) \geqslant 0$ if S^g is sufficiently small.

Now I show that the coup leader stages the coup if $v^i = 1, i = 1, \ldots, m$, which requires that expected payoff in (7) be greater than or equal to zero. This will be so with $y^c = y^g$ if

$$F \leqslant 1 - \frac{p^a(g) - p^c(g) + W \cdot [p^c(g) + u^c(y^g) - u^c(cw)]}{(1 - W) \cdot [p^c(c) - p^c(g)]}. \tag{A12}$$

By III(i) and IV(i), $F, W \to 0$ as $S^g \to 0, F, W \to 0$, so (A12) is satisfied for S^g sufficiently small. The coup leader stages the coup with $y^c = y^g$. This argument does not demonstrate the coup leader's best choice of policy or punishment profile. But the coup leader's choice of y^c and $P(c)$ must allow the coup to be staged, which establishes the proposition.

Proof of Proposition 2. Differentiation of (11) yields:

(a) $$\frac{\delta F^c}{\delta p^c(g)} = \frac{-b - W \cdot [p^c(c) + u^c(y^c) - u^c(cw)]}{(1 - W) \cdot [p^c(c) + u^c(y^c) - p^c(g) - u^c(y^c)]^2} < 0.$$

(b) $$\delta F^c / \delta b = -1/\{(1 - W) \cdot [p^c(c) + u^c(y^c) - p^c(g) - u^c(y^c)]\} < 0.$$

(c) $$\delta F^c / \delta u^c(cw) = -W/\{(1 - W) \cdot [p^c(c) + u^c(y^c) - p^c(g) - u^c(y^c)]\} > 0.$$

$$\frac{\delta F^c}{\delta u^c(y^g)} = \frac{-b - W \cdot [p^c(c) + u^c(y^c) - u^c(cw)]}{(1 - W) \cdot [p^c(c) + u^c(y^c) - p^c(g) - u^c(y^c)]^2} < 0.$$

(d) An immediate consequence of (1), VI, and the conditions of Ω.

(e) This allows an increase in $p^c(c)$ and

$$\frac{\delta F^c}{\delta p^c(c)} = \frac{b + W \cdot [p^c(g) + u^c(y^g) - u^c(cw)]}{(1 - W) \cdot [p^c(c) + u^c(y^c) - p^c(g) - u^c(y^c)]^2} > 0.$$

Proof of Proposition 3

(a) An immediate consequence of (1), VI, and the conditions on Ω. Differentiation of (6) yields:

(b) $$\frac{\delta EU^i(j)}{\delta p_j^i(g)} = (1 - W^j) \cdot F^j > 0.$$

(c) $$\frac{\delta EU^i(j)}{\delta p_j^i(c)} = (1 - W^j) \cdot (1 - F^j) > 0.$$

(d) $$\frac{\delta[EU^i(j) - EU^i(n)]}{\delta u^i(y^c)} = (1 - W^j) \cdot (1 - F^j) - (1 - W^n) \cdot (1 - F^n) > 0 \text{ by VI;}$$

$$\frac{\delta[EU^i(j) - EU^i(n)]}{\delta u^i(y^g)} = (1 - W) \cdot F^j - (1 - W^n) \cdot F^n < 0 \text{ by VI.}$$

$$\frac{\delta[EU^i(j) - EU^i(o)]}{\delta u^i(y^c)} > 0 \text{ and } \frac{\delta[EU^i(j) - EU^i(o)]}{\delta u^i(y^g)} < 0.$$

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