Chapter ???

Commitment Problems and Shifting Power as a Cause of Conflict

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Decades ahead of his time, Thomas Schelling emphasized that "most conflict situations are essentially *bargaining* situations" (Schelling 1960, 5). Building on this, formal work on the causes of war in political science since the mid-1990s has generally framed the problem in terms of an "inefficiency puzzle" akin to Hick's paradox regarding strikes (Kennan 2008). Since fighting is costly, war is Pareto inefficient at least ex post. Why then does bargaining ever break down in an inefficient outcome (Fearon 1995)?

Work on war and conflict has broadly emphasized two sources of inefficiency, informational problems and commitment problems. The former arise when (i) the bargainers have private information about, for example, their payoffs to prevailing or about their military capabilities and (ii) the bargainers have incentives to misrepresent their private information. Informational problems often confront states with a risk-return trade off. The more a state offers, the more likely the other state is to accept and the more likely the states are to avert war. But offering more also means having less if the other accepts. The optimal solution to this trade off frequently entails making an offer that carries some risk of rejection and war.

The crucial issue in commitment problems is that in the anarchy of international politics or in weakly institutionalized states which lack an effective monopoly on the use of force, states or opposing political factions may be unable to commit themselves to following through on an agreement and may also have incentives to renege on it. If these incentives undermine the outcomes that are Pareto superior to fighting, the states or factions may find themselves in a situation in which at least one of them prefers war to peace.[1]

Most of the initial work on the inefficiency puzzle centered on informational problems, possibly for two reasons. First, uncertainty and asymmetric information abound in international politics. Indeed, Schelling, again ahead of his time, took uncertainty and unpredictability to be the essence of a crisis (1966, 97). Formalizing these ideas in terms of asymmetric information seemed like a natural first step in understanding the causes of war. Second, the early models of bargaining and war drew very heavily on the then recent work in bargaining theory (e.g., Fudenberg, Levine and Tirole 1985; Gul and Sonnenschein 1988) which looked to asymmetric information n an attempt to explain delay and inefficiency.[2]

Subsequent work on the causes and conduct of war has begun to focus on commitment problems in the context of complete-information games. This essay examines some of this work and, in particular, the work that locates the cause of the commitment problem in shifts in the underlying distribution of power. The next section explains some of the motivations for shifting attention away from informational problems toward commitment problems. The third section discusses a canonical commitment problem in which two bargainers are trying

[1] Other potential sources of inefficiency have received some attention, including coordination problems in a global-games setting (Chassang and Miquel 2009), and agency problems (Acemoglu, Tichi, and Vindigni 2009; Jackson and Morrelli 2007). Jackson and Morrelli (2009) provide an overview. Bargaining indivisibilities are also sometimes seen as a cause of bargaining breakdown (Fearon 1995), but these are probably best seen as a kind of commitment problem (Powell 2006).

[2] Powell (2002) reviews this work and discusses its relation to bargaining theory.

to divide a flow of benefits or "pies." Each bargainer can use some form of power to impose a division at some cost, and the bargainers can commit to how they will divide today's pie but cannot commit to future divisions. If the distribution of power is shifting fast enough, no efficient division is time-consistent and all equilibria entail costly fighting. Although very simple, this basic mechanism explains costly conflict in many different models, e.g., costly coups in Acemoglu and Robinson's (2001, 2006b) models of political transitions, legislative lock-in in de Figueirdo's (2002) analysis of inter-party cooperation, prolonged civil wars in Fearon (2004), and war in Powell's (1999) analysis of power transitions between states. Section four discusses some of these examples and the empirical support for the mechanism. Section five reformulates the problem of shifting power in a somewhat simpler setting where it is easier to see how this commitment problem relates other kinds of commitment problems, including the standard hold-up problem (Grossman and Hart 1986, Williamson 1979, 1983) as well as to some of the sources of "democratic" inefficiency in Besley and Coate's (1998) citizen-candidate model.

Why Focus on Commitment Rather than Information Problems?

Two observations motivate the shift of attention from information issues to commitment problems. First, private information does not seem to be a first-order cause of persistent conflict. Second, information problems are often studied in the context of models in which complete-information leads to efficient outcomes, e.g., Rubinstein's (1982) seminal analysis. However, these formulations lead to a strange reading of some cases at variance with most historical accounts.

Civil wars often go on for a very long time. Twenty-five percent last a decade or more, and ten percent last more than twenty-five years (Fearon 2004). An informational approach would generally argue that prolonged fighting results from rival factions' efforts to secure better terms by demonstrating that they are "tough" or resolute. Moreover, we also ought to find significant informational asymmetries throughout the conflict as these are a prerequisite for continued fighting. But these asymmetries appear to be lacking. As Fearon observes "after a few years of war, fighters on both sides of an insurgency typically develop accurate understandings of the other side's capabilities, tactics, and resolve. Certainly, both sides in Sri Lanka (for instance) fight on in the hope that by luck and effort they will prevail militarily. But it is hard to imagine that they do so because they have some private information that makes it reasonable for them to be more optimistic about the odds than the other side is" (Fearon 2004, 290).

Many analyses of information problems also begin with a model in which there would be an efficient outcome were there complete information (e.g., Fearon 1995, Powell 1999, Slantchev 2003; Lenventolgu and Tarrar 2008). Consider most simply an ultimatum game in which *1* makes a take-it-or-leave-it offer $x \in [0, 1]$ to *2* who can accept the offer or reject it by fighting. If *2* fights, the game ends. Assume that a state gets 1 if it wins, 0 if it loses, and that $j \in \{1, 2\}$ pays c_j and wins with probability p_j. In the unique equilibrium, *1* offers *2* its certainty equivalent for fighting $p_2(1 - c_2) + (1 - p_2)(-c_2) = p_2 - c_2$, *2* accepts this offer with probability one, and there is no fighting.

Describing this equilibrium outcome differently, *1* prefers to appease *2 regardless of how much it has to offer 2*. When complete information ensures an efficient outcome, it is impossible for a bargainer to be facing a type it would prefer to fight rather than appease. This seems like an implausible reading of some historical cases. Rather, one state or faction often comes to the conclusion that it is facing a type it would rather fight that appease, e.g., Britain with respect to Germany after occupying Czechoslovakia a few months after Munich or the United States with respect to the hard-core Taliban or Al Qaeda.

Three remarks about the motivations for emphasizing commitment over informational problems in explaining persistent conflict are in order. First, the shift toward greater emphasis on commitment problems is obviously not based on a theorem or theoretical result showing that asymmetric information cannot explain persistent inefficient conflictual behavior. Indeed, we have models in which this kind of behavior (usually in the form of delay in a bargaining game) results from asymmetric information.[3] Rather, the emphasis on commitment is a research "bet" or hunch based on limited evidence suggesting that focusing on commitment issues rather than information problems is likely to prove to be a more fruitful line of inquiry.

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[3] See for example Amati and Perry (1987) where the time between offers is a strategic variable; Evans (1989) and Vincent (1989) on correlated values; and Feinberg and Skrzypaczi 2005) on higher order beliefs. Fearon (2007) focuses on a different cause in the context of fighting. More broadly, Ausubel and Deneckere (Ausubel, Cramton, and Deneckere 2002) show that almost anything can happened in bargaining games with two-sided incomplete information. But absent a compelling theory of equilibrium selection, the existence of inefficient equilibria which are Pareto dominated by efficient equilibria is not a very satisfactory explanation of why states or factions fight.

Second, although informational problems do not seem likely to explain prolonged fighting, uncertainty and asymmetric information may play an important role in the initial bargaining breakdown and fighting. Indeed a very natural conjecture is that types that can be appeased are screened out in the early stages of a conflict and that those conflicts are relatively short. Prolonged conflict ensues when one bargainer becomes confident that it is facing a type that it unwilling or unable to satisfy. Most of the work on commitment problems sets these considerations aside by abstracting away from any informational issues in order to focus on complete-information games. (Chassang and Miquel (2009) is a rare exception.)

Finally, a commitment problem exists whenever all of the equilibria of a game are Pareto dominated, and the prisoners' dilemma is a classic commitment problem. Clearly, then, the challenge is not to identify commitment problems *per se*. It is rather to identify and model mechanisms as complete-information games which provide important insights into the forces underlying persistent fighting and, more generally, persistent inefficient behavior.[4]

Shifting Power and Costly Conflict

This section highlights a canonical commitment problem created by rapid shifts in the distribution of power in conjunction with a king of "liquidity constraint." As will be seen,

[4] If some but not all equilibria are Pareto efficient, one might want to call the failure to play an efficient equilibrium and the resulting inefficiency a "coordination failure." But, again, it is hard to see a "coordination-failure" account of war as very compelling absent a theory of equilibrium selection which explains why the actors coodinate on war. Focusing on games in which all the equilibria are inefficient finesses this issue.

this simple problem is the cause of costly conflict in a wide range of models motivated by a very diverse set of substantive issues which at first seem unrelated. We begin with a concrete example and move to a somewhat more general setting.

Two players, *1* and *2*, have to divide a flow of benefits or "pies." The size of the pie varies stochastically from round to round perhaps because of varying economic conditions. More specifically, let π_t be the size of the pie in round t and assume $\{\pi_t\}_{t=0}^{\infty}$ are independent and identically distributed over $[\underline{\pi}, \overline{\pi}]$ with cumulative distribution H and mean $\mu = \int_{\underline{\pi}}^{\overline{\pi}} \pi dH$. Both players learn the size of the pie at the start of the round. Player *1* then has to decide whether to fight or make a take-it-or-leave-it offer $x_t \in [0, \pi_t]$ to *2* who can accept the offer or fight. If *2* accepts, *1* and *2* receive payoffs of $\pi_t - x_t$ and x_t, respectively, and play moves on to the next round.

If j chooses to fight, the game ends and $j \in \{1, 2\}$ wins with probability $p_j(t)$ where $p_1(t) + p_2(t) = 1$ for all t. Fighting destroys all of the current pie and a fraction $\delta \in [0, 1]$ of the expected future flow of benefits. To simplify matters, we assume that the expected cost of fighting is $\pi_t + \beta\delta\mu/(1-\beta)$ where β is the players' common discount factor.[5] The winner eliminates the loser and gets all of the surviving benefits. Hence, j's expected payoff to fighting at t is $p_j(t)(1-\delta)\beta\mu/(1-\beta) = p_j(t)\sigma\beta V$ where $\sigma \equiv 1-\delta$ is the fraction of future benefits that survives the fighting and $V \equiv \mu/(1-\beta)$ is the expected present value of the flow of future benefits. We initially assume that the distribution of power is weakly shifting

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[5] One might assume more simply that the cost of fighting at t is solely a fraction of that period's pie. A disadvantage of this formulation is that the cost of fighting goes to zero as the players become more patient ($\beta \to 1$).

against *2*, i.e., $p_2(t)$ is weakly decreasing in t.

To characterize the equilibria of this game, let $\widetilde{x}_t$ be the amount that leaves *2* indifferent between fighting at t and accepting $\widetilde{x}_t$ and then fighting at $t+1$. That is, $\widetilde{x}_t$ satisfies $p_2(t)\sigma\beta V = \widetilde{x}_t + p_2(t+1)\sigma\beta^2 V$ and is given by $\widetilde{x}_t = [p_2(t) - \beta p_2(t+1)]\sigma\beta V$ where the fact that $p_2(t)$ is weakly decreasing ensures $\widetilde{x}_t > 0$. Since *1* makes all of the offers and *2* either accepts them or fights, *1* has all of the bargaining power and can hold *2* down to its reservation value, i.e., its payoff to fighting. As a result, *2* must accept any $x > \widetilde{x}_t$ and reject any $x < \widetilde{x}_t$ in a subgame perfect equilibrium.[6]

As for *1*'s decision, *1* always prefers to buy *2* off rather than fight. To see why, note that *1* will never offer a $z > \widetilde{x}_t$ in equilibrium as it could profitably deviate to a lower offer of $(z + \widetilde{x}_t)/2$ which *2* would also accept. Thus *1*'s equilibrium offers are bounded above by $\widetilde{x}_t$. It follows that *2*'s equilibrium payoff at t is its payoff to fighting $p_2(t)\sigma\beta V$. Player *2* obtains this payoff if *1* offers something less than $\widetilde{x}_t$ and *2* actually fights, or if *1* offers $\widetilde{x}_t$ in which case *2* is indifferent between fighting and accepting. The fact that *2*'s equilibrium payoff equals its payoff to fighting means that whatever surplus is saved by not fighting must be going to *1*. The prospect of pocketing this surplus ensures that *1* strictly prefers to buy *2* off with rather than fight.

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[6] Assume that *2* did fight with postive probability if offered some $y > \widetilde{x}_t$ at time t in some subgame perfect equilibrium. This implies that *2's* equilibrium payoff in the subgame starting after an offer of y is $p_2(t)\sigma\beta V$. But this leads to a contradiction as *2* could profitably deviate by accepting y and then fighting in the next round. This yields $y + p_2(t+1)\sigma\beta^2 V$ which is greater than $\widetilde{x}_t + p_2(t+1)\sigma\beta^2 V = p_2(t)\sigma\beta V$.

However, *1* will be unable to buy *2* off if the distribution of power is shifting too rapidly. *1* cannot offer more than there is, i.e., *1*'s offer at t is bounded above by π_t, and *2* will reject any offer less than $\widetilde{x}_t$. Consequently, *1* cannot buy *2* off when

$$p_2(t) - \beta p_2(t+1) > \frac{\pi_t}{\beta \sigma V}. \tag{1}$$

This inequality is more likely to bind when π_t is small, i.e.,when times are tough. More generally, the probability of fighting at time t (conditional on being at t) is $\Pr\{\widetilde{x}_t > \pi_t\} = H([p_2(t) - \beta p_2(t+1)]\sigma \beta V)$. Larger shifts, therefore, make fighting more likely. Indeed, the inequality is sure to bind if the shift in power is too large, i.e., if $[p_2(t) - \beta p_2(t+1)] > \overline{\pi}/(\sigma \beta V)$. Thus large shifts in the distribution of power lead to fighting even though there is complete information.

A very simple intuition underlies condition (1). Consider the dilemma facing the bargainers at t. *2* can lock in a payoff of $p_2(t)\beta\sigma V$ if it fights now whereas it will only be able to assure itself of the smaller payoff of $p_2(t+1)\beta\sigma V$ if it forgoes the opportunity of fighting at t. Since *1* pockets the surplus saved by not fighting, *1* would like to buy *2* off at t. To do so, *1* must promise a future flow of benefits equal to what *2* can get by fighting, and indeed *1* would like to commit to providing this. But the bargainers cannot commit to future divisions. Thus, the most that *1* can credibly promise to give to *2* is all of today's benefits, π_t, plus *2*'s (discounted) reservation value at $t+1$ when the distribution of power has shifted against it. If this amount is less than what *2* can secure for itself by fighting at

t, the complete-information bargaining breaks down in inefficient fighting.[7]

This intuition generalizes to a larger class of stochastic games. The result is a sufficient condition which ensures that there is inefficient fighting along every equilibrium path (Powell 2004). Suppose that *1* and *2* are trying to divide the flow of benefits as in the example above but now play a bargaining game Γ_t in round t to decide how π_t is divided. Assume further that each bargainer in Γ_t has the opportunity to exercise some form of power in – be it military, economic, or more generally political – to impose a division of the spoils. But the exercise of power is costly, so imposing a division this way rather than just agreeing on a division is inefficient. More formally, each bargainer has the opportunity to exercise an outside option in Γ_t which ends the game and yields payoffs $(m_1(t), m_2(t))$ where $m_1(t) + m_2(t) < \pi_t + \beta V$.[8]

It is now straightforward to generalize the equilibrium condition (1) to an analogous sufficiency condition which guarantees that there is no time-consistent, efficient equilibrium path. That is, one player or the other is sure to prefer fighting somewhere along every efficient path when this condition holds. By construction, j can ensure itself a payoff of

[7] Clearly anything that increases the amount that *1* can commit to giving *2* eases the problem. Examples might include access through capital markets or outside assistance from third parties, e.g., foreign aid.

[8] More precisely, let p be any path through Γ_t which does not end in fighting. Then both *1* and *2* will have had the option of fighting somewhere along p.

at least $m_j(t)$ by exercising this option in round t.[9] If the other player wants to buy j off (which it must do along any efficient path), an upper bound on the amount that $k \neq j$ can credibly promise to j is $\pi_t + \beta[V - m_k(t+1)]$. The first term is all that there is to be had at time t. The second term is the (discounted) expected value of the future flow of benefits less what k can guarantee itself by exercising the outside option in the next round. Clearly, k cannot credibly promise a future transfer to j of more than this amount as k cannot credibly commit to having less than $m_k(t+1)$ in the continuation game starting at $t+1$. Thus, j is sure to prefer the inefficient outside option to continuing on to round $t+1$ if $m_j(t) > \pi_t + \beta[V - m_k(t+1)]$. Adding to $m_k(t)$ both sides and rearranging terms gives:

$$\beta m_k(t+1) - m_k(t) > \pi_t + \beta V - [m_j(t) + m_k(k)] \tag{2}$$

Inequality (2) has a natural substantive interpretation. The expression on the right is the bargaining surplus. That is, it is the difference between what there is to be divided and the sum of what each player can achieve on its own. The expression on the left measures the shift in the distribution of power in favor of k measured by the change in the values of the outside option. When the shift in the distribution of power is larger than the bargaining surplus, complete information bargaining breaks down in inefficient fighting.

Examples and Empirical Support

Although the mechanism described in the previous section is very simple, it lies at the

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[9] More generally, j's minmax payoff in the continuation game starting at t is bounded below by $m_j(t)$.

heart of many applied-theory models motivated by a wide range of seemingly unrelated substantive issues in political economics, American and comparative politics, and international relations. This section briefly describes some of those analyses and the empirical support for the mechanism.

In Acemoglu and Robinson's (2000, 2001, 2006b) work on political transitions, coups are inefficient and occur when the poor are in power and would like to buy the rich elite off but are unable to do so. When the cost of fighting, i.e., of removing the group currently in control of the government, is small (because of a bad economic shock as in the example above with π_t small), the poor cannot buy the rich off out of today's pie (by setting the current tax rate to zero which is the ideal point for the rich). Buying the rich off necessarily entails a promise of future concessions (low taxes). But with high probability, times will be good in the next period, the rich will be unable to credibly threaten to mount a coup, and the poor will renege on any promises. Anticipating this, the rich elite depose the poor while it has the chance. This occurs when (2) binds if we interpret $m_j(t)$ as j's minmax payoff in the continuation game starting at t (Powell 2004).

Political parties sometimes deliberately adopt inefficient policies. De Figueiredo (2002) explains at least some of these choices as one party's efforts to bind the other party. He stipulates a stochastic policy environment in which a political party's ideal policy depends on the state of the world. A party, therefore, would prefer not to lock in a rigid policy as long as it were sure that it would remain in power and be the party setting the policy after learning the state. If, however, party *1* comes to power in any period with probability p and *2* assumes power with probability $1 - p$, then *1* will prefer to lock a policy in place if

p is sufficiently small. When p is small, *1* is likely to lose office in the next round and not return to power for a long time. In these circumstances, the efficiency loss of locking in a policy is outweighed by the distributive gain from being the one to choose what to lock in when condition (2) binds (Powell 2004).

Essentially the same logic leads states or opposing factions to fight in Fearon's (2004) account of why some civil wars last a very long time, in Powell's (1999) analysis of the way that a rising state copes with an adverse shift in the distribution of power as well as in his model of state consolidation (Powell 2010), in Fearon's (1996) study of bargaining over objects that influence future bargaining power, in Slantchev and Leventoglu's (2006) punctuated equilibrium model of international conflict, and Chassang and Miquel's (2009) work on economic shocks and civil war.[10]

Clearly shifting power can lead to inefficient outcomes in many different applied models. But while this mechanism works mathematically, is it really what is going on in these cases? The models just mentioned are too general to "calibrate" in any serious way, so it is difficult to specify what sensible parameter values are. Even so, condition (2) seems to require a very large shift, i.e., a shift larger than the bargaining surplus, and this may seem substantively suspect.

One reason for suspicion is the distribution of power in many settings is at least partly endogenous as each actor has to decide how much of its "butter" to sacrifice for "guns" or

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[10] See Powell (2004, 2006) for a detailed discussion of the relation between condition (2) and Acemoglu and Robinson (2000. 2001, 2006b), de Figueiredo (2002), Fearon (1996, 2004), and Powell (1999).

more generally for the instruments of power. If there is a resource shock, then the actors would seem to be able to offset at least part of its effects on the distribution of power by changing their guns-butter portfolios. If so, then large resource shocks may not translate into large shocks in the distribution of power. This suggests that an important avenue for future work is explaining the micro foundations for these shocks and endogenizing the distribution of power.[11]

More immediately, what is the empirical evidence for this mechanism? There is both statistical and systematic qualitative evidence. Giving the governor of a state a line-item veto can be a way of locking in policies or at least making them more difficult to change. Suppose that (i) party *1* has historically held the governorship much more often than party *2* and expects to do so in the future, (ii) *2* has generally controlled the legislature, and (iii) *1* currently controls the legislature.

Party *1* faces the prospects of an adverse shift in the distribution of power as it is likely to lose control of the legislature. However, it can make it difficult for *2* to change *1*'s policies by giving the governor a line item-veto. If by contrast, *1* is electorally much stronger and has historically controlled both the legislature and the governorship, the legislative leaders

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[11] Interesting, games developed by political scientists generally explicitly model the decision to fight or not. But they take the distribution of power to be exogenous and do not explicitly model the resource allocation problem (e.g., Fearon 2004, Fearon and Laitin 2007, Powell 2009). By contrast, games developed by economists generally explicitly model the the guns-butter allocation problem but not the decision of whether or not to fight (e.g., Besley and Persson 2009).

from *1* would prefer not to transfer greater authority to the governor as the latter's policy preferences are surely somewhat different even though she is a member of the same party. De Figueiredo (2003) tests this argument and finds empirical support for it.

Another way that a political party can insulate its preferred policies is by making it more costly for an opposing party to change them should that party come to power. De Figueiredo and Vanden Bergh (2004) recognize that one way for a state legislature to do this is by adopting a state-level administrative procedure act. These acts create a set of requirements, e.g., rules of notice, standing, information gathering, judicial review, that every agency must follow in making policy decisions. De Figueiredo and Vanden Bergh (2004) again find support for the mechanism. Democrats are more likely to impose these acts when they perceive that their control is more likely to be temporary.

This is the strongest statistical evidence for the mechanism. But, unfortunately, it is of limited relevance to weakly institutionalized settings. In a majoritarian setting where controlling a bare majority of the membership of the legislature brings great advantages, it is clear how the swing in a few votes or seats could lead to a very large shift in the distribution of power. But this swing depends on a strong institution which defines the basis of power, i.e., that a bare majority brings privileges. When institutions are weak, the sources of power and shifts in the distribution of power lie elsewhere, and the micro foundations of any rapid shifts are much less clear.

A limitation of existing models is that there are only two actors. Nevertheless, it is easy to imagine in a three-actor setting that a re-alignment of one of the actors would have a very large effect on the distribution of power between the other two. Fearon and Laitin (2007) gather systematic qualitative evidence in a study of civil war termination that supports this point. They find that changes in foreign support for one of the sides is positively associated with ending the war. Moreover, most of these changes appear to be exogenous. "[I]t does not appear that foreign actors are often opting in or out as a direct result of developments within the civil war that would have made for termination regardless of the foreign actors' support" (2007, 33).[12]

Political Hold-Up and Other Commitment Problems

Although a commitment problem is at its most basic level simply a game in which the equilibrium payoffs are Pareto dominated, this formulation is too broad to provide any useful research guidance. It is merely a catch-all label. One way to move beyond this is to examine the relationship among different kinds of more specific commitment problems. This is the task of this section. It develops a simple model and rudimentary taxonomy that highlights the relationship among three different types of commitment problem. This section also links these types of commitment problem to analyses of inefficient levels of public debt resulting from political parties' inability to commit to future spending levels (e.g., Perrson and Svensson 1989, Alesina and Tabellin 1990, and Persson and Tabellini 2000), underdevelopment and the predatory state (Robinson 2001) and "democratic" inefficiencies or political market failures (Besley and Coate 1998).

[12] In a method they call "random narratives," the authors randomly selected 30 cases from the 139 civil wars started since 1945. The smaller number of cases made it possible to study each case in more detail.

Consider a two-period game between j and k in which the party or faction in power in each period decides how to allocate that period's "pie." Each player wants to maximize the undiscounted sum of its consumption in both periods, and j is in power in the first round. Player j has to decide (i) whether to make an efficient investment, (ii) whether to "lock" its policy preferences in place at some cost, and (iii) how to allocate whatever remains of the first-period pie to the two players.

More specifically, j can invest a fraction i of π and this results in the larger period-two pie of size $(1+r)\pi$. Investing is efficient, so $r > i$. Player j can also choose to "lock-in" the period 1 allocation shares at cost $\lambda\pi$. Finally, j allocates the rest of the first-period π with the fraction σ_1^j going to j and $\sigma_1^k = 1 - \sigma_1^j$ going to k. If, for example, j invests and locks the share σ_1^j in, then j's first period payoff is $\sigma_1^j(1-i-\lambda)\pi$ and k's is $\sigma_1^k(1-i-\lambda)\pi$.

The faction in power in the second period chooses the allocation shares $(\sigma_2^j(n), \sigma_2^k(n))$ of the period-two pie where n denotes the faction in power in the second round. The size of this pie is π if j decided not to invest in the previous period and is $(1+r)\pi$ if j did invest. If j did not lock-in the first period allocation shares, then the faction in power in the second period can costlessly change those shares. If, however, j did lock (σ_1^j, σ_1^j) in, then the cost of moving from these shares to $(\sigma_2^j(n), \sigma_2^k(n))$ increases in the distance between these shares and does so at an increasing rate. Assume most simply that this cost is a fraction of the amount to be divided in the second period and that this fraction is given by $c = \alpha\left(\left[(\sigma_2^j(n) - \sigma_1^j)^2 + (\sigma_2^k(n) - \sigma_1^k)^2\right]^{\frac{1}{2}}\right)^2 = 2\alpha\left[\sigma_2^j(n) - \sigma_1^j\right]^2$.

Finally, investing may affect the distribution of power in the future. Let p be the probability that j remains in power if it does not invest, and let p' be the probability that j

remains in power if it does. To keep things simple, assume that locking the first period's allocation in does not affect the distribution of power although it obviously may affect the what the faction in power in that period chooses to do.

Clearly the only efficient outcome is for j to invest and not lock in the first period allocation. To determine when this fails to be equilibrium behavior, note that j will claim everything for itself in the second period in any subgame perfect equilibrium, i.e., $\sigma_2^j(j) = 1$. Similarly, k is sure to claim everything for itself if j did not lock the first period shares in and therefore k can costlessly change them. If j did lock the first-period shares in, then k chooses $\sigma_2^k(k)$ to maximize $\sigma_2^k(k)s_2 - 2\alpha\left[\sigma_2^j(k) - \sigma_1^j\right]^2 s_2$ where s_2 is the size of the pie in the second period. Using $\sigma_2^j(k) = 1 - \sigma_2^k(k)$ and differentiating to obtain k's optimal share gives $\widehat{\sigma}_2^k(k) = 1 - \sigma_1^j + 1/(4\alpha)$ and $\widehat{\sigma}_2^j(k) = \sigma_1^j - 1/(4\alpha)$.

Turning to j's decision in the first round, j will clearly claim all of the first-period pie for itself, $\sigma_1^j = 1$, and the only issue is whether j invests, locks in, or both. Following the efficient path of investing and not locking in brings j a payoff of $(1-i)\pi + p'(1+r)\pi$. In order for this to be incentive compatible the following conditions must hold:

$$(1-i)\pi + p'(1+r)\pi \geq \pi + p\pi \tag{3}$$

$$(1-i)\pi + p'(1+r)\pi \geq (1-\lambda-\pi) + p'(1+r)\pi + (1-p')\sigma_j^*(1+r)\pi \tag{4}$$

where $\sigma_j^* = 1 - 1/(4\alpha)$. The first inequality ensures that j prefers the efficient payoff to not investing and not locking in the first period shares. The second inequality guarantees that the efficient path is at least as good as investing and locking in.[13] Simplifying these conditions gives:

$$i \leq pr + (p' - p)(1 + r) \tag{3'}$$

$$\lambda \leq (1 - p')\sigma_j^*(k)(1 + r) \tag{4'}$$

If either of these fails to hold, a commitment problem binds and the equilibrium outcome is inefficient.

Conditions (3′) and (4′) have simple interpretations and together suggest a rudimentary typology of commitment problems. Suppose that undertaking the investment has no effect on the future distribution of power, i.e., $p' = p$. Then inequality (3′) reduces to $pr \geq i$. That is, the efficient path is incentive compatible only if the expected return on the investment is at least as large as its cost. When the opposite obtains ($pr < i$), we have the classic hold-up problem in which the future bargaining power of the actor undertaking the costly investment is sufficiently small that the investment is not worthwhile (Grossman and Hart 1986; Williamson 1979, 1983; Che and Sakovics 2008). We might also call this a purely *economic commitment problem* insofar as the economic decisions have no effect on the distribution of political power.

Now suppose that investing or, more generally, following an efficient path leads to a shift in the distribution of power. When this is an adverse shift ($p' < p$), j faces a simple but

[13] It is straightforward to show that if (3) and (4) hold, then j also prefers the efficient path to not investing and locking in.

fundamental trade off highlighted in condition ($3'$). Player j can have a larger share of a smaller pie if it acts inefficiently, or it can have a smaller share of a larger pie by investing. If the adverse shift in power is sufficiently large, the former swamps the latter and the outcome is inefficient. Indeed, if $pr > i$, efficient behavior is not vulnerable to the purely economic hold up problem. But it is vulnerable to what might be called a *political commitment problem* due to shifting power. When the adverse shift is sufficiently large, then $i > pr + (p' - p)(1 + r)$ and the efficient investment will not be make.

Suppose, alternatively, that investment enhances j's power ($p' > p$). Then the shift in power reinforces the economic returns on investing and consequently makes inefficient investments more likely. Not only does investing increase the size of the pie, it also increases j's share. However, these reinforcing effects also mean that j may undertake economically inefficient investments, i.e., "white elephants," if the political gains from the favorable shift in the distribution of power are sufficiently large. That is, condition ($3'$) will hold even if $r < i$ as long as $p' - p$ is sufficiently large. (See for example Robinson and Torvik 2005.)

Finally consider j's decision about locking in its policy choices. In order to isolate this issue, assume that neither the economic nor the political commitment problem binds (i.e., $pr > i$ and $p' = p$). The inability of j and k to commit to future divisions of the surplus still leads to inefficient behavior when ($4'$) fails to hold. The issue here is that the faction currently in power, namely j, may be willing to behave inefficiently and thereby make the future pie smaller if doing induces k to give j a larger share of that smaller pie. Borrowing a term from international relations theory, the inefficiency results from what might be called a *soft-power commitment problem* in that j uses resources to affect k's (indirect) preferences rather than the distribution of power.[14]

Although the taxonomy is very simple, political or soft-power commitment problems underlie many different models. For example, a political commitment problem makes the state predatory in Robinson (2001). He develops a model in which a socially productive investment simultaneously increases the ability of outside groups to mobilize and this in turn reduces the chances that the ruling group will remain in power. That is, an efficient investment leads to an adverse shift in the distribution of power. If this shift is sufficiently large, the ruler will not invest and underdevelopment will persist. A political commitment problem also accounts for the inefficient allocations in Aghion and Bolton (1990) and Milesi-Ferretti and Spolaore (1994) where parties choose inefficient policies in order to affect their future electoral prospects, i.e., the probably of remaining in office. The same is true of Acemoglu and Robinson's (2006a) analysis of economic backwardness and underdevelopment. There adopting an efficient technological innovation reduces the cost of replacing an incumbent and thereby affects the voters' indirect utility for keeping an incumbent.

By contrast, a soft-power commitment problem is at work in Persson and Svensson (1989), Alesina and Tabellini (1990), and Persson and Tabellini (2000). In these studies, the political party in power takes on inefficient levels of debt in order to influence the policy choices of the other party should that party come to power.

Finally, Besley and Coate (1998) identify three reasons why efficient investments may not be undertaken in their citizen-candidate model of democracy.[15] The first is the standard

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[14] See Nye (1990, 2004) for the original formulation of soft power and subsequent elaboration.

[15] See examples 1,2, and 3 (Besley and Coate 1998, 146-51).

hold-up or pure economic commitment problem. If some potential future policy makers have different policy preferences and are sufficiently likely to come to power (i.e., if p is sufficient small so that $pr < i$), then the current policy maker will be deterred from undertaking costly investments even if the investment has no effect on the probability of winning future elections ($p' = p$). Besley and Coate's second reason is a political commitment problem. Efficient investments may affect the likelihood that someone with different preferences comes to power in the future. Finally, there may be soft-power commitment problems. Investments which do not affect the future distribution of electoral power but do "change the *choices* of future policy makers may also not be undertaken" (1998, 140).

Besley and Coate associate these three sources of inefficiency with democracy. Each "stems from the problem that when a society makes policy decisions via a representative democracy it cannot commit to future policy outcomes" (1998, 140). But as the simple model and taxonomy make clear, the issue is not really democracy but the inability to commit.[16]

Conclusions

[16] Indeed, one could easily imagine that citizens vote at time zero on how all future pies will be divided. However such agreements, as the flow-of-pies model above suggests, may not be time consistent if the distribution of de facto power (Acemoglu and Robinson 2006b) among citizens or groups of citizens shifts over time. The institutional feature that "no Congress can commit a future Congress" may be an endogenous institutional feature reflecting this time-inconsistency problem.

The focus on commitment problems as a cause of war generally grew out of a sense that asymmetric information is not the first-order explanation of persistent conflict. While it is easy to see how asymmetric information might explain why states or factions start fighting, it is harder to see how this could explain persistent conflict and the fact that a quarter of all civil wars last more than a decade and ten percent last more that twenty-five years (Fearon 2004). Abstracting away from asymmetric information in order to simplify the formal analysis, the challenge was to explain how complete-information bargaining could break down in persistent fighting.

Shifts in the distribution of power provide one answer. These shifts limit the amount that one bargainer can credibly promise to give to another in the future in an effort to buy the latter off. If the shift is too rapid, a bargainer may not be able to offer enough to buy the other off and the bargaining will breakdown in fighting. Essentially the same logic can keep the fighting going (Fearon 2004, Fearon and Laitin 2007, Powell 2010).

As the simple taxonomy of commitment problems makes clear, shifting power is just one possible source of inefficiency. How empirically important it will ultimately prove to be is an open question.

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