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Introduction

Civil war is an inefficient mean of allocation of resources. First, there is some evidence of high economic, human and welfare costs of civil wars[1]. Second, the transfer of resources between opposing groups seems to be feasible. Given this, why do agents go into civil wars when disputing the government? Instead, they could negotiate bilateral transfers, avoid these wars (and their costs) and be both better off.

A part of the theoretical literature on war answer this question arguing for limits on agents' commitment capacity (see, for instance, Acemoglu and Robinson [2001], Powell [2004], Powell [2010] and Yared [2010]). Since agents in these models cannot commit to implementing the transfer bargained in the past, agents will behave as if there was no negotiation when deciding to go to war. With that, limited commitment may explain the occurrence of inefficient wars. Moreover, this theory has an appeal given the evidence that politicians break their promises (more precisely, Lee, Moretti and Butler [2004] show evidence that politicians in the U.S. House have no commitment to electoral promises).

Many of these models are used to explain not only the occurrence of wars, but also the dynamics of wars, trying to explain cycles of wars and persistence (for instance, Powell [2009] and Yared [2010] use their models for this purpose), and to explain policy and institutions (for instance, the paper by Acemoglu and Robinson [2001] fall into this category). However, when it comes to the data, it is hard to say something about both the "level"of commitment and the extent to which such dynamics are driven by commitment instead of being driven by some other theory of war.

In this way, this paper's question is: what can be learned from the data about commitment to Coasian bargains in civil wars supposing there

[1]To mention some of them, seven million deaths happened in civil wars around the world in between 1950 and 1997 (Correlates of War (CoW) project). Moreover, a recent literature shows many cases in which civil wars had adverse effects over educational attainment, labor market outcomes and over macroeconomic variables in the short-run (Blattman and Annan [2010], Chamarbagwala and Morán [2010], Kondylis [2010], Abadie and Gardeazabal [2003], Miguel and Roland [forthcoming])

is transferability of utility (which most of the theoretical literature supposes)? Under such an assumption, is it plausible to assume that conflicting players in a country have zero commitment? To answer this question, this paper builds a model nesting several potential hypothesis on commitment levels, showing that variation in control of resources under peace and under war - meaning variation in a player's authority to decide on the allocation of resources under dispute - can be used to identify commitment. More precisely, if one observes variation in control of resources under war and under peace, one can identify how much of the value under dispute a player can commit to concede to a rebel movement. In particular, this model could be used to test the hypothesis of zero commitment commonly made in the literature.

Intuitively, variation in control of resources identify commitment because, in order to provide incentives for a given player not to go into wars, the opposing player must promise that if he gets control of resources after war, he will take the whole value under dispute to himself. On the other hand, if the opposing player gets control of resources after peace, he will concede a part of the values under dispute to the other player. Consequently, commitment problems may only arise during peace. Variation in control of resources after peace, for a given level of commitment, allows one to capture how often such commitment problems arise. However, by observing only variation in control of resources after peace, it is impossible to know whether conflicts are responding to this variable due to commitment issues or due to variations in the value under dispute. The observation of variation in control of resources after war allows for this distinction.

The assumption of transferability of utility simplifies considerably the problem under scrutiny: first of all, there are no costs of making a transfer to opposing groups (including potential electoral costs of making concessions to the opposition). While this might be plausible under some circumstances, it is certainly not always plausible. Second of all, this assumption eliminates the issues of having more than two players disputing a same cake: in such a case, with some limit on commitment, making a transfer to one player is costly in terms of transfers to other players. In other words, to use the analysis of this paper to multi-player conflict, it should be assumed that either (i) opposition players are playing together or that (ii) each opposition player disputes a separate cake with the government. Still, despite the fact that supposing transferability of utility may be implausible for many contexts, I believe that it is a natural first step in understanding something about contractual imperfections leading to wars.

The basic model is silent about three other topics: first, it takes parti-

cipation in wars, investments in military capacity, organization and creation of movements as given. The reason for that is that there might be a lot of heterogeneity in organizational forms, collective action capacity, costs of military expenditures, and for that, I prefer to look at shocks that are assumed to be exogenous to costs of war and to control of resources under war. Second, I suppose players have symmetric information. Despite the possibility that asymmetric information on military capacity and willingness to go to war might be relevant to the occurrence of many conflicts, players probably learn quickly during war about these parameters. Moreover, in face of such a possibility, players probably develop communication and mediation mechanisms to avoid the occurrence of such wars. Finally, the model does not incorporate the possibility of coordination into war or into peace. More precisely, I do not allow for many players in the game to decide to go to war. The reason for that is that multiple equilibria may arise in this game, and adding asymmetric information or an order of play are not enough to prevent multiple equilibria from happening.

Having the above caveats in mind, I apply this model to a panel of 133 countries between 1975-2004. When taking into account some heterogeneity in the model's parameters, the model estimates are not consistent with hypothesis of no commitment for the average country in my sample. The model estimates that in the average country, the government is able to commit to concede the whole amount of resources under dispute to the rebels. Moreover, costs of war are estimated to be negative for the average country (this estimate is imprecise, though).

These estimates also point to considerable heterogeneity in values under dispute, commitment and costs of war (despite, in practice, it is hard to differentiate between heterogeneity in each of these parameters). The full model predicts that out of the 3438 country-years observed, commitment does not bind the concessions under peace for 3140 country-years (or, approximately, 90% of this sample). These countries face probabilities of wars of around 2%. On the other hand, the other 10% of countries that are subject to binding commitment constraints face a probability of wars of around 80%. Those probabilities are consistent with the unconditional probabilities in the data, indicating that variation in commitment capacity explains wars. Still, for the countries bound by commitment, it is hard to distinguish between the commitment hypothesis and other alternatives: surprisingly, changing the technology of taking over the government through wars and through peace does not have an impact over the probability of war for these countries. It should be noted: these conclusions may be sensitive to changing the source

of heterogeneity analyzed (again, I only analyzed the heterogeneity related to income and past of wars). Moreover, the fact that it is hard to differentiate between heterogeneity in values under dispute, commitment and costs of war raises doubts on the empirical feasibility of the identification strategy (at least, based on the sources of heterogeneity analyzed).

This papers adds to a small but growing literature trying to infer from the data something about contractual theories of conflict. Besley and Persson [2009] use a model with limited commitment and State advantages in organizing for conflict to analyze jointly repression and wars. Beber [2009] uses seazonal variation in supply of mediation efforts by foreign countries to see if mediation helps to limit conflict (potentially, due to improving information). Beber and Blattman [2010] uses micro-data on participation in wars to understand something about theories of agency inside rebel movements. To the best of my knowledge, this is the first paper identifying commitment in the context of civil wars using variation in control of resources. While some papers have used policy measures to identify commitment in the case of electoral politics (see Moretti, Lee and Butler [2004] and Bardhan and Mookherjee [2010]), the fact that I do not use policy measures to identify commitment to Coasian bargains in civil wars allows me, in theory, to capture both explicit mechanisms (peace agreements and current policy decisions) and implicit mechanisms (reputation) through which parties in a conflict may commit to bargains.

The next section describes the theoretical model, which will be useful for the specification of my empirical model and for my argument of identification of commitment. The third section describes the data. Section four discusses the identification and estimation of the model. Section five estimates the model with a simpler two stage procedure. Section six provide the estimates of the structural model in the paper. Section seven describes the model's parameters. Section eight analyses the consequences of the model's estimates for policy making and probability of wars, looking at the impact predicted by the model of increasing commitment, increasing democracy and changing the technology of government takeover through wars. Finally, section nine concludes the paper.