International Conventions and Non-State Actors: Selection, Signaling, and Reputation Effects [*]

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Abstract

Non-state actors (NSAs) play an important role in contemporary violent conflicts, but cannot generally sign international conventions open only to state actors. The non-governmental organization Geneva Call solicits NSAs to sign conventions that tie their hands and ban particular activities, for example the use of landmines, and to allow monitoring of their compliance. This specific case highlights general questions over why non-state actors should sign conventions that limit their autonomy and cannot be enforced, and whether such conventions can change subsequent behavior. We propose a game-theoretic model to assess the motivations for NSAs and states in armed conflict to sign conventions and how they affect subsequent conflict behavior, considering the costs of foregoing mines as well as possible reputation costs. We find that decisions to sign hinge on expectations about whether the antagonist will sign, and that actors can signal resolve through signing and under some circumstances for the other party to sign and comply. Empirical analyses of conflict behavior in countries where Geneva Call has been active support the implications of the theoretical model, once we take into account selection issues.

1 Introduction

Non-state actors (NSAs) play an important role in contemporary violent conflicts, but cannot generally sign international conventions open only to state actors. The international non-governmental organization (NGO) Geneva Call solicits NSAs to sign conventions that tie their hands and ban particular activities and to allow monitoring of their compliance.The first convention offered by Geneva Call for NSAs to sign is deed of commitment banning the use of landmines. This is intended to be a parallel to the Ottowa Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction on the government side (see, e.g., Goose, 1998; Moser-Puangsuwan, 2008).[1] Several NSAs have indeed heeded the Geneva Call, and signed agreements limiting their use of landmines, in much the same manners as governments have signed the interstate Ottawa convention.

However, merely a cursory look at contemporary conflicts reveal considerable variation in whether governments or non-state actors in actually sign on to these agreements. In his inaugural address on August 7, 2010, newly elected Colombian President Juan Manuel Santos implored the *Fuerzas Armadas Revolucionarias de Colombia* (FARC) guerillas to cease using landmines.[2] Geneva Call had since 2006 unsuccessfully attempted to win over the FARC to sign (Geneva Call, 2006), despite the fact that the Columbian government signed the landmine treaty in 2000.[3] Geneva Call had more success in Sudan. In October 2001 the Sudan People's Liberation Movement/Army (SPLM/A) signed the proposed convention (Geneva Call, 2007). Only two years later the Sudanese government followed suit and signed the treaty.[4] Overall 153 countries have by now signed the Ottawa landmine treaty, and 41 non-state actors (NSAs) from 10 countries have done the same for Geneva Call's convention. Few non-state actors (NSAs) have signed the convention after their government signed the treaty; many more have signed before the government has pledged its support.[5]

This variation in patterns of state and non-state actor signing behavior in this spe-

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[1]Geneva Call also wishes to cover the areas of child soldiers and sexual violence.

[2]"Santos assumes Colombia's presidency amid conciliation with Venezuela, Ecuador" *Los Angeles Times* August 10, 2010 and "Santos Präsident Kolumbiens" *Neue Zürcher Zeitung* August 9, 2010.

[3]See `http://www.icbl.org/index.php/icbl/Universal/MBT/States-Parties`.

[4]See `http://www.icbl.org/index.php/icbl/Universal/MBT/States-Parties`.

[5]The term non-state actors is often used much more broadly than to denote actors in violent armed conflicts. Here we use the term to denote to the latter, following the terminology of Geneva Call (2007).

cific context highlights two general questions relevant to the current debate on human rights treaties in international relations in general and civil wars more specifically. First, why would a non-state actor sign a constraining convention, that limits their autonomy to use potentially valuable measures, especially if it cannot be enforced? And second, what effects do such conventions have on subsequent compliance of the parties? Both of these questions are intimately related to the current debate on the screening and constraining effects of international agreements (see for instance Simmons, 1998; von Stein, 2005; Simmons and Hopkins, 2005). In addition, they highlight a more general process of interaction between NSAs and governments, who both play to at the same time to a domestic and international audience. Obviously, this type of interaction is not necessarily dependent on having available conventions for NSAs to sign offered by outside agencies, but may also exist in a much looser fashion with informal agreements or commitment devices.

Although Geneva Call's efforts to engage non-state actors in human rights treaties is quite specific and limited, the existence of this actual effort and availability of actual empirical data allow us to draw insights that extend beyond this very specific application. Our theoretical model and our empirical analyses show that decisions by governments and NSAs with regards to signing treaties are interdependent. Both actors will weight the costs of foregoing mines against the possible reputation costs for not signing the convention as well as signing after the other party. The decision of an NSA to signing up to the Geneva Call's deed of commitment can influence the reputation costs of governments for not signing, and hence make governments sign on to the Ottawa convention in situations where it probably would not otherwise have done so. Similar relationships are likely to be found in other areas where no NGO offers formal deeds of commitments to NSAs, but where NGOs operate through "naming and shaming" (e.g., Hafner-Burton, 2008) to influence both governments and NSAs. Moreover, we also find that selection effects are very important for evaluating the effect of both the Ottawa convention and Geneva Call's deed of commitment on subsequent conflict behavior. More precisely, we only find a positive effect for Geneva Call's deed of commitment on NSAs refraining from using landmines when we consider the factors that shape the decision to sign this deed of commitment. Similarly, the effect of the Ottawa convention is only apparent after taking into consideration the signing decisions, although in this case the effect surprisingly turns out to be negative: signatories of the convention, taking into account the reasons for signing, are more likely to continue

using landmines. The rather weak enforcement regime of the Ottawa convention is probably an important reason underlying this result (e.g., Drezner, 2005).

The remainder of the manuscript is structured as follows. We first discuss in section two the literature on human rights as it relates to our research question. We also discuss the context of Geneva Call's intervention. In section three we propose a game-theoretic model focusing on the interaction between governments and NSAs when it comes to signing and complying with conventions related to human rights. Section four presents empirical tests of some of the implications derived from the theoretical model. Section five concludes and discusses more general implications for commitments by non-state actors and avenues for future research.

2 Human rights and non-state actors

There has been a surge of academic interest in the study of human rights over the last decades (see, e.g., Carey, Gibney and Poe, 2010; Finnemore and Sikkink, 1998; Hafner-Burton, 2008; Hathaway, 2002; Hollyer and Rosendorff, 2010; Risse, Ropp and Sikkink, 1999; Simmons, 2009; Vreeland, 2008). Below we first review the recent literature on human rights most relevant for our research questions, before offering a short overview over Geneva Call's actions.

2.1 Human rights treaties

Authors like Finnemore and Sikkink (1998) and Risse, Ropp and Sikkink (1999) see the growth of human rights treaties as expressions of the power and importance of norms, and interpret this as evidence for sociological institutionalist arguments on the emergence of norms based orders (see, e.g., Dimaggio and Powell, 1991; March and Olsen, 1984). However, this largely optimistic view has been criticized by other researchers focusing on the tangible effects of human rights conventions, who highlight the critical issue of enforcement. Several studies note how authoritarian regimes have agreed to sign human rights conventions without actually enforcing them (e.g., Hafner-Burton, 2008; Hathaway, 2002; Hollyer and Rosendorff, 2010; Vreeland, 2008; Simmons, 2009). This in turn raises the question of whether the norm diffusion effects that have been highlighted in earlier studies merely entail states paying lip-service when signing treaties, and whether signing such treaties by itself has any tangible consequences.

The debates over the effects of human rights treaty ratification and subsequent behavior are related to a more general debate on the effects of international treaties on behavior (see, e.g., Simmons, 1998; Simmons and Hopkins, 2005; von Stein, 2005). This literature highlights the problem of assessing the constraining effects of international treaties (including treaties related to human rights) arising from the fact that signing a treaty often is influenced by the expected compliance and compliance costs. Observing that the signatories of particular treaties behave differently could simply be due to parties signing treaties they are already compliant with, or other relevant factors that make particular types of countries choose to sign treaties rather than the effects of signing the treaties themselves for subsequent behavior(see, e.g., von Stein, 2005).[6] In our context, the Sudanese SPLA had already started to refrain from using landmines when it signed Geneva Call's deed of committment (personal communication by Pascal Bongard, program officer Geneva Call, January 5, 2011). Stated differently, assessing the causal nature of treaties require us to establish plausible counterfactuals for behavior in the absence of the treaty. In the context of human rights work by Hafner-Burton and Tsutsui (2005, 2007),Hafner-Burton (2008), Hill (2010), Hollyer and Rosendorff (2010), Simmons (2009) and Vreeland (2008) examines these issues in more detail.

NSAs differ from state actors in that their human rights obligations are much less clearly developed (e.g., Clapham, 2006), as NSAs by definition are not signatories to standard human rights conventions. Scholars have only recently become interested in the conditions under which NSAs obey human rights norms (see for instance Jo and Thomson, forthcoming).[7] The most extensive applied effort in this area is certainly Geneva Call's initiative to propose human rights conventions to NSAs.[8]

Beyond the general work on human rights treaties, there is a considerable amount of research on the Ottawa convention banning the use of landmines. As with the early

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[6]Simmons and Hopkins (2005) contends that there are constraining effects of treaties even after taking this selection problem into account. Similar debates have emerged in studies of whether the World Trade Organization leads to trade liberalization or not (see Rose, 2002).

[7]To be clear "non-state actors," we here refer exclusively to armed opposition organizations previously or currently engaged in violent intra-state conflict. As outlined above, many other types of relevant non-state actors such as NGOs figure prominently in the study of human rights, primarily in arguments stressing mechanisms of transnational and domestic mobilization for human rights protection (e.g., Keck and Sikkink, 1998; Simmons, 2009). In general, however, the literature on compliance with international law suffers from a state-centric focus (see Simmons, 2010). An important exception is Morrow (2007), who in his study of state compliance with the laws of war discusses the agency problem introduced by non-compliance by individual soldiers.

[8]See `http://www.genevacall.org/` for more details.

work on human rights, many studies of that examine this treaty have emphasized the importance of NGOs and civil society to bring about this convention from a sociological institutionalist perspective (see, e.g., Anderson, 2000; Lins de Albuquerque, 2007; Price, 1998; Rutherford, 2000*b*; Rutherford, 2000*a*; Short, 1999; Wexler, 2003).[9] More recently, however, scholars have questioned the importance of civil society in this context, as most of the signatories to the Ottawa convention did not stock landmines at the time of ratification and the enforcement mechanisms remain particularly weak (see, e.g., Drezner, 2005).

This perceived ineffectiveness of the Ottawa convention limiting the ability of states to use landmines makes it all the more interesting to understand why NSAs would sign a convention imitating the Ottawa convention and how this affects their subsequent human rights record. To our knowledge, no existing systematic study has examined this, and there are still few studies that look specifically at how treaties may influence the interaction between governments and NSAs. Many researchers have studies variations in treaty compliance during wartime with regards to the adherence to the laws of war (Valentino, Huth and Croco, 2006; Morrow, 2007). Another body of literature deals with the determinants of violence against civilians by states and/or NSAs during wartime more generally (e.g., Azam and Hoeffler, 2002; Azam, 2006; Balcells, 2010; Downes, 2006; Eck and Hultman, 2007; Humphreys and Weinstein, 2006; Kalyvas, 2006; Stanton, 2010; Valentino, Huth and Balch-Lindsay, 2004). More recently, Bussmann and Schneider (2011) analyze how ratification of international humanitarian law influences the presence of the International Committee of the Red Cross in conflict zones and its effects on violence against civilians in intra-state armed conflicts. Other related work includes Beber and Blattman's (2010) work dealing with restrictions on child-soldiers, an area into which Geneva Call is also in the process of venturing (see `http://www.genevacall.org/Themes/Children/children.htm`).

The study most relevant to ours is Jo and Thomson (forthcoming), who propose a theoretical model to assess how compliance with human rights norms with regards humanitarian access in armed conflicts relates to reputation and international organizations. The explanation that we offer below for why NSAs and governments sign the Geneva Call deed of commitment or the Ottawa convention similarly highlights

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[9]In a recent contribution on global norm creation with regards to specific weapons types, Carpenter (2011) argues that it is advocacy networks around an issue per se that explains variation in the emergence and success of campaigns on norms on particular weapons, but rather that issue selection processes within nongovernmental and international organizations that are most central to advocacy networks ("network hubs") are crucial in bringing particular issues to global prominence.

the interdependence between NSAs and governments and the role of reputation effects relative to costs of forsaking a specific military technology.

Before turning to our proposed explanation for why non-state actors should sign such a deed of commitment to refrain from using landmines and how this may influence behavior, we first turn to examine in a bit more detail the Geneva Call's deed of commitment and how ratification by NSAs relates to a government signing or not signing the parallel Ottawa convention.

2.2   Geneva Call

As previously mentioned, Geneva Call is an NGO that aims at engaging armed NSAs to respect international humanitarian law and human rights law. It was founded in 1998, the year after the Ottawa convention was adopted, in response to the concern that this anti-mining convention was only binding on states, and did not prevent armed NSAs to continue to use these weapons. Geneva Call effectively began in 2000 to engage NSAs on the subject of landmines. To this end, Geneva Call offers the "Deed of Commitment for Adherence to a Total Ban on Anti-Personnel Mines and for Cooperation in Mine Action." The convention engages NSAs to ban the production, use, and transfer of landmines, as well as to participate in mine clearance and mine risk education. Importantly, the convention entails verification missions by Geneva Call.

Geneva Call is currently engaged in 6 areas, namely Africa (since 2000), Asia (since 2000), the Caucasus (since 2006), Europe (since 2001), the Middle East (since 2000), and Latin America (since 2003).[10] Table 1 gives an overview of the numbers of countries and NSAs that have signed the Ottowa treaty and the Geneva Call convention to date. If the behavior of states and NSAs were completely unrelated and parties in conflict sign independently we should se be no systematic pattern to when states and NSAs sign. Likewise, if NSAs simply mimic states we should see them sign on only in cases where governments have already signed, as the Ottawa convention has been open longer than the Geneva Call deed of commitment. Table 1 indicates not surprisingly that there are more states that have signed than NSAs signing the Geneva Call's deed of commitment (note that many of these states do not have NSAs engaged in armed conflict). However, it is clearly generally not the case that NSAs simply follow states, and we have a substantial number of cases where NSAs sign before states do or where states have not signed despite NSAs signing.

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[10]See `http://www.genevacall.org/home.htm` (accessed September 7, 2010).

Table 1: Ratification of Landmine Ban Convention and Sequence

Countries (number of NSAs that signed in parentheses)
Country signed first, NSA afterwards
Burundi (1)
Phillipines (3)
Turkey (1)
NSA signed first, country afterwards
Iraq (2)
Sudan (1)
NSA signed first, country not yet
Burma (6)
India (3)
Iran (6)
Morocco (1)
Somalia (17)
Country signed, no NSA signed
148 countries
Neither country nor NSA signed
34 countries
Sources:
http://www.icbl.org/index.php/icbl/Universal/MBT/States-Parties
Geneva Call (2007)

3   A Model

We propose a simple game-theoretic model to understand when and why governments
and armed non-state actors will ratify a convention on the ban of landmine usage—the
Ottawa and Geneva Call conventions, respectively—as well as when and why a for-
mal ratification of such a convention subsequently will be adhered to in practice. We
conjecture that the formal act of ratification is not necessarily followed up by com-
pliance, especially since such constraint can undermine the actors ability to achieve
their objectives in the dispute, where the government and the non-state actors have
divergent interests. Our model highlights the importance of the relationship between
reputation costs from using landmines and the costs from refraining from using land-
mines, as well as uncertainty about the type of the opposing actor. Since governments
and non-state actors in conflict pursue opposing objectives, their interaction occurs in
an environment of uncertainty, with incentives to misrepresent. Thus, both parties are
uncertain whether the other party will actually put deeds into action. As we will show
in more detail below, our model suggests that non-state actors under certain conditions
by signing can induce governments to sign the convention when they otherwise would
not. Moreover, compliance is more likely after signing when landmines are of greater
tactical value to NSAs.

The game is played between two principal actors in a conflict, a government G and
an armed non-state actor A. Nature N is a third actor that determines the types of G
and A, that is to what extent each actor actually is inclined to put words into actions in
the event that the convention is formally ratified. In other words, the type determines
whether a *de jure* ratification is matched by a *de facto* adherence. The extensive form

of the game is given in Figure 1, and the sequence of play can be described as follows:

1. Nature determines whether G and A will comply and refrain from using land-mines if they should choose to ratify their respective conventions. For simplicity, this move is omitted from Figure 1.

2. The government G chooses whether (or not) to sign the Ottawa convention.

3. The armed non-state actor A decides whether (or not) to ratify the Geneva Call convention.

4. If only A has signed, but not G, then G gets another chance to sign or not sign the Ottawa convention.

5. If A and/or G have ratified the convention, they decide *simultaneously* whether (or not) they will put deeds into action and act accordingly, i.e. comply by refraining from using landmines.

This results in an imperfect information game in which the effects of ratifications are endogenous. Below we analyze both a complete and an incomplete information version of the game. For both versions, the payoffs are composed of the following elements. First, to capture the widely accepted fact that conflict is generally costly (e.g, Fearon, 1995), we introduce:

- the costs of the civil war $cw_i > 0$, with $i \in \{G, A\}$.[11]

Second, we assume that public perception of ratification pertains primarily to the government and results in consequences which are either positive, absent, or negative, depending on the timing of a signatory. If the government moves first, it signals genuine commitment to human rights, and so there will be a reputation benefit. If the government merely follows suit *after* the armed NSA has signed, the government's action will be considered opportunistic and so no gains are credited. Likewise, if neither actor signs, no reputation gains or losses apply. Finally, if the government does not sign but the armed non-state actor did, it suffers a reputation cost for negligence of human rights vis-à-vis its competitor. These considerations are captured by:

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[11]As we will focus on states and armed NSAs engaged in civil wars, this term will be constant and could be dropped. We nevertheless keep it in what follows to allow for extensions beyond civil war cases.

Figure 1: Extensive Form of the Model

- the reputation benefits $r_G \geq 0$ (if G signs first) or costs (if A signs and G does not).[12]

Finally, pledging to a ban of landmines potentially alters the battlefield capabilities of both governments and armed non-state actors, since—at least in theory—adherence limits the set of available military strategies. However, this will be highly context specific, for instance dependent on the technology of rebellion. In addition, ratifying a convention does not necessarily equal actual compliance. Indeed, compliance is likely to depend on how severe the consequences of getting caught relative to the purely military costs are to governments and non-state actors. Thus, because compliance is in part determined by intentions that are unobservable *ex ante*, we decompose it into two parts. The first part captures the observable military disadvantage, i.e.:

- the increased costs of warfare $w_i \geq 0$ if a treaty is adhered to, with $i \in \{G, A\}$ (by assumed symmetry, these increased costs generate benefits for the adversary).

The second part concerns the potential consequences of non-compliance if a treaty is formally ratified but not adhered to in practice. While this component can be monitored, we theorize this it as unobservable ex ante. Thus denote:

- the increased costs related to non-compliance $c_i \geq 0$, with $i \in \{G, A\}$.

Specifically, non-compliance by actor i removes the w_i term from both actors' respective payoffs while the "offending" actor i pays a cost of c_i if non-compliance is detected (possibly stochastically) by monitoring. Following this logic, the analysis of the model presented below, we then use the relationship between w_i and c_i to characterize the actors types as either "nice" or "mean" (see Jo and Thomson, forthcoming).

3.1 Complete but Imperfect Information

We begin by considering the complete but imperfect information case in which the decision to comply occurs simultaneously. There are four combinations of possible

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[12]More precisely, the costs of not signing the treaty after N's signing of the convention is assumed to be twice as large as the benefits of signing first. It is easy to see that if costs and benefits were of the same magnitude, G will always sign at the first decision node if it were also to sign at its second node. We assume that NSAs do not face reputation costs or benefits related to to human rights conventions. It is likely that NSAs do face such costs, but this will depend strongly on the position of the armed NSA. Armed NSAs close to winning a war might be concerned much more about civilian victims than other NSAs. We thank Susanna Campbell for raising this point. Moreover, empirically the cost of civil war will also vary across time depending on the level of intensity.

compliance decisions:

1. Both G and A comply

$$
\begin{aligned}
EU_G &= -cw_G - w_G + w_A + r_G \\
EU_A &= -cw_A - w_A + w_G
\end{aligned}
\tag{1}
$$

2. Only G complies

$$
\begin{aligned}
EU_G &= -cw_G - w_G + r_G \\
EU_A &= -cw_A + w_G - c_A
\end{aligned}
\tag{2}
$$

3. Only A complies

$$
\begin{aligned}
EU_G &= -cw_G + w_A + r_G - c_G \\
EU_A &= -cw_A - w_A
\end{aligned}
\tag{3}
$$

4. Neither G nor N comply

$$
\begin{aligned}
EU_G &= -cw_G + r_G - c_G \\
EU_A &= -cw_A - c_A
\end{aligned}
\tag{4}
$$

From this setup it easily follows that compliance for both actors i depends on the condition $-w_i > -c_i$ (i.e., the costs of warfare under the treaty must exceed the increased costs of non-compliance). Consequently, we use this condition to define the "mean" and "nice" types of actors. For a "nice" G $-w_G > -c_G$, while for a "mean" G $-c_G > -w_G$. Similarly, for a "nice" A $-w_A > -c_A$ holds, while $-c_A > -w_A$ holds for a "mean" N.[13]

If both G and A are uncertain about the type of their adversary, compliance will depend on their updated beliefs about each other. We denote the prior beliefs as p ($prob(c_G > w_G)$) and q ($prob(c_A > w_A)$). Relying on subgame perfection as the solution concept, we can state the following proposition:

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[13]More precisely, we assume that all payoff elements are common knowledge except the c_is, which are private information to both is, respectively.

Proposition 1 (Complete and imperfect information) *In any subgame-perfect equilibrium, either G fails to sign at its first decision node but signs after A's signing (if $p = 1$, $q = 1$ and $2 \times r_G > w_G$) or G signs at its first decision node, while A refrains from doing so (in all other cases).*

Proposition 1 suggests that under complete but imperfect information A may induce G to sign (or vice versa G by not signing first forces A to sign), thus highlighting direct strategic interdependence between the actor's decision whether or not to ratify conventions related to human rights at the intra-state level.

3.2 Incomplete and imperfect information

In order to refine our understanding about the conditions under which strategic actors make use of the possibility to commit to human rights at the expense of limiting their battlefield capabilities and/or to induce strategic interdependence vis-à-vis their opponent, as well as a more nuanced understanding of the conditions under which the actors are likely to engage in compliant behavior, we also consider an incomplete and imperfect formulation of the model, that is a signaling game with two-sided incomplete information. To this end we introduce a slight modification to the above introduced game structure and assume that there are two types of actors. Specifically, we assume that c_i may take two values: $2 \times w_i$ for a "nice" type and $\frac{w_i}{2}$ for a "mean" type.[14] Using this simple characterization, we solve the game using the perfect Bayesian equilibrium as the solution concept and state the following proposition:

Proposition 2 (Incomplete and imperfect information) *Each of the perfect Bayesian equilibria produce one the following outcomes:*

- *Both types of G refrain from signing at each of their decision node, leading both types of N not to sign.*

- *Both types of G sign at their first decision node, leading both types of A not to sign.*

- *Both types of G refrain from signing at their first decision, leading both types of A to sign, followed by both types of G signing as well.*

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[14]If the more general formulation were to be used, some equilibria would depend on the exact distribution of the two c_is.

- *A "mean" G signs at first decision node and a "nice" G does not, leading both types of A not to sign.*

- *A "mean" G signs at first decision node and a "nice" G does not, leading the "mean" type of A to sign, followed by a signing by both types of G as well.*

- *A "nice" G does not sign first, while the "mean" A does not sign probabilistically, leading the "nice" A to sign probabilistically, while the "mean" A always signs, which are followed by both types of G signing.*

Several aspects of the proof of proposition 2 are worth highlighting for the purposes of this paper and our subsequent empirical evaluation:

1. If w_G is sufficiently high compared to r_G neither G nor A will ever sign.

This implication draws on a comparison of two costs for government: reputation costs and the cost of refraining from using landmines. Below we will presume that reputation costs for democracies are higher than for non-democratic countries, while the costs of refraining from using landmines may be proxied by previous use or stockpiles of landmines. Formulated as an empirical expectation, we thus expect that democratic institutions may increase the likelihood of government signature, especially in cases where landmines are militarily less beneficial to begin with.

2. If the prior belief q is high, then both types of G will first refrain from signing, but will follow suit after A has signed.

3. If the prior belief q is low, then both types of G will sign immediately.

Implications 2 and 3 relate the expected cost of non-compliance to the military benefits of landmine usage. As we assume the former to be private information, we start from the presumption that observing one-sided violence by one actor gives the other actor information on how costly it is for the former to engage in non-tolerated activities. Thus, if the government has reason to believe that the armed non-state actor is relatively unconcerned about potential costs of non-compliance—that is, the armed non-state actor is "mean", for example because of a history of one-sided violence— then A's signatory can serve as a credible signal that induces G to sign as well. By contrast, if the government believes that the armed non-state actor is "nice", then it will ratify the Ottawa convention already before the non-state actor.

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4. For moderate values of w_G a "nice" G may not sign at first, inducing a "mean" A to sign on its turn, followed by G signing.

In more concrete terms the fourth implication relates the military benefit of landmines to the cost of treaty adherence. If landmines are of reasonable military and tactical value to an armed NSA—for example where they can be used to defend controlled territory—then late signatories by A will be followed by compliance.

4 Implications and empirical tests

4.1 Scope of the Data

We begin by describing our data. Since we are interested in evaluating the consequences of Geneva Call's engagement, our analyses are temporally and spatially restricted to countries in which Geneva Call played an active role and to NSAs in contact with the latter NGO. Moreover, given the setup of our theoretical model, we require data that allow us to model the (strategic) interaction between NSAs and their governments. To retain time varying information, our unit of analysis is the dyad-year.

The next step is to define the sample. Within the regions (and the respective time periods) of Geneva Call's engagement, the dataset covers all dyads where the NSA has been involved in intra-state armed conflict with the state (as defined by UCDP[15]) at least once since 1989. More precisely, dyads are included if the NSA has been actively involved in armed hostilities with the government, i.e., in intra-state conflict as defined by UCDP,[16] during at least one year during the period from 1989 through 2009.[17] Armed organizations do not enter the dataset prior to their active involvement in an intra-state armed conflict. Once NSAs have qualified for inclusion, they enter the

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[15] The UCDP project defines armed conflict as "a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths in one calendar year." `http://www.pcr.uu.se/database/definitions_all.htm` (accessed September 14, 2010).

[16] UCDP Dyadic Dataset v.1-2011 (Harbom, Melander and Wallensteen, 2008; Harbom, 2010; Themnér and Wallensteen, 2011).

[17] Intra-state conflict dyads are composed of the government of a state and an armed opposition organization. UCDP defines armed opposition organizations as "[a]ny non-governmental group of people having announced a name for their group and using armed force to influence the outcome of the stated incompatibility" (Harbom, 2010). The criterion for inclusion of NSAs into the UCDP dyadic dataset is at least 25 battle-related deaths during the given year in the dyad of the warring party `http://www.pcr.uu.se/database/definitions_all.htm` (accessed September 14, 2010).

dataset on a yearly basis during Geneva Call's period of engagement in the respective region, regardless of whether they were actively engaged in armed conflict during a given year.[18] However, we only include NSAs as long as they qualify as politically active organizations that maintain their own armed wing (our coding effort) and have been engaged by Geneva Call. To ensure robustness, we run our estimations on both a strict and a more lenient coding of activity (the latter includes dyad-years for which the pattern of activity is unclear; see table 7 in the appendix).

We restrict this sample to regions and periods of Geneva Call's actual engagement. These are listed below. The countries where Geneva Call has already ended its programs are listed in parentheses.[19]

Regions and time periods of Geneva Call's engagement:[20]

- Africa (2000 onwards): (Burundi), Niger, Senegal, Somalia, (Sudan), Western Sahara/Morocco.

- Asia (2000 onwards): Burma-Myanmar, India, Philippines, (Nepal), (Sri Lanka), (Indonesia).

- Caucasus (2006 onwards): Azerbaijan [and Armenia],[21] Georgia.

- Europe (2001 onwards): Turkey.

- Latin America (2003 onwards): Colombia.

- Middle East (2000 onwards): Iran, Iraq, Lebanon,[22] Yemen.

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[18]To illustrate, the conflict between the *Mouvement des forces démocratiques de Casamance* (MFDC) and the government of Senegal was coded active first in 1990 in the UCDP dyadic dataset (v. 1-2010). This dyad is therefore included in the dataset during all years since Geneva Call became active in the respective region (2000 onwards), although this dyad did not reach the 25 battle-related threshold every year after 2000.

[19]Note that Geneva Call provides more accurate start and end dates of engagement for a subset of countries. For this version, the start year as indicated for Geneva Call's regions of engagement was taken.

[20]Source: Geneva Call. `http://www.genevacall.org/home.htm` (accessed September 11, 2010).

[21]Armenia does not qualify as a primary conflict party during the period of investigation. Rather than having been directly challenged by a non-state actor itself, Armenia supported the pro-independence movement in Nagorno-Karabakh against Azerbaijan (UCDP Database, Uppsala Conflict Data Program, accessed October 24, 2010: `http://www.ucdp.uu.se/gpdatabase/gpcountry.php?id=6&regionSelect=9-Eastern_Europe`, Uppsala University.)

[22]In Lebanon, Geneva Call is mainly in contact with organizations affiliated with Hezbollah. Therefore, the Israel-Hezbollah dyad is included in the dataset.

4.2 Variables

In our analyses we rely on two sets of dependent variables. The first set captures whether (or not) the NSA has signed Geneva Call's deed of commitment banning anti-personnel (AP) mines during a given year ($mbtreaty_{nsa}$).[23] For the government, the corresponding variable denotes ratification of the international mine-ban treaty ($mbtreaty_{gov}$). The second set deals with compliance and relies on on information on mine use as provided by IISS.[24] This measure is, however, has some problems, as the indicator covers all types of mines and other "improvised explosive devices." Nevertheless, we consider it the best measure available.[25]

We employ several additional variables in our analyses:

Territorial control is a dummy variable denoting whether the NSA exerts at least a moderate level of control over its main territory.[26] As outlined above, we argue that this variable is related to w_N, the costs induced by treaty adherence. The logic is simple. Landmines are an effective way of securing territory from governmental intrusion, hence relinquishing their usage is likely to make the NSA more vulnerable since it removes an effective military strategy from its portfolio.

Use of mines by government indicates whether landmines and improvised explosive devices were among the weapons used by the state actor of this dyad during any year between 1997 and the start year of Geneva Call's engagement in the respective region.[27]

One sided violence (*OSV*) denotes the extent to which NSAs or governments were responsible for one-sided violence according to UCDP.[28] The variables indicate the best estimate of the aggregated estimated fatalities for all incidents of one-sided vio-

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[23]Source: Geneva Call.http://www.genevacall.org/resources/list-of-signatories/list-of-signatories.htm (accessed September 16, 2010).

[24]Source: IISS Armed Conflict Database, http://acd.iiss.org/armedconflict/report/dsp_MainForm.asp (accessed February 11, 2011).

[25]Geneva Call also assesses compliance and deploys monitoring missions. So far these have, however, not been carried out in a systematic and recurrent fashion (personal communication by Pascal Bongard, program officer Geneva Call, January 5, 2011).

[26]Information on territorial control is largely adopted from Cunningham, Gleditsch and Salehyan (2009).

[27]Source: IISS Armed Conflict Database, http://acd.iiss.org/armedconflict/report/dsp_MainForm.asp (accessed February 11, 2011).

[28]To construct these variables, the UCDP One-sided Violence Dataset (Eck and Hultman, 2007) was used, an actor-year dataset on deadly attacks on civilians by governments and armed groups. It is based on media reports and provides information on the unilateral use of armed force by governments and formally organized groups against unarmed persons resulting in at least 25 deaths per calendar year (Kreutz, 2004; Kreutz, Eck, Wallensteen, Harbom, Hgbladh and Sollenberg, 2005).

lence for a given actor and year. Consistent with our sample definition, fatality estimates have been assigned to dyad-years if the perpetrator has been actively involved in a given dyadic conflict in any year since 1989. Instances of one-sided violence were not assigned to a conflict-year if the perpetrating actor did not constitute one of the primary conflict parties in the respective countries according to UCDP/PRIO-criteria.[29] Accordingly, the fatality estimates attributable to one particular actor and year appear multiple times in the dataset where the respective actor has been involved in more than one dyad since 1989.[30] We employ OSV as a proxy for p and q, i.e., the prior beliefs. With regard to one-sided violence serving as proxy for prior beliefs this assumes that higher such violence suggests being caught in violation of a treaty is less costly (i.e., smaller c_is).

Democracy is the Cheibub, Gandhi and Vreeland's (2010) democracy indicator and is meant to proxy reputation effects.[31]

To capture size-related effects, such as military capacity, we also use an estimate of the *troop size* of the NSA.[32]

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[29]Exceptions are militias that allegedly acted on behalf of - or supported by - the state (Janjaweed in Sudan, Autodefensas Unidas in Colombia) and were therefore attributed to the state actor of a given dyad-year. The following perpetrators of osv active in Geneva Call's countries of engagement do not enter our sample as primary conflict parties: Colombia: Autodefensas Campesinas de Córdoba y Urabá, Medellin Cartel; India: Bodo Liberation Tiger Force, Dima Halam Daogah, Hmar People's Convention, Indian Mujahideen, Kuki Revolutionary Army, Lashkar-e-Taiba, Ranvir Sena, Students' Islamic Movement, United People's Democratic Solidarity, Vishwa Hindu Parishad; Indonesia: Jemaah Islamiya; Iraq: Gov of USA, Asa'ib Ahl al-Haqq, Jamaat Jund al-Sahaba; Lebanon: Gov. of USA; Morocco: Salafia Jihadia; Niger: Gov. of Lybia; Philippines: Ampatuan Militia; Senegal: MFDC - Front Nord, Somalia: Rahanweyn Resistance Army, SPM - Somali National Alliance; Sudan: South Sudan Defence Force, Lord's Resistance Army; Turkey: Abu-Hafs al-Masri Brigades.

[30]To give an example, the government of Burundi was involved in several dyadic conflicts during the period 1989-2009. Therefore, the OSV fatality estimates attributed to the government of Burundi in a given year have been assigned to all dyads that qualify for inclusion in our sample during this year (see sample definition, section 4.1.). Similarly, the actor "Hutu rebels" encompasses more than one NSA involved in intra-state conflict (e.g., Palipehutu and Palipehutu-FNL) (see Harbom and Sundberg, 2009); OSV fatality estimates attributable to this actor are therefore assigned to several dyads. One exception to this general coding rule is Israel, which as a special case was coded only with respect to the conflict with Hezbollah (see section 4.1.).

[31]As this data series ends in 2008, we extrapolated for 2009.

[32]Information on troop size is adopted from Cunningham, Gleditsch and Salehyan (2009) as well as the IISS Armed Conflict Database.

Table 2: Signatories and "Follow-Suit" Signatories: number of countries, number of dyads (% of countries, % of dyads)

	NSA has not signed	
	Government has signed	Government has not signed
NSA does not sign	6, 54 (75.0, 96.4)	13, 115 (61.9, 93.2)
NSA signs	2, 2 (25.0, 3.6)	8, 11 (38.1, 6.8)
Total	8, 56 (100.0, 100.0)	21, 126 (100.0, 100.0)
	Government has not signed	
	NSA has signed	NSA has not signed
Government does not sign	34 (91.2)	146 (96.6)
Government signs	3 (8.8)	5 (3.4)
Total	37 (100.0)	146 (100.0)

4.3 Ratifying Mine-Ban Treaties

For the time being we consider the decision by Geneva Call to propose conventions in particular areas as exogenous.[33] Our first set of analyses addresses some of the formal model's empirical implications for the ratification of mine-ban treaties by both governments and NSAs.

We begin with some descriptive statistics given in table 2. The table contains information on the ratification sequence of both governments and NSAs of the convention on landmines. It indicates the numbers of dyad-years that correspond to the respective signatory status of governments or NSAs (dyad-years following signature are dropped). Depicted in parentheses are the respective numbers of cases where the "other" actor has previously ratified. In terms of substantive implications, the table suggests that an NSA's probability of signing the Geneva Call convention is larger if the government has failed to sign than if the government has signed the Ottowa convention. The differences are, however, rather small. Conversely, if an NSA signs first it increases the probability of a government signing from 0.03 to 0.09 in our strict sample. Consequently, once NSAs have signed the Geneva Call convention, governments are much more likely to follow suit than in the reverse scenario (i.e., when governments sign first).

Next we assess with a series of (corresponding) logit models whether the implications concerning the signing find empirical support in our data.[34] As many schol-

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[33]Geneva Call has provided us with a list of NSAs contacted by them. As reported by Pascal Bongard (program officer Geneva Call, personal communication of January 5, 2011) the selection focuses essentially on NSAs that have employed landmines. Not surprisingly in exploratory analyses we find that in our dataset the engagement decision by Geneva Call is heavily influenced by an NSA's use of landmines.

[34]We employed Gelman and Hill's (2006) Bayesian logit model, as in some instances we encountered problems of complete separation (we will note these when discussing the results). In addition we also controlled for time dependence by following Carter and Signorino's (2010) suggestion. As these corrections do not affect our results we report these results in the appendix. In addition, given that our

ars have noted, the strategic nature of the decisions we wish to explain (signing of a treaty by government and NSA) creates statistical estimation problems. While estimators are rather well understood for complete information models (see for instance Signorino, 1999; Signorino, 2002; Signorino and Yilmaz, 2003; Signorino, 2003; Signorino and Tarar, 2006), for incomplete information models as ours only few models exist (see for instance Lewis and Schultz, 2003; Esarey, Mukherjee and Moore, 2008; Whang, 2010). In addition, or theoretical model is not a simple stage game of a more complex repeated one, as the former changes as a function of the outcome of the previous iteration. For this reason we rely essentially on simply estimating for each relevant decision node in figure 1 the effect of various variables on the decisions of a given actor.

Table 3: Bayesian Logit Estimates of Signatory Status of Government

	government signs		government signs before NSA		government signs after NSA	
sample:	$strict$	$lenient$	$strict$	$lenient$	$strict$	$lenient$
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
constant	−2.461	−2.583*	−3.525*	−3.153*	−1.804	−2.074
	(0.737)	(0.719)	(1.055)	(0.887)	(1.756)	(1.800)
democracy(lagged)	1.005	1.166	1.878*	1.728*	−0.948	−0.806
	(0.736)	(0.726)	(0.980)	(0.864)	(1.513)	(1.562)
one-sided violence$_G$ (logged)	0.019	0.030	−0.043	−0.014	0.090*	0.093*
	(0.029)	(0.027)	(0.039)	(0.034)	(0.053)	(0.053)
one-sided violence$_N$ (logged)	−0.012	−0.016	0.014	0.001	−0.020	−0.016
	(0.036)	(0.036)	(0.040)	(0.039)	(0.078)	(0.080)
use of mines by government	−1.971*	−2.042*	−2.190*	−2.256*	−0.623	−0.635
	(0.790)	(0.774)	(0.959)	(0.926)	(1.102)	(1.062)
N	185	223	151	177	39	51
$\log L$	−13.214	−17.054	−0.444	−5.053	7.836	6.944

Standard errors in parentheses
* indicates significance at $p < 0.1$

Table 3 focuses on the government's decision to sign the Ottawa convention, and models 1 and 2 simply regress this decision on a set of independent variables without taking into account where in the game tree the decision to sign is reached. Both for the strict (model 1) and lenient (model 2) sample definition the results reported in table 3[35] we find that especially the signing costs, i.e., whether the government has used landmines in the past, affect negatively the decision of the government to sign the Ottawa convention. We also find that the reputation costs as measured by the country's status as democracy positively (though statistically not significantly) affects the government's decision. The extent to which the government or the NSA commit one-sided violence, on the other hand, hardly seems to affect a government's decisions.

The estimates of these first two models rely on the assumption that governments de-

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dyads are grouped by country we have also, in a previous version, employed clustered standard errors, which affected, however, unnoticeably our results.

[35]Table 8 reports the results of the same models including, however, controls for time-dependency. The substantive insights from these modes are the same.

cide to sign independently of what the NSA is doing. The next set of models relax this assumption and focus on the government's decision in two situations, namely when the NSA has not yet signed and when it considers signing after the NSA's signing. As models 3-6 demonstrate, these situations differ quite importantly. First of all, the results of models 3 and 4 show that both signing (use of mines) and reputation (democracy) costs statistically significantly affect the government's decision to sign before an NSA has done so. This is in line with our implications from the theoretical model, namely that high such costs should reduce, respectively increase, the likelihood of a government signing the Ottowa convention. When the latter decides, however, after the NSA has signed, then neither reputation nor signing costs seem to matter (models 5 and 6).[36] This seems to suggest that these costs serve as a screening device, i.e., they affect the government's decision at the first node and the NSAs reaction (taking into account this decision) leads to situations where these costs have already screened out potential governmental signers.

Contrary to another implication from our theoretical model we find that one-sided violence does barely affect a government's decision. According to our model one-sided violence by the NSA, proxying for the government's prior belief of facing a "mean" type should have increased the likeliood of signing at the first decision node. While we find a positive effect as predicted (models 3 and 5), these do not reach statistical significance. We find also, however, that as governments commit more one-sided violence, they are more likely to sign if the NSA already has. This might be linked to the increased reputation effects that we have assumed in our theoretical model in situations where an NSA signs before the government does.

Table 4: Bayesian Logit Estimates of Signatory Status of NSA

	NSA signs		NSA signs before government	
sample:	*strict*	*lenient*	*strict*	*lenient*
	Model 1	Model 2	Model 3	Model 4
one-sided violence$_G$ (logged)	0.016	0.015	0.022	0.022
	(0.036)	(0.036)	(0.041)	(0.041)
one-sided violence$_N$ (logged)	0.017	0.020	−0.012	−0.012
	(0.036)	(0.036)	(0.043)	(0.043)
territorial control $\geq$ moderate	−1.995∗	−2.057∗	−1.689	−1.712
	(0.974)	(0.978)	(1.112)	(1.112)
NSA troop size (logged)	0.768∗	0.735∗	0.997∗	1.008∗
	(0.433)	(0.422)	(0.574)	(0.577)
constant	−8.742∗	−8.437∗	−10.854∗	−10.946∗
	(3.951)	(3.844)	(5.126)	(5.158)
N	150	156	88	90
$\log L$	−2.338	−2.479	5.036	5.033

Standard errors in parentheses
* indicates significance at $p < 0.1$

[36]In these models we encounter a problem of complete separation. Non-democratic countries never sign in this instance (but there are very few cases, and certain values of one-sided violence by the NSA also perfectly predict the outcome.

Table 4 presents the results for the NSAs. The implications that we have presented for the NSAs' actions involve again the prior beliefs and the costs faced by government. Both should operate, however, strongly through the government's prior decision[37] Consequently we focus on the prior beliefs, proxied by one-sided violence, and the costs faced by the NSA. The first two models in table 4 are again based on all decision nodes where the NSA can decide on signing Geneva Call's deed of commitment. The results provide strong evidence that the costs of relinquishing landmines (territorial control and troop size) strongly affect an NSA's decision to sign. If its territorial control is moderate or high, the likelihood of signing decreases cnsiderably, while larger NSAs are more likely to sign. Again, however, one-sided violence, our proxy for prior beliefs, seems not to affect the NSA's decision. When only considering the NSAs decision when the government has not yet signed, it seems that especially the size of the NSA increases the likelihood of the NSA signing. The effect of territorial control is slightly reduced and loses statistical significance.

4.4 Evaluating the effectiveness

Having established these patterns, we now turn to evaluating the effect of such conventions. In tables 5 and 6 we assess how various variables affect the governments' and the NSAs' decision to use landmines. As discussed above, we rely on the IISS Armed Conflict Database (see above) to measure compliance. While this is an imperfect measure, as IISS also includes improvised exploding devices in their coding, it is in our view the best measure available.[38] In both tables we first report for the two sample definitions how signing a convention or Geneva Call's deed of commitment affects the two actors' behavior, while neglecting the fact that signatories are potentially endogenous to their effect. For the government's decision to comply (table 5) we find that its signatory status and that of the NSA has no effect on compliance. Only prior use of landmines (before Geneva Call's engagement) reduces notably the likelihood of compliance. Table 6 shows, however, that for the NSA the signatory status has an impact. If an NSA signs it is much more likely to refrain from using landmines. Interestingly enough the signatory status of the government has the reverse effect. If the government has signed the Ottawa convention, then the NSA is much more likely to

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[37]In preliminary analyses we also found that the signing and reputation costs of the government do not directly affect the NSA's decision.

[38]Note that when we used information on mine use to explain the signing decision, we only considered this up to the point of signing.

use landmines. The other variables we employed to explain compliance appear to have no statistically significant effect.

Table 5: Results for Government Compliance

	Model 1 $probit$ $strict$	Model 2 $probit$ $lenient$	Model 3 trivariate probit (CMP) strict=lenient		
sample:					
dependent variable:	mine use G		$mineuse$G	$signed$G	$signed$N
government signed Ottawa convention	0.312	−0.233	1.019∗		
	(0.700)	(0.306)	(0.460)		
NSA signed Geneva Call's deed of commitment	−0.562	−0.310	−0.199		
	(0.554)	(0.256)	(0.290)		
democracy(lagged)	−0.540	0.009	−0.589∗	1.453∗	
	(0.559)	(0.254)	(0.297)	(0.242)	
use of mines by government	5.092∗	2.847∗	3.097∗	−1.627∗	
	(0.584)	(0.242)	(0.266)	(0.241)	
one-sided violence$_N$				−0.013	−0.030
				(0.012)	(0.019)
one-sided violence$_G$				−0.006	0.030
				(0.010)	(0.015)
territorial control $\geq$ moderate					−2.379∗
					(0.515)
NSA troop size (logged)					0.828
					(0.240)
constant	−2.209∗	−1.352∗	−1.462∗	−1.020∗	−7.378∗
	(0.513)	(0.217)	(0.262)	(0.262)	(2.117)
ρ_{12}					−0.547∗
					(0.232)
ρ_{13}					−0.156
					(0.257)
ρ_{23}					0.415∗
					(0.197)
N	235	282	247		
log L	−47.719	−57.896	-183.766		

Standard errors in parentheses
* indicates significance at $p < 0.1$

These results, while interesting, neglect that the signing of a treaty is hardly exogenous and both governments and NSAs choose strategically to sign (or not sign) a convention. We take this into account in models 3 of tables 5 and 6 by estimating a trivariate probit using CMP (Roodman, 2007) which deals with the endogenous nature of the government's and the NSA's signatory status.[39] To model the latter we reuse the same independent variables as above and find largely similar results. Intersting to note, however, is that in both tables we find that one-sided violence by the NSA, i.e. our proxy for prior belief, affects negatively the NSAs signing decision. Although the two coefficients fail to reach statistical significance, they point in the right direction, namely if an NSA is likely to be a mean one, the governments are more likely to sign first,[40] which induces NSAs to refrain from signing.

For the effects of the signatory status we now find partly different results. When

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[39]This trivariate probit model allows for correlations between the error terms of three equations, namely the ones corresponding to the two signing decisions and one for the compliance decision. As Wilde (2000) has shown for the bivariate probit, such a model also allows for endogenous regressors, in our case the two signing decisions (see also Roodman, 2007). For these models the strict and lenient sample definitions collapse, as exactly the same cases are selected.

[40]We fail to find evidence for this effect in our empirical results, but this might be due to the fact that we do not distinguish between the government before or after the NSA.

taking into account the endogeneity of the signatory status it appears that the government's status actually increases the likelihood of its using landmines. On the other hand if the NSA has signed this reduces slightly (and statistically non-significantly) the use of landmines by government. For the NSA's compliance decision (table 6) we find as before that the signing of Geneva Call's deed of commitment reduces the likelihood of using landmines by an NSA. This effect just barely reaches statistical significance. On the other hand, the government's signatory status increases considerably the likelihood of the NSA using landmines.

Table 6: Results for NSA Compliance

	Model 1 $probit$ $strict$	Model 2 $probit$ $lenient$	Model 3 trivariate probit (CMP) strict=lenient		
sample:					
dependent variable:	mine use N		$mineuse$N	$signed$G	$signed$N
government signed Ottawa convention	2.317*	1.865*	3.111*		
	(0.476)	(0.414)	(0.523)		
NSA signed Geneva Call's deed of commitment	−1.007*	−1.152*	−1.333*		
	(0.458)	(0.436)	(0.807)		
territorial control ≥ moderate	−0.369	−0.464	−0.432		−2.329*
	(0.361)	(0.347)	(0.418)		(0.515)
NSA troop size (logged)	0.114	0.031	0.217		0.809*
	(0.192)	(0.186)	(0.207)		(0.238)
use of mines by government	0.809*	0.429	1.226*	−1.495*	
	(0.364)	(0.314)	(0.368)	(0.239)	
democracy(lagged)				1.351*	
				(0.240)	
one-sided violence$_N$				−0.013	−0.036
				(0.012)	(0.022)
one-sided violence$_G$				−0.014	0.032
				(0.010)	(0.016)
constant	−1.161	−0.077	−2.466	−1.118	−7.312*
	(1.578)	(1.487)	(1.618)	(0.263)	(2.092)
ρ_{12}					−0.580*
					(0.296)
ρ_{13}					0.163
					(0.452)
ρ_{23}					0.437*
					(0.190)
N	133	138	247		
$\log L$	−63.221	−71.767	-184.27653		

Standard errors in parentheses
∗ indicates significance at $p < 0.1$

5 Discussion and conclusion

This paper offers a first look and assessment of how NSAs decide whether to sign Geneva Call's convention on the ban of landmines and its effectiveness. We propose a simple game-theoretical model on the interactions between governments and NSAs. The equilibrium analysis of this model allows for a rich set of implications, for some of which we provide empirical tests of in the present paper.

Our empirical analyses provide clear evidence that the decisions by governments and NSAs to sign a landmine ban convention are not independent. Especially governments' decisions to sign appear to be notably affected by whether NSAs have already signed. Surprisingly, for the governments' decision to sign first its assessment of possible compliance by NSAs appears not to be an important factor. For NSAs not surprisingly territorial control is an important factor influencing the costs of implementation and thus also the signing decision.

Regarding the consequences of signing such conventions our results are also instructive. We only find effects if we consider the decision of signing a convention as endogenous. When dosing so we can show that the decision by an NSA to sign a deed of commitment reduces its use of landmines. For the governments, however, after taking into account that it is mostly countries having not used landmines that signed the Ottawa convention, we find a negative effect on compliance.

These results speak to the broader literature on human rights conventions and the effectiveness of treaties. Our analyses clearly suggests that assessing the effectiveness of conventions needs to take into consideration the selection effects linked to the conscious decisions of actors signing these conventions. Our results also suggest that NSAs influence the domestic audience costs of government. In the empirical realm that we covered where an NGO actively intervenes to influence NSAs this is to be expected, but we surmise that NSAs and NGOs influence these audience costs also in other circumstances through more subtle indirect means.

Appendix

In this appendix we provide proofs of the propositions presented in the main text and some information on the data used in our empirical analysis.

Proofs

We first present a few observations helpful in proving the main propositions presented in the main text. We then prove the two propositions characterizing equilibrium behavior under complete and imperfect and incomplete and imperfect information.[41]

1. Observation

   If G signs at its first decision node, N will never sign, since it obtains the benefit of compliance by G for free, or cannot improve on its own its situation if G should sign but not comply.

   Proof: Simply comparing expected utilities with p' the possibly updated prior belief yields:

$$
\begin{aligned}
EU_N(sign) &= p' \times (-cw_N - q \times w_N + w_G - (1-q) \times c_N) \\
&= +(1-p') \times (-cw_N - q \times w_N + (1-q) \times c_N) \\
&= -cw_N - q \times w_N - (1-q)c_N + p' \times w_G \quad (5) \\
EU_N(not\ sign) &= p' \times (-cw_N + w_G) + (1-p') \times (-cw_N) \\
&= -cw_N + p' \times w_G \quad (6)
\end{aligned}
$$

   As w_N and c_N are both positive, independent of q N will never sign. $QED.$

2. Observation

   If N signs the agreement (when G has not in the first round), G's decision to sign after N is independent of its possibly updated belief of N's type q'.

   Proof: To see this assume first that G is "nice" (i.e., $p = 1$)

$$
\begin{aligned}
EU_G(sign) &= q' \times (-cw_G - w_G + w_N) + (1 - q') \times (-cw_G - w_G) \\
&= -cw_G - w_G + q' \times w_N \quad &(7)
\end{aligned}
$$
$$
\begin{aligned}
EU_G(not\ sign) &= q' \times (-cw_G - 2 \times r_G + w_N) + (1 - q') \times (-cw_G - 2 \times r_G) \\
&= -cw_G - 2 \times r_G + q' \times w_N \quad &(8)
\end{aligned}
$$

Consequently, G signs if $-cw_G - w_G + q' \times w_N > -cw_G - 2 \times r_G + q' \times w_N$, hence only if $2 \times r_G > w_G$.

If G is "mean" (i.e., $p = 0$)

$$
\begin{aligned}
EU_G(sign) &= q' \times (-cw_G + w_N - c_G) + (1 - q') \times (-cw_G - c_G) \\
&= -cw_G - c_G + q' \times w_N \quad &(9)
\end{aligned}
$$
$$
\begin{aligned}
EU_G(not\ sign) &= q' \times (-cw_G - 2 \times r_G + w_N) + (1 - q') \times (-cw_G - 2 \times r_G) \\
&= -cw_G - 2 \times r_G + q' \times w_N \quad &(10)
\end{aligned}
$$

In that case G will sign if $-c_G > -2 \times r_G$ or $2 \times r_G > c_G$.

In both cases, i.e. independent of p, the decision of G to sign or not is independent of q'. $\qquad QED.$

3. Observation

From observation 2 follows that if $2 \times r_G > w_G$ then independent of its type G will always sign at its second decision node.[42] If, however, $w_G > 2 \times r_G$ then the "nice" type does not sign, but the 'mean" type signs as long as $2 \times r_G > c_G$, but will not comply or does not sign if $c_G > 2 \times r_G$. As in this case the payoff for N is identical, it can anticipate its payoff, namely if $2 \times r_G > w_G$ and $q = 1$

$$
\begin{aligned}
EU_N(sign) &= p' \times (-cw_N + w_G - w_N) + (1 - p') \times (-cw_N - w_N) \\
&= -cw_N - w_N + p' \times w_G \quad &(11)
\end{aligned}
$$
$$
EU_N(not\ sign) = -cw_N \quad (12)
$$

---

[42]This follows from the fact that $p = 0$ implies $w_G > c_G$.

Consequently a "nice" N signs in that case if $p' > \frac{w_N}{w_G}$. For a "mean" N the payoffs are as follows:

$$
\begin{aligned}
EU_N(sign) &= p' \times (-cw_N + w_G - c_N) + (1 - p') \times (-cw_N - c_N) \\
&= -cw_N - c_N + p \times w_G \quad\quad\quad (13)\\
EU_N(not\ sign) &= -cw_N \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad (14)
\end{aligned}
$$

Consequently a "mean" N signs in that case if $p' > \frac{c_N}{w_G}$

If on the other hand $w_G > 2 \times r_G$ then N knows that G either won't sign or won't comply. Consequently, its payoffs for a "nice" ($q = 0$) type are

$$
\begin{aligned}
EU_N(sign) &= -cw_N - w_N \quad\quad\quad\quad (15)\\
EU_N(not\ sign) &= -cw_N \quad\quad\quad\quad\quad\quad\quad (16)
\end{aligned}
$$

As $w_N > 0$ N will never sign. For a "mean" type

$$
\begin{aligned}
EU_N(sign) &= -cw_N - c_N \quad\quad\quad\quad (17)\\
EU_N(not\ sign) &= -cw_N \quad\quad\quad\quad\quad\quad\quad (18)
\end{aligned}
$$

is relevant and as $c_N > 0$ N will never sign.

Complete and imperfect information

Proof of Proposition 1 [43]

Based on the observations above the following subgame-perfect equilibrium can be established:[44]

1. If $p = 1, q = 1$ and $w_G > 2 \times r_G, w_G > w_N, r_G > w_N$ $G : \{sign, sign, comply\}$, $R : \{not\ sign, sign, comply\}$[45]

---

[43]We refrain from presenting the equilibria of the complete and perfect information game depicted in figure **??** as these are closely related to the ones presented here.

[44]For simplicity's sake we omit cases where either of the two actors is indifferent between his or her to actions.

[45]For simplicity's sake we shorten the strategies for both actors by only stating their actions at their first two decision nodes and indicating with the third element the action taken at their remaining decision nodes, as these do not vary.

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2. If $p = 1, q = 1$ and $w_G > 2 \times r_G, w_G > w_N, w_N > r_G$ $G : \{not\ sign, sign, comply\}$, $R : \{not\ sign, sign, comply\}$

3. If $p = 1, q = 1$ and $w_G > 2 \times r_G, w_G < w_N$ $G : \{not\ sign, signcomply\}$, $R : \{not\ sign, not\ sign, .\}$

4. If $p = 1, q = 1$ and $2 \times r_G > w_G, r_G > w_G$ $G : \{sign, not\ signcomply\}$, $R : \{not\ sign, not\ sign, .\}$

5. If $p = 1, q = 1$ and $2 \times r_G > w_G, w_G > r_G$ $G : \{not\ sign, not\ signcomply\}$, $R : \{not\ sign, not\ sign, .\}$

6. If $p = 0, q = 1$ and $2 \times r_G > c_G, r_G > c_G$ $G : \{sign, sign, not\ comply\}$, $R : \{not\ sign, not\ sign, comply\}$

7. If $p = 0, q = 1$ and $2 \times r_G > c_G, c_G > r_G$ $G : \{not\ sign, sign, not\ comply\}$, $R : \{not\ sign, not\ sign, comply\}$

8. If $p = 0, q = 1$ and $c_G > 2 \times r_G, r_G > c_G$ $G : \{sign, not\ sign., not\ comply\}$, $R : \{not\ sign, not\ sign, comply\}$

9. If $p = 0, q = 1$ and $c_G > 2 \times r_G, c_G > r_G$ $G : \{not\ sign, not\ sign., not\ comply\}$, $R : \{not\ sign, not\ sign, comply\}$

10. If $p = 1, q = 0$ and $w_G > 2 \times r_G$ $G : \{not\ sign, not\ sign, comply\}$, $R : \{not\ sign, not\ sign, not\ comply\}$

11. If $p = 1, q = 0$ and $2 \times r_G > w_G, c_N > w_G, r_G > w_G$ $G : \{sign, sign, comply\}$, $R : \{not\ sign, not\ sign, notcomply\}$

12. If $p = 1, q = 0$ and $2 \times r_G > w_G, c_N > w_G, w_G > r_G$ $G : \{not\ sign, sign, comply\}$, $R : \{not\ sign, not\ sign, notcomply\}$

13. If $p = 1, q = 0$ and $2 \times r_G > w_G, w_G > c_N, r_G > w_G$ $G : \{sign, sign, comply\}$, $R : \{not\ sign, sign, notcomply\}$

14. If $p = 1, q = 0$ and $2 \times r_G > w_G, w_G > c_N, w_G > r_G$ $G : \{not\ sign, sign, comply\}$, $R : \{not\ sign, sign, notcomply\}$

15. If $p = 0, q = 0$ and $r_G > c_G$ $G : \{sign, sign, not\ comply\}$, $R : \{not\ sign, not\ sign, .\}$

16. If $p = 0$, $q = 0$ and $2 \times r_G > c_G, c_G > r_G$ $G : \{not\ sign, sign, not\ comply.\}$, $R : \{not\ sign, not\ sign, not\ comply.\}$

17. If $p = 0$, $q = 0$ and $c_G > 2 \times r_G$ $G : \{not\ sign, not\ sign, not\ comply.\}$, $R : \{not\ sign, not\ sign, not\ comply.\}$

As these equilibria exhaust all possible conditions, proposition 1 simply summarizes the insights from these equilibrium characterizations. $QED.$

Incomplete information

As mentioned in the main text we simplify the model for the incomplete information version by letting $c_i \in \{2 \times w_i, \frac{w_i}{2}\}$. c_i takes the higher value if i is a "nice" type, and the lower one when i is a "mean" type. This allows us as an extension of the discussion above already to establish the following observations:

1. Observation

   If G does not sign at the first decision node and N does at its second decision node, then if $w_G > 4 \times r_G$ then neither type of G will sign at its second decision node, while if $4 \times r_G > w_G > 2 \times r_G$ then only the "mean" type of G will sign, while if $2 \times r_G > w_G$ both types will sign.

Using this observation we start by deriving the conditions under which completely pooling and separating equilibria may occur before moving to semi-pooling equilibria

Pooling equilibria

We start by looking at a candidate equilibrium where both types of G refrain from signing at the first decision node. We first assume that $4 \times r_G > w_G$ implying that no type of G would sign at its second decision. Consequently N must evaluate the following expected utilities:

$$
\begin{align}
EU_N(sign|q = 1) &= -cw_N - w_N \tag{19}\\
EU_N(sign|q = 0) &= -cw_N - \frac{w_N}{2} \tag{20}\\
EU_N(not\ sign|q = .) &= -cw_N \tag{21}
\end{align}
$$

Consequently, both types of N will never sign in this case. For this to be part of a pooling equilibrium the following has to be evaluated:

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$$EU_G(sign|p=1) \quad = \quad -cw_G - w_G + r_G \tag{22}$$

$$EU_G(sign|p=0) \quad = \quad -cw_G - \frac{w_G}{2} + r_G \tag{23}$$

$$EU_G(not \ sign|p=.) \quad = \quad -cw_G \tag{24}$$

For both types not to sign at the first decision node is optimal provided $r_G < w_G$ and $2 \times r_G < w_G$ hold, which is the case given our assumption from above. This establishes a first pooling equilibrium when the following conditions hold:

- $w_G > 4 \times r_G$

Assuming now that $4 \times r_G > w_G > 2 \times r_G$ we know that a "mean" G will sign after N's decision to sign, while a "nice" type will not. As not signing by G has the same consequences for N as not complying, the expected utility calculations both for N and G are as above, establishing a second pooling equilibrium under the following conditions:

- $4 \times r_G > w_G > 2 \times r_G$

Finally if $2 \times r_G > w_G$ both types of G will sign after N's decision to sign. Consequently N evaluates the following expected utilities where the updated belief p' is identical to the prior belief, giving the assumption of a pooling equilibrium:

$$EU_N(sign|q=1) \quad = \quad p'(-cw_N - w_N + w_G) + (1-p')(-cw_N - w_N)$$
$$= \quad -cw_N - w_N + p' \times w_G \tag{25}$$

$$EU_N(sign|q=0) \quad = \quad p'(-cw_N - c_N + w_G) + (1-p')(-cw_N - \frac{w_N}{2})$$
$$= \quad -cw_N - \frac{w_N}{2} + p' \times w_G \tag{26}$$

$$EU_N(not \ sign|q=.) \quad = \quad -cw_N \tag{27}$$

This implies that a "nice" N will sign if $p' > \frac{w_N}{w_G}$, while a "mean" N will do so if $p > \frac{w_N}{2 \times w_G}$. From this it follows that we need to evaluate a series of possible configurations.

First consider $w_N > 2 \times w_G$ implying that both Ns will refrain from signing. For G the following expected utilities are relevant:

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$$EU_G(sign|p=1) = -cw_G - w_G + r_G \tag{28}$$

$$EU_G(not\ sign|p=.) = -cw_G \tag{29}$$

$$EU_G(sign|p=0) = -cw_G - \frac{w_G}{2} + r_G \tag{30}$$

For both types of G not to sign requires that $w_G > r_G$ and $w_G > 2 \times r_G$. As the latter is in contradiction with the initial assumption no pooling equilibrium exists.

Second, assume that $2 \times w_G > w_N > w_G$ and $p > \frac{w_N}{2 \times w_G}$. As in this case again both Ns refrain from signing the above expected utilities for G apply, establishing that no pooling equilibrium exists.

Third, assume that $2 \times w_G > w_N > w_G$ and $p > \frac{w_N}{2 \times w_G}$ which implies that $p < \frac{w_N}{w_G}$. Consequently a "nice" G will not sign while a "mean" one will. Consequently, for G the following expected utilities become relevant:

$$EU_G(sign|p=1) = -cw_G - w_G + r_G \tag{31}$$

$$EU_G(not\ sign|p=.) = -cw_G \tag{32}$$

$$EU_G(sign|p=0) = -cw_G - \frac{w_G}{2} + r_G \tag{33}$$

from which it follows that both types of G would not sign if $w_G > r_G$ and $w_G > 2 \times r_G$ hold. As the latter conditions are in contradiction with the assumption that $2 \times r_G > w_G$ no pooling equilibrium exists.

Fourth, if $w_G > w_N$ and $p < \frac{w_N}{2 \times w_G}$ then neither of the two types of N will sign. Hence we are in the same situation as above and no pooling equilibrium exists.

Fifth, if $w_G > w_N$ and $\frac{w_N}{2 \times w_G} < p < \frac{w_N}{w_G}$ then only the "mean" N signs which is equivalent to the third situation implying again the absence of a pooling equilibrium.

Finally, if $w_G > w_N$ and $\frac{w_N}{w_G} < p$ then both Ns will sign. Consequently, for G the following is relevant:

$$EU_G(sign|p=1) = -cw_G - w_G + r_G \tag{34}$$

$$EU_G(not\ sign|p=1) = q(-cw_G - w_G + w_N) + (1-q)(-cw_G - w_G)$$

$$= -cw_G - w_G + q \times (w_N) \tag{35}$$

Thus a "nice" G will not sign if $-cw_G - w_G + q \times w_N > -cw_G - w_G + r_G$ which is equivalent to $q > \frac{r_G}{w_N}$. For the "mean" G the following expected utilities are relevant:

$$EU_G(sign|p=0) \;=\; -cw_G - \frac{w_G}{2} + r_G \tag{36}$$

$$EU_G(not\ sign|p=0) \;=\; q(-cw_G - \frac{w_G}{2} + w_N) + (1-q)(-cw_G - \frac{w_G}{2})$$

$$\;=\; -cw_G - \frac{w_G}{2} + q \times (w_N) \tag{37}$$

Thus a "mean" G will not sign if $-cw_G - \frac{w_G}{2} + q \times w_N > -cw_G - \frac{w_G}{2} + r_G$ which is equivalent to $q > \frac{r_G}{w_N}$. Consequently, a pooling equilibrium exists if

- $w_G > w_N$

- $p > \frac{w_N}{w_G}$

- $q > \frac{r_G}{w_N}$

- $2 \times r_G > w_G$

As this exhausts all possible conditions for the first type of pooling equilibrium, we now consider a pooling equilibrium where both types of G sign at the first decision node. Given the derivations of the first set of pooling equilibria, this can only occur if $2 \times r_G > w_G$.

Assume first that $w_G > w_N$ and that the out-of equilibrium belief is $p' = 1$, which leads both types of N to sign. The relevant expected utilities for G are as follows:

$$EU_G(sign|p=1) \;=\; -cw_G - w_G + r_G \tag{38}$$

$$EU_G(not\ sign|p=1) \;=\; q(-cw_G - w_G + w_N) + (1-q)(-cw_G - w_G)$$

$$\;=\; -cw_G - w_G + qw_N \tag{39}$$

Consequently, a "nice" G will prefer signing if $r_G > qw_N$ or if $q < \frac{r_G}{w_N}$ For a "mean" G the following is relevant:

$$EU_G(sign|p=0) \;=\; -cw_G - \frac{w_G}{2} + r_G \tag{40}$$

$$EU_G(not\ sign|p=1) \;=\; q(-cw_G - \frac{w_G}{2} + w_N) + (1-q)(-cw_G - \frac{w_G}{2})$$

$$\;=\; -cw_G - \frac{w_G}{2} + qw_N \tag{41}$$

which again requires $q < \frac{r_G}{w_N}$ for a "mean" G to sign at the first decision node, establishing thus a pooling equilibrium under the following conditions:

- $2 \times r_G > w_G$

- $q < \frac{r_G}{w_N}$

- $w_G > w_N$

- $p' = 1$

Let's next assume that $2 \times w_G > w_N > w_G$ and $p' = 1$, implying that only the "mean" N will sign, which implies the following:

$$
\begin{aligned}
EU_G(sign|p = 1) &= -cw_G - w_G + r_G & (42) \\
EU_G(not\ sign|p = 1) &= q(-cw_G) + (1 - q)(-cw_G - w_G) \\
&= -cw_G - w_G + qw_G & (43)
\end{aligned}
$$

Consequently, a "nice" G will prefer signing if $r_G > qw_G$ or if $q < \frac{r_G}{w_G}$ For a "mean" G the following is relevant:

$$
\begin{aligned}
EU_G(sign|p = 0) &= -cw_G - \frac{w_G}{2} + r_G & (44) \\
EU_G(not\ sign|p = 1) &= q(-cw_G) + (1 - q)(-cw_G - \frac{w_G}{2}) \\
&= -cw_G - \frac{w_G}{2} + q\frac{w_G}{2} & (45)
\end{aligned}
$$

which implies that a "mean" G will only sign if $r_G > q\frac{w_G}{2}$ or $q < \frac{2 \times r_G}{w_G}$. Hence a pooling equilibrium exists if

- $2 \times r_G > w_G$

- $2 \times w_G > w_N > w_G$

- $q < \frac{r_G}{w_G}$

- $p' = 1$

Next, let's assume that $w_N > 2 \times w_G$ which with $p' = 1$ will lead both types of N not to sign. Consquently, the relevant expected utilities for G are the following:

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$$EU_G(sign|p=1) \quad = \quad -cw_G - w_G + r_G \tag{46}$$

$$EU_G(not\ sign|p=.) \quad = \quad -cw_G$$

$$EU_G(sign|p=0) \quad = \quad -cw_G - \frac{w_G}{2} + r_G \tag{47}$$

Consequently, both types of G will prefer signing if $r_G > w_G$ and $2 \times r_G > w_G$ hold, establishing another pooling equilibrium:

- $r_G > w_G$

- $w_N > 2 \times w_G$

- $p' = 1$

Let's next assume that the out-of-equilibrium belief is $p' = 0$. In that case neither types of N will sign. Consequently, for G the following expected utilities are relevant:

$$EU_G(sign|p=1) \quad = \quad -cw_G - w_G + r_G \tag{48}$$

$$EU_G(not\ sign|p=.) \quad = \quad -cw_G \tag{49}$$

$$EU_G(sign|p=0) \quad = \quad -cw_G - \frac{w_G}{2} + r_G \tag{50}$$

Consequently, a "nice" G will prefer signing if $r_G > w_G$ and a "mean" one will prefer the same if $r_G > \frac{w_G}{2}$ or $2 \times r_G > w_G$. This establishes again a pooling equilibrium under the following conditions

- $2 \times r_G > w_G$

- $r_G > w_G$

This equilibrium is based, however, on a counter-intuitive out-of-equilibrium belief, as it is mostly the "nice" G that could profit from not signing.

Separating equilibria

Given the complete and imperfect information equilibria, a first candidate for a separating equilibrium is that the "nice" G does not sign the treaty and the "mean" G signs it. Whether this can be a separating equilibrium depends, as above, on the relationship between r_G and w_G.

Assuming $w_G > 4 \times r_G$ we know from above that neither type of G will sign if N signs. But then N will neither sign. Hence, for this condition to allow for a separating equilibrium to exist the following has to hold:

$$EU_G(sign|p=1) = -cw_G - w_G + r_G \qquad (51)$$

$$EU_G(not\ sign|p=.) = -cw_G \qquad (52)$$

$$EU_G(sign|p=0) = -cw_G - \frac{w_G}{2} + r_G \qquad (53)$$

Consequently a "nice" G will not sign if $w_G > r_G$, while for the "mean'" G $r_G > \frac{w_G}{2}$ has to hold. But the latter is in contradiction with the assumption that $w_G > 4 \times r_G$ so that no separating equilibrium can exist.

Assuming next that $4 \times r_G > w_G > 2 \times r_G$ we know that a "mean" G will sign after N's signing, while the "nice" G will not. This induces N not to sign either. But then the same conditions as discussed above have to hold for a separating equilibrium to exist, which are again in contradiction with the assumption that $4 \times r_G > w_G > 2 \times r_G$. Hence no separating equilibrium exists.

Next assume that $2 \times r_G > w_G$ implying that both types of G will sign after N's decision to sign. As shown above in this situation a "nice" N will sign if $p' > \frac{w_N}{w_G}$ while a "mean" N will do the same if $p' > \frac{w_N}{2 \times w_G}$ holds. Consequently, a series of configurations have to be evaluated.

First, assume that $w_N > 2 \times w_G$ which implies that the threshold values for the updated beliefs of N are both higher than 1 implying that both Ns will refrain from signing. Consequently, the question becomes how this situation looks from G's perspective:

$$EU_G(sign|p=1) = -cw_G - w_G + r_G \qquad (54)$$

$$EU_G(not\ sign|p=.) = -cw_G \qquad (55)$$

$$EU_G(sign|p=0) = -cw_G - \frac{w_G}{2} + r_G \qquad (56)$$

$$\qquad (57)$$

Consequently, a "nice" G will not sign if $w_G > r_G$ while a "mean" G will sign if $r_G > \frac{w_G}{2}$. This establishes a separating equilibrium under the following conditions:

- $2 \times r_G > w_G$

- $w_G > r_G$

- $w_N > 2 \times w_G$

Second, let's assume that $2 \times w_G > w_N > w_G$. As in the proposed separating equilibrium $p' = 1$ and this value is smaller than $\frac{w_N}{w_G}$ but larger than $\frac{w_N}{2 \times w_G}$ the "mean" N will sign, while the "nice" N will refrain from doing so. Thus from G's perspective the following expected utilities are relevant:

$$
\begin{align}
EU_G(sign|p = 1) &= -cw_G - w_G + r_G \tag{58} \\
EU_G(not\ sign|p = 1) &= q \times (-cw_G) + (1 - q) \times (-cw_G - w_G) \\
&= -cw_G - w_G + q \times w_G \tag{59}
\end{align}
$$

From this it follows that a "nice" G will not sign if $\frac{r_G}{w_G} < q$. This can only happen if $w_G > r_G$. For the "mean" G the following expected utilities apply:

$$
\begin{align}
EU_G(sign|p = 0) &= -cw_G - \frac{w_G}{2} + r_G \tag{60} \\
EU_G(not\ sign|p = 0) &= q \times (-cw_G) + (1 - q) \times (-cw_G - \frac{w_G}{2}) \\
&= -cw_G - \frac{w_G}{2} + q \times \frac{w_G}{2} \tag{61}
\end{align}
$$

so that a "mean" G will sign if $r_G > q \times \frac{w_G}{2}$ or that $q < \frac{2 \times r_G}{w_G}$. As we assume that $2 \times r_G > w_G$ this latter condition will always hold, establishing thus a separating equilibrium under the following conditions:

- $2 \times r_G > w_G$

- $2 \times w_G > w_N > w_G$

- $w_G > r_G$

- $q > \frac{r_G}{w_G}$

Finally, let's assume that $w_G > w_N$ which implies that both thresholds for the updated belief p' are smaller than the one leading N in the proposed separating equilibrium to sign under all circumstanes. Hence, from G's perspective the following expected utilities are of importance:

$$EU_G(sign|p=1) \quad = \quad -cw_G - c_G + r_G \tag{62}$$

$$EU_G(not\ sign|p=1) \quad = \quad q(-cw_G - w_G + w_N) + (1-q)(-cw_G - w_G)$$

$$= \quad -cw_G - w_G + q \times w_N \tag{63}$$

Consequently, the "nice" G will not sign if $q > \frac{r_G}{w_N}$ which requires $w_N > r_G$. For the "mean" G the following expected utilities are of interest:

$$EU_G(sign|p=0) \quad = \quad -cw_G - \frac{w_G}{2} + r_G \tag{64}$$

$$EU_G(not\ sign|p=0) \quad = \quad q(-cw_G - \frac{w_G}{2} + w_N) + (1-q)(-cw_G - \frac{w_G}{2})$$

$$= \quad -cw_G - \frac{w_G}{2} + q \times w_N \tag{65}$$

which implies that signing requires $r_G > q \times \frac{w_G}{2}$. This, however, is only possible of $q < \frac{r_G}{w_N}$, which is in contradiction with the condition for the "nice" G to not sign. Consequently, no separating equilibrium can exist.

A completely separating equilibrium may also exist where the "nice" G signs the treaty and the "mean" G does not. From above we know that the relationship between w_G and r_G is relevant.

Assuming that $w_G > 4 \times r_G$ we know that no type of G will sign at its second decision node so that N will also refrain from signing. Thus the following expected utilities becomes relevant:

$$EU_G(sign|p=1) \quad = \quad -cw_G - w_G + r_G \tag{66}$$

$$EU_G(not\ sign|p=1) \quad = \quad -cw_G \tag{67}$$

Thus a "nice" G will sign if $r_G > w_G$ which is in contradiction with the assumption $w_G > 4 \times r_G$. Consequently no separating equilibrium of this type exists.

Second assuming that $4 \times r_G > w_G > 2 \times r_G$ we know that the "mean" type of G will sign at its second decision while the "nice" type will not. But then again both types of N will also refrain from signing, so that the same conditions should hold for a separating equilibrium, which are again in contradiction with $4 \times r_G > w_G > 2 \times r_G$. Consequently, no separating equilibrium can exist.

Finally, if $2 \times r_G > w_G$ we know that both types of G will sign after N's signing. Given the proposed separating equilibrium we know that the updated belief p' is 0, leading both types of N to refrain from signing. Consequently, the following expected utilities become relevant:

$$EU_G(sign|p=1) = -cw_G - w_G + r_G \tag{68}$$

$$EU_G(not\ sign|p=.) = -cw_G \tag{69}$$

$$EU_G(sign|p=0) = -cw_G - \frac{w_G}{2} + r_G \tag{70}$$

Consequently, the "nice" G will sign at its first decision node if $r_G > w_G$, while the "mean" type will not sign the treaty if $\frac{w_G}{2} > r_G$. But the latter condition is in contradiction with $2 \times r_G > w_G$ so that no separating equilibrium of this type exists.

Semi-pooling equilibria

From above it follows that semi-pooling equilibria can only exist under the condition of $2 \times r_G > w_G$

The first candidate equilibrium is based on the following (partial) strategy for the two types of G at their first decision node:

$$p(not\ sign|p=1) = 1$$
$$p(not\ sign|p=.) = s \tag{71}$$

From this it follows that the updated belief for N is the following: $\frac{p}{p+s(1-p)}$.

We first assume that G chooses s in such a way that $p' = \frac{w_N}{w_G}$ implying that the "nice" N is indifferent between signing and not signing, while the "mean" N will sign with certainty. Consequently, s can be determined as follows:

$$\frac{p}{p+s(1-p)} = \frac{w_N}{w_G}$$

$$p = \frac{w_N}{w_G}(s(1-p)+p)$$

$$p(\frac{w_G}{w_N}-1) = s(1-p)$$

$$s = \frac{p(w_G - w_N)}{w_N(1-p)} \tag{72}$$

For s to be larger than 0 $w_G > w_N$ has to hold, while $p < \frac{w_N}{w_G}$ assures that $s < 1$. As a "nice" N is in this case indifferent between signing or not signing its (partial) strategy will be $p(sign|q = 1) = t$. Hence from G's perspective the following expected utilities are relevant:

$$EU_G(sign|p = 1) = -cw_G - w_G + r_G \tag{73}$$

$$\begin{aligned} EU_G(not\ sign|p = 1) &= q(t(-cw_G - w_G + w_N) + (1 - t)(-cw_G)) \\ &\quad + (1 - q)(-cw_G - w_G) \\ &= -cw_G - w_G + q \times w_G + q \times t \times w_N - q \times t \times w_G \end{aligned} \tag{74}$$

Consquently, the "nice" G will not sign if $q > \frac{r_G}{w_G + t(w_N - w_G)}$. For the "mean" G the following has to hold:

$$EU_G(sign|p = 0) = -cw_G - \frac{w_G}{2} + r_G \tag{75}$$

$$\begin{aligned} EU_G(not\ sign|p = 0) &= q(t(-cw_G - \frac{w_G}{2} + w_N) + (1 - t)(-cw_G)) \\ &\quad + (1 - q)(-cw_G - \frac{w_G}{2}) \\ &= -cw_G - \frac{w_G}{2} + q\frac{w_G}{2} + q \times t \times w_N - q \times t\frac{w_G}{2} \end{aligned} \tag{76}$$

As the "mean" type has to be indifferent the following has to hold:

$$r_G = -cw_G - \frac{w_G}{2} + q\frac{w_G}{2} + q \times t \times w_N - q \times t\frac{w_G}{2} \tag{77}$$

which implies

$$t = \frac{r_G - q\frac{w_G}{2}}{2q(w_N - \frac{w_G}{2})} \tag{78}$$

t will be positive if $q < \frac{2 \times r_G}{w_G}$ which will always be the case given that we assume that $2 \times r_G > w_G$. And t will be smaller than 1 if $r_G < w_N$. It can also easily be checked that the t determined here satisfies the condition for t for the "nice" G to sign. Consequently a semi-pooling equilibrium exists under the following conditions:

- $2 \times r_G > w_G$

- $p < \frac{w_N}{w_G}$

- $q > \frac{r_G}{w_N}$

- $w_N > r_G$

Assuming next that G will choose s in such a way that the "mean" N will be indifferent between signing and not signing, implying that the "nice" N will not sign, the following has to hold:

$$
\begin{aligned}
\frac{p}{p + s(1 - p)} &= \frac{w_N}{2 \times w_G} \\
2 \times w_G p &= w_N(p + s(1 - p)) \\
s &= \frac{p(2 \times w_G - w_N)}{w_N(1 - p)}
\end{aligned}
\tag{79}
$$

s will be positive if $2 \times w_G > w_N$ and smaller than 1 if $p < \frac{w_N}{2 \times w_G}$. As a "mean" N is in this case indifferent between signing or not signing its (partial) strategy will be $p(sign|q = 0) = t$. Hence from G's perspective the following expected utilities are relevant:

$$
\begin{aligned}
EU_G(sign|p = 1) &= -cw_G - w_G + r_G \tag{80} \\
EU_G(not\ sign|p = 1) &= q(-cw_G) + (1 - q)(t(-cw_G - w_G) + (1 - t)(-cw_G)) \\
&= -cw_G - (1 - q)tw_G \tag{81}
\end{aligned}
$$

Consequently, the "nice" G will not sign if $-(1 - q)tw_G > -w_G + r_G$ which implies that $t < \frac{w_G - r_G}{w_G(1 - q)}$. For the "mean" G the following has to hold:

$$
\begin{aligned}
EU_G(sign|p = 0) &= -cw_G - \frac{w_G}{2} + r_G \tag{82} \\
EU_G(not\ sign|p = 0) &= q(-cw_G) + (1 - q)(t(-cw_G - \frac{w_G}{2}) + (1 - t)(-cw_G)) \\
&= -cw_G - \frac{w_G}{2}t(1 - q) \tag{83}
\end{aligned}
$$

As the "mean" type has to be indifferent the following has to hold:

$$
\begin{aligned}
r_G - \frac{w_G}{2} &= -\frac{w_G}{2}t(1 - q) \\
t &= \frac{\frac{w_G}{2} - r_G}{(1 - q)\frac{w_G}{2}}
\end{aligned}
\tag{84}
$$

For t to be positive $w_G > 2 \times r_G$ has to hold which is in contradiction with the assumption that $2 \times r_G > w_G$. Hence, no semi-pooling equilibrium of this type can exist.

Empirics

Table 7 provides a list of the countries covered in our empirical analysis, the number of observations and dyads from each country, as well as the start and end date of the period covered.

Table 7: Countries, NSAs and periods covered in empirical analysis

country	NSA	strict sample			strict sample		
		first year	last year	n	first year	last year	n
Burundi	CNDDFDD	2000	2003	4	2000	2003	4
Burundi	Palipehutu				2000	2003	4
India	NDFB	2000	2009	10	2000	2009	10
India	NSCN K	2005	2009	5	2005	2009	5
India	NLFT	2000	2009	10	2000	2009	10
India	NSCN IM	2000	2009	6	2000	2009	10
India	KNF	2000	2009	10	2000	2009	10
India	ULFA	2000	2009	10	2000	2009	10
Indonesia	GAM	2000	2005	6	2000	2005	6
Iran	KDPI	2000	2009	10	2000	2009	10
Iraq	PUK	2000	2007	8	2000	2007	8
Iraq	KDP	2000	2007	8	2000	2007	8
Morocco	POLISARIO	2000	2009	10	2000	2009	10
Myanmar	ABSDF				2000	2008	9
Myanmar	ARIF	2000	2006	7	2000	2009	10
Myanmar	KIO	2000	2009	10	2000	2009	10
Myanmar	KNPP	2000	2009	10	2000	2009	10
Myanmar	KNU	2000	2009	10	2000	2009	10
Myanmar	NMSP	2000	2009	10	2000	2009	10
Myanmar	RSO	2000	2006	7	2000	2009	10
Nepal	CPNM	2000	2006	7	2000	2009	9
Philippines	CPP	2000	2000	1	2000	2000	1
Philippines	MILF	2000	2000	1	2000	2000	1
Philippines	MNLF	2000	2000	1	2000	2000	1
Somalia	SPM				2000	2009	10
Somalia	SRRC	2001	2003	3	2001	2009	9
Sri Lanka (Ceylon)	LTTE	2000	2009	8	2000	2009	8
Sudan	SPLM/A	2000	2003	4	2000	2001	2
Turkey	PKK	2001	2003	3	2001	2003	3
total				179			218

Table 8: Results for Signatory Status of Government with Control for Time-dependency (Polynomials)

	government signs		government signs before NSA		government signs after NSA	
sample:	*strict*	*lenient*	*strict*	*lenient*	*strict*	*lenient*
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
democracy(lagged)	0.917	1.042	1.756*	1.547*	−1.632	−0.763
	(0.739)	(0.726)	(0.989)	(0.862)	(1.753)	(1.575)
one-sided violence$_G$	0.020	0.031	−0.044	−0.016	0.082	0.092*
	(0.029)	(0.028)	(0.040)	(0.034)	(0.059)	(0.054)
one-sided violence$_N$	−0.013	−0.020	0.019	0.003	−0.013	−0.013
	(0.037)	(0.036)	(0.040)	(0.039)	(0.083)	(0.084)
use of mines by government	−1.862*	−1.923*	−1.732*	−1.869*	0.047	−0.437
	(0.802)	(0.777)	(0.978)	(0.937)	(1.217)	(1.108)
time	−0.109	−0.084	−0.183	−0.111	0.050	0.089
	(0.235)	(0.227)	(0.271)	(0.253)	(0.632)	(0.498)
time^2	0.002	−0.002	−0.014	−0.014	0.065	0.020
	(0.034)	(0.033)	(0.041)	(0.039)	(0.153)	(0.101)
time^3	0.000	−0.000	−0.001	−0.002	0.021	0.001
	(0.004)	(0.003)	(0.005)	(0.005)	(0.031)	(0.017)
constant	−2.177*	−2.270*	−3.023*	−2.687*	−2.891	−2.538
	(0.866)	(0.832)	(1.149)	(0.975)	(2.125)	(2.084)
N	188	226	154	180	42	54
log L	−4.017	−7.680	9.714	5.033	18.596	16.103

Standard errors in parentheses
* indicates significance at $p < 0.1$

Table 9: Results for Signatory Status of NSA with Control for Time-dependency (Polynomials)

	NSA signs		NSA signs before government	
sample:	*strict*	*lenient*	*strict*	*lenient*
	Model 1	Model 2	Model 3	Model 4
one-sided violence$_G$	0.014	0.013	0.019	0.019
	(0.036)	(0.036)	(0.041)	(0.041)
one-sided violence$_N$	0.019	0.021	-0.013	-0.013
	(0.037)	(0.037)	(0.043)	(0.043)
territorial control $\geq$ moderate	$-1.975*$	$-2.006*$	-1.598	-1.610
	(1.011)	(1.022)	(1.160)	(1.162)
NSA troop size (logged)	$0.759*$	0.712	0.949	0.955
	(0.452)	(0.433)	(0.638)	(0.640)
time	0.195	0.184	0.112	0.109
	(0.275)	(0.272)	(0.281)	(0.278)
time^2	-0.009	-0.010	-0.010	-0.010
	(0.038)	(0.038)	(0.036)	(0.036)
time^3	-0.002	-0.002	-0.002	-0.002
	(0.004)	(0.004)	(0.004)	(0.004)
constant	$-8.913*$	$-8.469*$	$-10.526*$	$-10.574*$
	(4.187)	(4.005)	(5.855)	(5.878)
N	153	159	91	93
$\log L$	7.216	7.050	14.343	14.335

Standard errors in parentheses
* indicates significance at $p < 0.1$

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