Models of Multilateral Negotiations and Ratification*

Simon Hug†
Département de science politique, Université de Genève

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Abstract

Models of international negotiations have so far been severely limited, either by considering one-dimensional bargaining spaces or by reducing the set of negotiators to two parties. Such models can hardly reflect negotiations in the current international context, may it be in the realm of the European Union, the World Trade Organization, the United Nations, etc. The lack of empirical correspondence becomes even more glaring, when the ratification of international treaties in these various organziations is considered. Thus, the paper proposes to take stock of the possibilities how existing multilateral bargaining models might be applied to negotiations of international treaties which are subject to domestic ratification processes.

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† Département de science politique, Faculté des sciences économiques et sociales; Université de Genève; 40, Bd du Pont d'Arve; 1211 Genève 4; Switzerland; phone ++41 22 379 83 78; email: simon.hug@unige.ch

1 Introduction

It has become almost trivial to assume that ratification processes of international treaties affect the negotiations of these treaties. At least since Schelling's (1960) path-breaking work and the subsequent partial formalization by Putnam (1988) scholars studying international negotiations almost systematically refer to domestic ratification constraints. The literature has also progressed considerably in rendering the conjectures advanced by Schelling (1960) more precise by deriving them formally from a set of explicitly stated assumptions. Similarly, empirical studies dealing with the effects of ratifications have become more sophisticated.[1]

With the increasing frequency of multilateral negotiations, for instance in the European Union (EU), the World Trade Organization (WTO), the United Nations (UN) and other international organizations, an important gap opened, however, between the theoretical models and the empirical referent. Almost all theoretical models based on a two-level game either only consider two negotiators or reduce the bargaining space to a one-dimensional policy space.

Both simplifications are problematic. On the one hand, the driving force at the international level in most two-level games is either explicitly or implicitly Rubinstein's (1982) bargaining model. But this model, while leading to a unique subgame-perfect equilibrium outcome in bilateral negotiations, has a "multiplicity of subgame perfect equilibria" (Muthoo, 1999, 337) if the number of players exceeds two. On the other hand, negotiations in the realm of the EU, the WTO or the UN can hardly be characterized as dealing with a single issue. While a one-dimensional bargaining space might represent the contract curve in a bilateral negotiation model, this analogy inevitably breaks down if either additional actors are involved in the ratification or more than two negotiators are present.

Thus, quite obviously, the theoretical models and the derived implications we currently use to study the effect of ratification constraints on international negotiations are inadequate. The present paper wishes to discuss this problem and to show how recent advances in bargaining models help us to propose more realistic models. In the next section I briefly review existing work on the way in which domestic ratification of international treaties affects international negotia-

[1] Pahre (2005) offers a stimulating review of empirical studies focusing on two-level games, while Humphreys (2007) presents an excellent review of the theoretical models and their shortcomings.

tions. The emphasis in this section is on demonstrating the shortcomings of the models currently used to study ratification constraints, especially when they are applied to concrete empirical examples. In section 3 I discuss the various models of multilateral negotiations which appear with increasing frequency in the literature.[2] Section 4 is devoted to an attempt to link existing models of multilateral bargaining to the literature on two-level models. More precisely, I propose ways in which ratification constraints might be fruitfully introduced into multilateral bargaining models. Section 5 concludes by suggesting future research avenues.

2 International negotiations and ratification

Since the publication of Schelling's (1960) work and his deservedly famous conjectures various authors have attempted to put this author's insights on more solid analytical footing. While Putnam (1988) popularized the notion of two-level games in the late 1980s, the first explicit formal models dealing with the effect of domestic ratification on treaty negotiations only appeared at the beginning of the 1990s. Iida's (1993) model provides a first formalization of Schelling's (1960) and Putnam's (1988) insights, by combining Rubinstein's (1982) bargaining model with the assumption that one player has a domestic ratification constraint. His results confirm some of Putnam's (1988) conjectures, while questioning others. Tarar (2001) extends Iida's (1993) model to cover situations in which both negotiating countries face domestic ratification constraints. He finds that under complete information the relative stringency of these constraints explains the bargaining advantages. Hence, the negotiator with the higher domestic constraints is, if a negotiated outcome is possible, better off. If both negotiators face similar ratification constraints, however, it is the second mover in the alternating offer game who gains more.[3]

[2]Muthoo (1999, 336) justifies the omission of multilateral bargaining models from his extensive and detailed review of the bargaining literature by arguing that "the literature on multilateral and coalitional bargaining that uses . . . game-theoretic methodology . . . is extremely small (albeit growing) and under-developed." Powell (2002) in his review has a section on "multilateral bargaining," which contains, however, no reference to any multilateral bargaining model.

[3]Interesting to note is that in both models only the negotiators are impatient. Legislators or other ratifying actors are assumed not to discount the payoffs received in the negotiations. See Humphreys (2007) important discussion of this point.

Milner and Rosendorff (1997) and Milner (1997) propose a similar model, employ, however, the Nash bargaining solution to determine the division of the pie among the negotiators.[4] Since the underlying model used in Iida (1993) and Tarar (2001), for instance, is distributional, an important question is how the gains obtained at the international level are distributed at the domestic level. In both cases, however, it is implicitly assumed that at the domestic level the bargaining result becomes a public good. Contrary to this assumption, Mo (1994) considers in his model a way in which the distributional issues might be introduced at the domestic level (see also Mo, 1995).

A more general approach regarding these problems appears in Tarar (2005), who suggests that the distribution of the spoils differs between presidential and parliamentary systems. In presidential systems, given the national constituency of the president, the latter derives benefits from the overall size of the share of the pie he obtains in the negotiations. In the ratification stage the legislators then determine the distribution of the share of the pie among themselves. But what the legislators get must exceed what they could get in the absence of an international agreement. In parliamentary systems, especially if the ratification involves actors outside government (e.g., under minority governments), the share of the pie has to be shared with the other actors necessary for the ratification. Again, these shares have to exceed what the actors could get in the absence of an international agreement. This creates a participation constraint that the executive has to consider in the bargaining stage.

All the models referred to above are based on a one-dimensional bargaining space. Hammond and Prins (1999), after providing an extensive analysis of a two-level game with a one-dimensional bargaining space, including games with more than two negotiators,[5] propose cursory results from a two-dimensional model.

[4]Butler (2004) criticizes the use of the Nash bargaining solution and advocates Kalai and Smorodinsky's (1975) proposed solution. In many applications, however, the conditions which lead to different predictions according to these two solutions, are hardly plausible, since they require an oddly shaped Pareto-frontier. Criticizing Kalai and Smorodinsky's (1975) solution as well, Felsenthal and Diskin (1982) propose another variant based on experimental evidence, which, however, has never caught on. Part of the explanation to this might be related to Rubinstein's (2001) thoughts on experimental evidence in economics. Finally, both Schneider, Finke and Bailer (2003), Schneider (2005) and Linhart and Thurner (2004) propose empirical tests of the Nash bargaining solution compared to other solution proposals, among them one based on an exchange model in the latter publication. See also Achen's (2006) excellent discussion and comparison of these various bargaining models.

[5]In the context of a one-dimensional bargaining space they demonstrate, however, that the

General results prove, however, difficult to obtain in this context. Similarly, Mansfield, Milner and Rosendorff (2000) provide a model where bargaining takes place over two dimensions. The ideal-points of the domestic ratification actors are assumed, however, to lie on a single line, simplifying the derivation of the results.[6]

Finally, Humphreys (2007) proposes a more general model on the effect of one ratifying agent in a bilateral bargaining model, where the ratifying agent is not confronted with a simple take-it-or-leave-it offer, but a rejection by her leads to new rounds of negotiations. In such a model, even if the ratifying agent prefers the bargaining outcome in the absence of ratification to the status quo, Humphreys (2007) demonstrates that ratification affects the bargaining.[7]

3 Models of multilateral negotiations

A central element in analyses of multilateral negotiations is Nash's (1950) bargaining solution. Since Binmore (1987) had proved that the equilibrium payoffs in a bilateral bargaining model with alternating offers converges to the Nash bargaining solution as the time intervals between offers tends toward 0, this seemed like a natural extension. As was proven later, however, the n-player extension of the alternating-offer game had a "multiplicity of subgame perfect equilibria" (Muthoo, 1999, 337).[8] The reason for this multiplicity of perfect equilibria resides in the possibility for players responding to offers being compensated for rejecting offers which deviate from the equilibrium path. Hence, implicitly the problem

strategic interaction can be reduced to the two negotiators with the most extreme opposing preferences. See Hammond and Prins (2006) for a summary of their main insights.

[6]Dai (2002) criticizes Mansfield, Milner and Rosendorff's (2000) application of their solution concept. In their response Mansfield, Milner and Rosendorff (2002) present the ad-hoc assumption that the outcome has to be on the Pareto-frontier of the two negotiators. In all two-level games I am aware of, this is an implication of the modeling assumptions, namely of the one-dimensional bargaining space, but in no way explicitly assumed. Humphreys (2007) concurrs and shows that it is also implied by the assumption that the ratifying agent is faced with a take-it-or-leave-it offer.

[7]This is in stark constrast to most models that assume that the ratifying agent faces a take-it-or-leave-it offer, where such an effect only appears if the ratifying agent prefers the status quo to the negotiated outcome.

[8]This stands in some contrast to Chae and Yang's (1994, 86) claim, that their model generalizes the Rubinstein model. Their claim rests on the fact that their model, with a protocol leading to a series of bilateral negotiations, reduces to Rubinstein's (1982) model if the number of players is 2. More on this model below.

arises that coalitions among the players can form.[9]

Thus, many scholars attempted to modify the bargaining protocol, the structure of the game or other aspects to arrive at uniqueness results (either in terms of payoffs or, more challenging, in terms of equilibrium strategies). An interesting bargaining model appears in Chae and Yang (1994).[10] They obtain a uniqueness result under the assumption that the multilateral bargaining process can be broken down into a series of bilateral negotiations. More precisely, a randomly chosen proposer among the n players submits a "share of the pie" to one of the $n-1$ other players. If this player accepts, the proposer turns to one of the remaining $n-2$ players with another offer. If all $n-1$ players accept the share that the proposer offers them, the pie is divided according to the accepted offers and the remaining pie incumbs to the proposer. If any of the $n-1$ players rejects the offer of the proposer, this player becomes the proposer, and the game starts afresh with the payoffs discounted.

It is easy to understand how a unique perfect equilibrium may emerge in such a model. First, given that players having accepted an offer from the proposer drop out of the game, coalitions are no longer feasible. Second, the proposer, by offering the continuation value to each of the $n-1$ other players ensures that her offers are accepted, and she pockets the spoils. The question, though, arises whether the series of bilateral bargains adequately reflects the multilateral negotiation.

Closely related to this model is the one proposed by Krishna and Serrano (1996). In their model, after a proposal has been made, actors may leave the bargaining table with the share of the "pie" they have been offered. Under this assumption, the authors show that stationary strategies lead to subgame perfect equilibria corresponding to the Nash solution.

Baliga and Serrano (1995) propose an n-person extension of the Rubinstein (1982) model, by assuming that there is a fixed order in proposing and accepting/rejecting offers. In addition, the offers the proposers make remain private information for the proposer and the player being offered a share. If all players accept their share, the pie is split according to the accepted offers. If a player

[9]Sutton (1986) discusses these issues and demonstrates that unique subgame-perfect equilibria are only obtainable if with k players the common discount factor $\delta < \frac{1}{k-1}$. Osborne and Rubinstein (1990, 63-65) offer an extended discussion on these issues.

[10]This model extends Chae and Yang's (1988) earlier model, which operated with more restrictive assumptions.

rejects an offer, the complete set of offers is revealed and the next player on the list after the proposer makes an offer. Given the sequential acceptance/rejection for a rejected offer only one rejection is revealed. This information is used to condition the subsequent rounds of the game. Baliga and Serrano (1995) prove that under the assumption of optimistic off-the-equilibrium-path beliefs a unique equilibrium obtains.

All the models discussed above obtain unique equilibria results by restricting the bargaining protocol.[11] An equally important avenue is to restrict the admissible strategies. Merlo and Wilson (1995) develop a model of stochastic bargaining and derive a unique subgame perfect equilibrium outcome under the assumption of stationary strategies.[12] In their model, the size of the pie is stochastically determined in each negotiation round, and a randomly selected proposer makes an offer on how to devide the pie. If all other actors accept the offer the game ends. If not, the size of the pie changes stochastically, and another proposer is selected randomly. The authors prove that this model has a unique subgame perfect equilibrium outcome, and this outcome may be achieved even with some delay.[13]

Winter (1996*b*) proposes a model with both veto players and actors with no veto power bargaining over the division of a pie. He solves the bargaining game for subgame perfect equilibria in stationary strategies. A more general model appears in Banks and Duggan (2000). The structure of the game is very similar to the one chosen by Merlo and Wilson (1995). An individual is randomly chosen as proposer, and she makes an offer to all remaining $n-1$ players. If the offer is accepted simultaneously by all players, the game ends. If not it starts afresh with a new draw of a proposer. Under the assumption of stationary strategies Banks and Duggan (2000) derive the conditions under which equilibria obtain, whether they are unique, and what their relationships are with the (possibly empty) core.[14]

[11]Winter (1996*a*) demonstrates that equilibria that are insensitive to the assumed bargaining mechanisms lead to outcomes belonging to the core.

[12]Osborne and Rubinstein (1990, 39) criticize the appropriateness of such strategies in bargaining games.

[13]Further extensions of this model appear in Merlo and Wilson (1998) and Eraslan and Merlo (2002).

[14]Banks and Duggan (2000) derive these results under very general assumptions concerning the decision-making rules, including unanimity which characterizes most international bargaining. Relatedly, Brams, Kilgour and Sanver (2004) suggest a bargaining procedure which mini-

Gilligan (2004) builds upon Banks and Duggan's (2000) model to address the issue whether broader agreements necessarily lead to shallower negotiation results. He models both a negotiation stage and an implementation phase and derives an equilibrium outcome. The results suggest that a broader-deeper tradeoff fails to exist under the assumption that the agreement does not require equal policies for all contracting partners. While the modeled decision (i.e., pollution thresholds) implies a multidimensional bargaining space the absence of the ratification stage in Gilligan's (2004) model does not allow us to address the issues we are interested in. Similarly, Stone, Slantchev and London's (2008) model covers a one-dimensional bargaining space and finds, contrary to Gilligan (2004), a broader-deeper tradeoff in multilateral bargaining.[15]

4 Multilateral negotiations and ratification

None of the models discussed so far allow us to adequately reflect the main elements of current international negotiations, namely their multilateral and multidimensional character combined with the presence of a ratification stage. Clearly, addressing the issue of how ratification constraints affect multilateral negotiations is a complicated endeavor. On the one hand, models of multilateral negotiations obtain uniqueness results only under restrictive assumptions. On the other hand, the almost necessarily ensuing multidimensional bargaining space heightens the importance of being clear about whether the negotiations involve a public or a private good. While for instance Banks and Duggan's (2000) model is general enough to accommodate negotiations over both private and public goods, others, for instance Chae and Yang (1994) and Winter (1996*b*) deal exclusively with private goods.

In extensions of two-level games to multilateral negotiations the nature of the object over which is bargained becomes of central importance. While in bilateral negotiations a divide-the-dollar setup may easily also reflect the negotiation over a public good along the contract curve, the difference between private goods (e.g., a dollar) or public goods (e.g., in spatial games) cannot be easily fudged in

mizes the "maximum distance" between the ideal proposal and the negotiation outcome. This distance is derived in the context of a multidimensional bargaining space but with dichotomous alternatives.

[15]Related to these models is also Baron and Herron's (2003) study of a multilateral decision in a multi-dimensional space. The decision-rule, however, is majority rule.

multilateral bargaining models.[16]

In what follows, I will first offer a discussion about how ratification constraints can be integrated into a multilateral bargaining model over a private good. For this I will prove a proposition under restrictive assumptions how the payoffs are affected by domestic ratification constraints in a game with three players. Then, I will show how domestic ratification constraints might be included in a multilateral bargaining model over a public good.

4.1 Multilateral negotiations over private goods

Given the close relationship between Chae and Yang's (1994) and Rubinstein's (1982) respective models, the former lends itself for assessing to what degree multilateral negotiations are affected by domestic constraints. Since in Chae and Yang's (1994) model the object of the bargain is a fixed pie, it is obvious that the negotiations take place over a private good. To simplify the modeling exercise, I will refrain, however, from addressing the issue of how this private good is distributed domestically.[17]

As a starting point it is useful to note that in equilibrium the pie of size π is divided among the initiator 1 and the responders $i \neq 1 \in N$ in the ratio $\frac{1}{1-\delta_1} : \frac{\delta_i}{1-\delta_1}$ in Chae and Yang's (1994) model. Under the assumption of a set of players $N = \{1, 2, ...n\}$ and equal discount factors ($\delta_k = \delta_l \forall k \neq l \in N$) it is easy to show that the initiator 1 obtains $\frac{1}{1+(n-1)\delta}$ of pie π, while each of the remaining $n-1$ actors obtains a share of $\frac{\delta}{1+(n-1)\delta}$. To simplify the analysis I let the size of the pie to equal 1.

As Iida (1993) and Tarar (2001) I assume that the domestic ratification processes generate for all negotiators an implicit constraint $C_i \forall i \in N$. For an international agreement to pass the domestic ratification stage in round t

[16] Actually, already in bilateral two-level games the nature of the bargaining good becomes of importance when the deal has to be ratified at the domestic level. More precisely, if at the international level a division of the dollar is agreed upon, the question arises how the share of the dollar obtained is divided at the domestic level. Often it is simply assumed that the domestic ratifyer has a reservation price (e.g., Iida, 1996; Tarar, 2001). More precise discussions of how a public good is divided up at the national level appear in Tarar (2005) and Humphreys (2007).

[17] In essence I assume that at the domestic level the private good becomes a public good, or I might subscribe to Tarar's (2005) characterization of a presidential system, where the president cares for the whole size of the share won in the negotiations. I also neglect the discounting taking place at the domestic level. Hence, the domestic ratifying actors are either perfectly patient or they have the same discount factor as their respective governments.

I would need $x_i^t \geq C_i \forall i \in N$.[18] It is easy to show that if $\frac{1}{1+(n-1)\delta} \geq C_1$ and $\frac{\delta}{1+(n-1)\delta} \geq C_i, \forall i \neq 1 \in N$ then ratification is assured and the equilibrium payoffs are not affected by the ratification stage. More interesting are the cases where these conditions on the ratification constraints are not met, and a treaty negotiated without considering the ratification constraints would fail in at least one country.

Following Chae and Yang's (1994) model I propose here a game that starts with player 1 making an offer x_i^1 to player i ($i \neq 1 \in N$). If player i accepts, 1 makes an offer x_j^1 to another player j ($j \in N, j \neq 1, i$). Again, if player j accepts, player 1 turns to the next player until all players have accepted their respective offers. In that case the pie of size 1 is distributed among the players, provided that $x_i^1 \geq C_i \forall i \in N$, the bargain is ratified in the domestic arena and payoffs are distributed. If $x_i^1 < C_i$ for some $i \in N$ then the game ends and all players receive a payoff of 0.

If player i rejects the offer from player 1, then the game starts afresh in a new round with player i becoming the initiator and making offers $x_\cdot^2$. Payoffs are discounted by the common discount factor δ. The game continues until all players have accepted offers and then proceeds to the ratification stage.

All aspects of the game are common knowledge, thus this is a game of complete and perfect information. To simplify the analysis I impose 2 assumptions. First, the number of negotiating players is reduced to 3 ($N = \{1, 2, 3\}$). Second, the domestic ratification constraints C_i for $i > 1$ are identical, namely $C_{i>1}$.[19] Under these assumptions the following proposition can be proved:[20]

Proposition 1 *If $\sum_{i \in N} C_i \leq 1$ equilibria exist in which the initiator 1's proposal is accepted in the first round and the division of the pie is of the following form:*

i) if $\frac{\delta}{1+2\delta} \geq C_1$ and $\frac{\delta}{1+2\delta} \geq C_{i>1}$ then $x_1^1 = \frac{1}{1+2\delta}$ and $x_{i>1}^1 = \frac{\delta}{1+2\delta}$

ii) if $C_1 > \frac{\delta}{1+2\delta}$ and $\frac{\delta(1-C_1)}{1+\delta} \geq C_{i>1}$ then $x_1^1 = \frac{1-\delta+2\delta C_1}{1+\delta}$ and $x_{i>1}^1 = \frac{\delta(1-C_1)}{1+\delta}$.

iii) if $C_1 > \frac{\delta}{1+2\delta}$ and $\frac{1-C_1}{2} \geq C_{i>1} > \frac{\delta(1-C_1)}{1+\delta}$ then $x_1^1 = 1 - \sum C_{i>1}$ and $x_{i>1}^1 = C_{i>1}$

iv) $\frac{\delta}{1+2\delta} > C_1$ and $\frac{1-C_1}{2} \geq C_{i>1} > \frac{\delta}{1+2\delta}$ then $x_1^1 = \frac{1-\delta+2\delta C_1}{1+\delta}$, $x_{i>1}^1 = \frac{\delta(1-C_1)}{1+\delta}$,

[18] This highlights the fact that the payoffs for the ratifying actors are not discounted.

[19] Both of these assumptions simplify the derivation of the results that follows. Extensions to relax both of these assumptions are easy to conceive, but since the focus below will be on multilateral bargaining over public goods, I refrain from extending the presentation here.

[20] A sketch of the proof of proposition 1 appears in the appendix.

Proposition 1 suggests two things. First, equilibria are only possible if $\sum_{i \in N} C_i \leq 1$. Thus, if the ratification constraints are too high, no negotiation result is ratifyable. Second, if the constraints are not too high, three different types of payoff distributions are possible. If the constraints are sufficiently low, namely $\frac{\delta}{1+2\delta} \geq C_i \forall i \in N$, then the equilibrium payoffs are identical to the ones in Chae and Yang's (1994) model without ratification. If player 1's constraint is sufficiently high, and those of players 2 and 3 sufficiently low, player 1 can gain a higher share of the pie than with no ratification constraints. Finally, in all other cases, players 2 and 3 obtain the exact share of the pie which makes the bargain ratifyable in their respective domestic arena, while player 1 obtains any remaining surplus.

Figure 1: Equilibria as a function of domestic ratification constraints

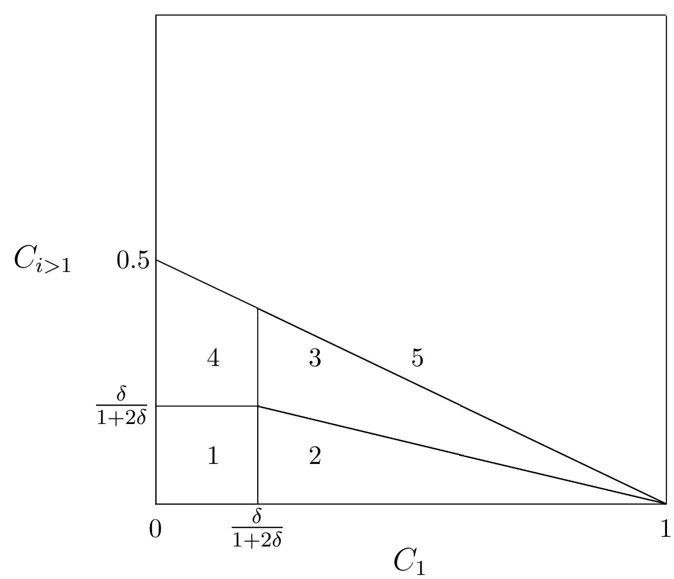


Figure 1 illustrates the conditions under which these equilibria obtain. For a given value of δ surface 1 corresponds to the combination of domestic ratification constraints C_1 and $C_{i>1}$ for which these constraints do not affect the negotiation result. Surface 2 corresponds to the combination of domestic ratification constraints for which player 1 can increase its payoffs compared to the game without ratification constraints. Surface 3 corresponds to the situations where players 2 and 3 obtain the exact share of the pie making ratification possible, while player 1 obtains any remaining surplus, while in surface 4 these roles are inversed with 2 and 3 sharing the spoils. Finally, combinations of ratification constraints reflected in surface 5 yield no unique equilibria.

These results suggest that ratification constraints in this complete information model of multilateral bargaining advantage mostly player 1. Players 2 and 3 obtain only under restrictive assumptions more than the share of the pie necessary for ratification. Player 1, however, in almost all situations (except in surfaces 1 and 4 in figure 1) obtains more than is necessary for ratification. These findings contrast to some degree with those obtained by Tarar (2001) for a bilateral two-level game. He noted that the second mover, under certain circumstances, profits more from domestic ratification constraints than the initiator of the bargaining process. This appears to be a result specific to the bilateral setting.

Finally, it is interesting to observe that as δ tends toward 1 the surface 3 figure 1 diminishes to vanish for $\delta = 1$. Among the remaining surfaces 1 and 2 increase in size, while 4 decreases in surface. Since this latter surface depicts combinations of domestic constraints where players 2 and 3 gain it follows that increasing δs strengthen the hand of the initiator of the negotiations.

4.2 Multilateral negotiations over public goods

While in some cases multilateral negotiations might best be represented as bargains over a private good,[21] in many cases public goods seem the more appropriate referent. Given the generality of Banks and Duggan's (2000) model, their approach clearly serves as the most promising stepping stone to consider the effect of ratification constraints for negotiations over public goods. Given that most outcomes of international negotiations require unanimous approval, several results obtained by Banks and Duggan (2000) facilitate this work. First of all they prove existence of equilibria in pure strategies. Second, they also show that these equilibria are no-delay equilibria, hence the first proposal will be accepted in equilibrium.

In terms of characterizing the equilibrium outcomes bargaining models over public goods are more difficult, since all possible preference profiles would need to be evaluated.[22] Hence, theoretical models should in that situation much more closely be tailored to the empirical referent one wishes to study (e.g., Hug and

[21] Though, one might question this assumption for instance for decisions reached in the UN's security council (e.g., Winter, 1996*b*).

[22] Hammond and Prins (1999) carry out such an exercise for a one-dimensional bargaining model with ratification, and offer some generalizations for a two-dimensional setup.

König, 2002). For this reason I build upon two examples discussed in Banks and Duggan (2000) to illustrate the effects of ratification constraints. In both of these examples Banks and Duggan (2000) assume decision-making by majority rule and that the whole policy space is preferable to the status quo policy.

In the first one-dimensional example 3 actors have ideal-points on the real-line $[-1, 1]$, namely $x_1 = -1, x_2 = 0$ and $x_3 = 1$ with utility functions $u_1(x) = 2 - |-1-x|$, $u_2(x) = 1-|x|$, $u_3(x) = 2-|1-x|$. Banks and Duggan (2000) derive for this example a symmetric equilibrium under majority rule where 1 proposes $-\alpha$, 2 proposes 0 and 3 α when recognized. In this no-delay equilibrium, under the assumption of a common discount factor δ, the respective offers are immediately accepted with $\alpha = \frac{1-\delta}{1-\frac{2}{3}\delta}$.

Extending this example to cover unanimity is straightforward. 2 continues to propose 0 if recognized, while 1 proposes $-\alpha$ and 3 α. These offers, however, have to be acceptable to all three players. This suggests that offers by 1, respectively 3 have also to satisfy 3, respectively 1. It is easy to derive that under these conditions $\alpha = 1 - \delta$. Not surprisingly, this value for α is smaller than the one obtained for majority rule, suggesting that 1 and 3 have to make proposals closer to 2's ideal-point.[23]

A second extension, which Banks and Duggan (2000) briefly mention is the case in which not the whole set of possible agreements is preferable to the status quo. In that case, the status quo has explicitly to be included in the analysis. In the example elaborated upon above, the status quo could lie anywhere on the real-line. Obviously, if the status quo lies inside the Pareto-set $[-1, 1]$ no negotiated change is possible. For the sake of simplicity, let $x_{sq} = -1 - \epsilon$ with $\epsilon \in [0, 1]$.[24] Under these assumptions, both 2 and 3 are constrained, since their equilibrium proposal from above is no longer acceptable to 1. Thus, 2 and 3 will propose $-\epsilon$ which 1 would still accept. 1, however, would propose $-\frac{3-2\delta(1-\epsilon)-\delta}{3-\delta}$, which is closer to x_1 as long as $\epsilon \in [0, 1]$.

In the case where $\epsilon \in [1, 2 - \delta]$ then only 3 has to adjust its offer to ϵ, while 1 and 2 can offer their previously determined best offer. Finally, if $\epsilon \in [2 - \delta, \infty]$ the results as above obtain.

[23] Given the rather straightforward derivation of this result, the proof of this result is omitted.

[24] If $\epsilon < 0$ then quite obviously no proposal is preferred by all three actors to the status quo. To use Hammond and Prins's (1999) terminology, the negotiation-set is empty. If $\epsilon > 2$, then by symmetry the same results obtain as under the set of values I discuss here.

The introduction of the status quo as constraint already suggests the likely effects of ratification constraints. In the example used so far, a binding ratification constraint can only result from a ratification agent having an ideal-point closer to the status quo. In that case, the proposals made by the three actors will move closer to the status quo outcome, thus benefitting the negotiating actors located more closely the status quo.

The second example from Banks and Duggan (2000) deals again with three actors, but here they have ideal-points in a two-dimensional space. The ideal-points of the three actors correspond to the endpoints of the three unit-vectors in a three-dimensional space.[25] Again, Banks and Duggan (2000) derive equilibria under the assumption of majority rule. Extensions to unanimity are, however, straightforward. If the three actors are perfectly patient, it is easy to show that each of them will propose the center of gravity of the contract-plane, and each actor will only accept such proposals. Impatience, on the other hand, allows each actor to make proposals which reside on the line connecting its ideal-point with the center of gravity, while the exact location depends on the value of δ.

Again, this example only works as long as the whole set of points belonging to the contract-plane is preferable to the status quo. If this is not the case, the status quo has to be included into the model. The consequences of this inclusion are similar to those in the example discussed above. Again, it restricts the possible proposals by the actors with ideal-points further away from the status quo, and allows actors closer to the status quo to make proposals closer to their ideal-point. The same thing results from ratification constraints.

Thus in essence, domestic ratification constraints under complete and perfect information would simply influence the "acceptance sets" which define the set of proposals that a player would accept in a particular round. Hence, building up on the examples provided in Banks and Duggan (2000), and integrating information from the empirical cases one wishes to study, the effects of the ratification constraints might be assessed. Given that in Banks and Duggan's (2000) most general model one also finds an advantage for the first mover, this is likely to carry over to a model with ratification constraints. Thus, the conjecture might be that as in the bargaining model over a private good, the domestic ratification constraints profit mostly the initiator of the bargaining process. If the initiator

[25]Given this, the plane generated by the hull of these three points corresponds to the contract-plane in two dimensions. Thus, this example also reflects the familiar divide-the-dollar game.

is, however, randomly determined as in Banks and Duggan (2000), the ex-ante expected utility for each player would be the same.

(sh: develop)

5 Empirics

Empirics based on (Hug, 2007) and data collected for the DOSEI-project (König and Hug, 2006; Hug and König, 2007)

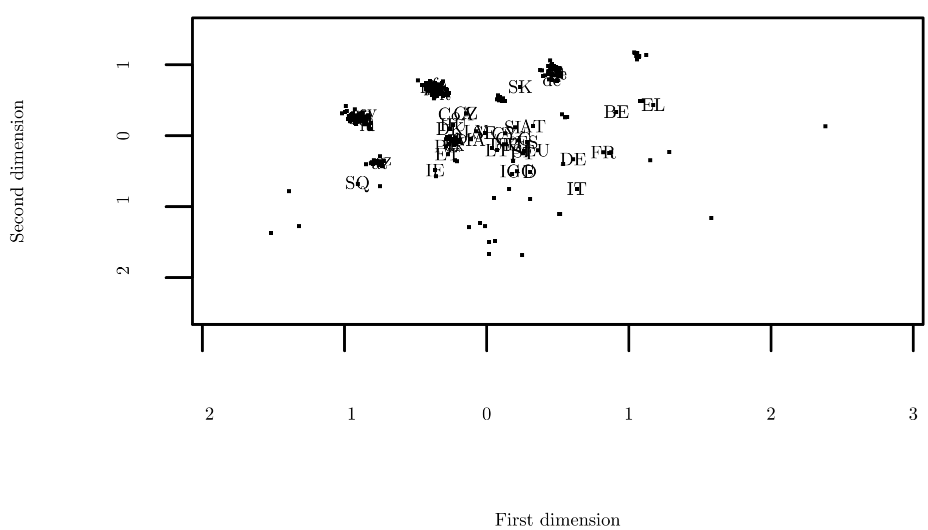
- center of gravity of governmental positions: CoG

- center of gravity of all ratification actors incl. governments: CoA

- center of gravity of governmental positions but constrained to those in win-set

- idem for ratifying actors

Figure 2: Bargaining and ratification space: center of gravity of governments and all.



6 Conclusion

Studies of international negotiations increasingly focus on how ratification constraints affect the negotiation outcome. Formal two-level games have been proposed in the literature to assess under what circumstances domestic ratification in parliaments or referendums is beneficial or detrimental for the negotiators. These formal models are limited, however, in either or both of two limitations. First, most models only consider bilateral negotiations. Most important international negotiations in the EU, over the WTO to other fora are, however, multilateral. Second, most models consider the bargaining space to be one-dimensional or reduce it to a contract curve. Again, most important international negotiations deal with multiple issues and given this, there is no one-dimensional bargaining space to be considered.

In this paper I discussed how existing two-level games might be extended by having recourse to models of multilateral negotiations. A key insight is that in multilateral negotiations the nature of the good to be bargained over becomes of much more central importance. Whether negotiators bargain over a private (the proverbial dollar) or a public good, has important consequences on how the domestic ratification constraints are modeled.

Based on these discussions I offered an extension of a multilateral bargaining model covering three players with domestic ratification constraints. Under simplifying assumptions I showed that domestic ratification constraints benefit mostly the initiator in a bargaining process. She reaps most of the benefits of having a domestic ratification constraints. This contrasts with the findings of Tarar (2001) who shows that in bilateral negotiations with domestic ratification constraints there are situations where the initiator of the negotiations profits less than the first responder.

Similar results also appear in a bargaining model over public goods. Ratification constraints may diminish the set of feasible outcomes and the initiator of the bargaining process may profit from this situation. Quite clearly, however, these results depend very strongly from the preference profiles assumed. Thus, very generalizable claims are difficult to obtain. Given that the results presented in this paper are derived under a set of rather stringent assumptions, there as ample room for attempts at generalize them.

7 Appendix

In this appendix I provide a sketch of a proof of proposition 1. This proof relies on lemmas 1-6 which I state and prove first.

Lemma 1 *If* $\frac{\delta}{1+2\delta} \geq C_i \forall i$ *then 1 always proposes* $x_1^1 = \frac{1}{1+2\delta}$ *and* $x_{i>1}^1 = \frac{\delta}{1+2\delta}$ *and accepts all offers* $x_1 \geq \frac{\delta}{1+2\delta}$. *All other players* $i > 1$ *accept* $x_{i>1} \geq \frac{\delta}{1+2\delta}$ *and always propose* $x_i^i = \frac{1}{1+2\delta}$, *and* $x_j^i = \frac{\delta}{1+2\delta}$ *for* $j \neq 1, i$.

Proof: Given that none of the ratification constraints C_i is binding, it follows easily that the equilibrium derived from Chae and Yang (1994) carries over.

Lemma 2 *If* $C_1 > \frac{\delta}{1+2\delta}$ *and* $\frac{\delta(1-C_1)}{1+\delta} \geq C_{i>1}$ *then 1 always proposes* $x_1^1 = \frac{1-\delta+2\delta C_1}{1+\delta}$ *and* $x_{i>1}^1 = \frac{\delta(1-C_1)}{1+\delta}$ *and accepts all offers* $x_1 \geq C_1$. *All other players* $i > 1$ *accept* $x_{i>1} \geq \frac{\delta(1-C_1)}{1+\delta}$ *and always propose* $x_1^i = C_1$, $x_i^i = \frac{1-C_1}{1+\delta}$ *and* $x_j^i = \frac{\delta(1-C_1)}{1+\delta}$ *for* $j \neq 1, i$.

Proof: Suppose for any C_1 and $C_{i>1}$ s.t. $\sum_{i \in N} C_i \leq 1$ that 1 proposes $C_1 + g$ where $g (\geq 0)$ reflects any surplus he may gain. Then $x_1^1 = C_1 + g$ while $x_{i>1} = \frac{1-C_1-g}{2}$. This offer is rejected by 2 if its share is larger when proposing $x_1^2 = C_1$, $x_2^2 = \frac{1-C_1}{1+\delta}$ and $x_3^2 = \frac{\delta(1-C_1)}{1+\delta}$. Thus, for the offer in the first round to be accepted the following has to hold:

$$\frac{1 - C_1 - g}{2} \quad > \quad \frac{\delta(1 - C_1)}{1 + \delta} \tag{1}$$

Solving for g leads to

$$\frac{(1 - \delta)(1 - C_1)}{1 + \delta} \quad \geq \quad g \tag{2}$$

At the same time if 1's offer is rejected and is offered $x_1^2 = C_1$ this has to offer a higher utility than waiting a round and keeping $C_1 + g$ for himself. Thus

$$C_1 \quad \geq \quad \delta(C_1 + g) \tag{3}$$

$$\frac{C_1(1 - \delta)}{\delta} \quad \geq \quad g \tag{4}$$

The condition on g from equation 4 is less stringent than the one from equation 2 if $C_1 > \frac{\delta}{1+2\delta}$. Thus, by setting g to its maximum possible value defined by equation 2 1 proposes

$$
\begin{aligned}
x_1^1 &= C_1 + \frac{(1-\delta)(1-C_1)}{1+\delta} \\
&= \frac{1-\delta+2\delta C_1}{1+\delta} \\
x_{i>1}^1 &= \frac{\delta(1-C_1)}{1+\delta}
\end{aligned}
\tag{5}
$$

But the offers $x_{i>1}^1$ are only accepted if $x_{i>1}^1 \leq C_{i>1}$, which results in the condition that $C_{i>1} < \frac{\delta(1-C_1)}{1+\delta}$.[26] *Q.E.D.*

Lemma 3 *If* $C_1 > \frac{\delta}{1+2\delta}$ *and* $\frac{1-C_1}{2} \geq C_{i>1} > \frac{\delta}{1+2\delta}$ *then 1 always proposes* $x_1^1 = 1 - \sum C_{i>1}$, $x_{i>1}^1 = C_{i>1}$, *and accepts all offers* $x_1 \geq \delta(1 - \sum C_{i>1})$. *All other players* $i > 1$ *accept* $x_{i>1} \geq C_{i>1}$ *and always propose* $x_i^i = C_i + 1 - \sum_{j \in N, j \neq i} C_i$ *and* $x_j^i = C_j$ *for* $j \neq 1, i$.

Proof: From the proof of lemma 2 it follows that an offer by 1 of $x_{i>1}^1 = \frac{\delta(1-C_1)}{1+\delta}$ would be rejected by 2 and 3 given the ratification constraints. After such a rejection players 2 or 3 would offer $x_1^2 = C_1$ and divide the remaining pie among themselves. For such an offer to be accepted by 1, it would need to hold that C_1 exceeds the discounted continuation value of the game after 1's rejection. Under the assumption that this offer is $x_1^1 = 1 - \sum C_{i>1}$ it needs to be true that $C_1 > \delta(1 - \sum C_{i>1})$. If $\delta(1 - \sum C_{i>1}) \leq \frac{\delta}{1+2\delta}$ then this holds for all $C_1 > \frac{\delta}{1+2\delta}$. Rearranging and solving for $C_{i>1}$ yields that this condition holds if $C_{i>1} > \frac{\delta}{1+2\delta}$. Hence after a rejection by 2 or 3 the proposed strategies are in equilibrium. This suggests that 1 has to offer at least $\frac{\delta(1-C_1)}{1+\delta}$ to 2 and 3, which exceeds $C_{i>1}$ if $\frac{1-C_1}{2} \geq C_{i>1} > \frac{\delta}{1+2\delta}$, which establishes the equilibrium. *Q.E.D.*

Lemma 4 *If* $C_1 > \frac{\delta}{1+2\delta}$ *and* $\frac{\delta}{1+2\delta} \geq C_{i>1} > \frac{\delta(1-C_1)}{1+\delta}$ *then 1 always proposes* $x_1^1 = 1 - \sum C_{i>1}$, $x_{i>1}^1 = C_{i>1}$, *and accepts all offers* $x_1^1 \geq C_1$. *All other players* $i > 1$ *accept* $x_{i>1} \geq C_{i>1}$ *and always propose* $x_1^i = C_1$, $x_i^i = \frac{1-C_1}{1+\delta}$ *and* $x_j^i = \frac{\delta(1-C_1)}{1+\delta}$ *for* $j \neq 1, i$.

[26] Incidentially, this condition also implies that $\sum_{i \in N} C_i \leq 1$ as long as $C_1 \leq 1$.

Proof: From the proof of lemma 3 it follows that players 2 and 3 after a rejected offer need to offer 1 more than C_1 for 1 to accept the offer. Given that 1 can guarantee himself $1 - \sum C_{i>1}$ after a rejection, it will only accept $x_1 \geq \delta(1 - \sum C_{i>1})$. Thus, players 2 and 3, if rejecting an offer by 1 bargain over $1 - \delta(1 - \sum C_{i>1})$ thus leading to offers $x_i^i = \frac{1-\delta(1-\sum C_{i>1})}{1+\delta}$ and $x_j^i = \frac{\delta(1-\delta(1-\sum C_{i>1}))}{1+\delta}$. Thus, in equilibrium $x_{i>1}^1 \geq \frac{\delta(1-\delta(1-\sum C_{i>1}))}{1+\delta}$, which when solving for $C_{i>1}$ yields the condition that $\frac{\delta}{1+2\delta} \geq C_{i>1}$. This establishes the equilibrium. *Q.E.D.*

Lemma 5 *If* $\frac{\delta}{1+2\delta} > C_1$ *and* $\frac{1-C_1}{2} \geq C_{i>1} > \frac{\delta}{1+2\delta}$ *then 1 always proposes* $x_1^1 = \frac{1-\delta+2\delta C_1}{1+\delta}$, $x_{i>1}^1 = \frac{\delta(1-C_1)}{1+\delta}$, *and accepts all offers* $x_1^1 \geq C_1$. *All other players* $i > 1$ *accept* $x_{i>1} \geq C_{i>1}$ *and always propose* $x_1^i = C_1$, $x_i^i = \frac{1-C_1}{1+\delta}$ *and* $x_j^i = \frac{\delta(1-C_1)}{1+\delta}$ *for* $j \neq 1, i$.

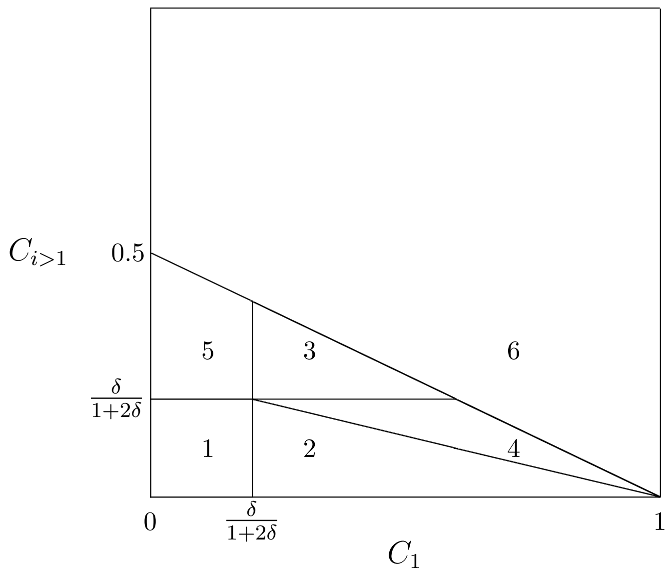
Proof: Given that the domestic constraints of players 2 and 3 exceed the payoff these players would get in the absence of ratification constraints, 1 needs to offer at least $x_{i>1}^1 = C_{i>1}$ leaving at most $1 - \sum C_{i>1}$ for herself. However, from the proof of lemma 4 it follows that the conditions on the ratification constraints are such, that 2 and 3 would reject these offers and make a counter-offer of $x_1^i = C_1$ From this it follows, that 2 and 3 will share the remaining part of the pie, which results in the offers mentioned in the lemma and establishes the equilibrium. *Q.E.D.*

Lemma 6 *If* $\sum_{i \in N} C_i > 1$ *no unique equilibrium exists.*

Proof: Given that $\sum_{i \in N} C_i > 1$ no negotiation result is ratifyable at the domestic level. Thus, whatever strategies of offering divisions of the pie and accepting and rejecting offers, the players' payoff will be equal to zero. *Q.E.D.*

Figure 3 illustrates what combinations of domestic ratification constraints correspond to which lemma.

Figure 3: Equilibria as a function of domestic ratification constraints: Lemmas



Proof of proposition 1: Lemmas 1-6 cover all combinations of domestic ratification constraints under the assumptions imposed in the main text. Thus, jointly they prove proposition 1.

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