

A Learning Model of Agreement Flexibility

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ABSTRACT:

When nations are unsure about the distributional effects of their collaboration. They may do this by include the appropriate level of flexibility in their agreements. In this chapter, we provide a formal model that allows for the renegotiation of an unclear agreement in order to take fresh knowledge into account. The parties will resolve this issue as they acquire experience with the agreement and it relates to how the profits under the agreement will be divided. States are more likely to desire to shorten the agreement's term and include renegotiation the more uncertain the pact is. Noise, or fluctuation in results not coming from the agreement, works against renegotiation. Because it gets harder to see how an agreement is truly operating the more noise there is, including limited term and renegotiation clauses loses value. In a thorough case study show that the kind of uncertainty in my model matches the uncertainty felt by the Nuclear Non-Proliferation Treaty parties, who chose the course of action my model suggests.

KEYWORDS:

Agreements, Nuclear, Parties, Renegotiation, States, Treaty.

I. INTRODUCTION

Existing international accords are evidence of governments' desire and capacity to work together despite the situation of international anarchy. Understanding how governments manage to bring about the formal collaboration contained in international accords is of theoretical and practical significance given the challenges of cooperation under anarchy outlined in contemporary international relations research. By altering agreements' provisions for length and renegotiation, states may make them more appealing in theory and strong in reality. These clauses assist nations in taking into consideration the ambiguous economic, political, and technical environments that govern the formation and enforcement of agreements. However, the length and renegotiation concerns have received remarkably little attention in the political science literature on international relations. They have received relatively little attention from empirical perspectives and have been completely ignored in theoretical studies of international cooperation. There is really no study that seeks to explain or even account for the observed patterns and variety in agreement length and renegotiation, despite the fact that certain discussions of specific agreements address the concerns of duration and renegotiation for the agreement in question. In essence, I'm trying to apply theory to international law, namely formal international relations theory. I contend that nations pick certain length and renegotiation provisions as a result of the international environment's uncertainty, which may take on various shapes and intensities depending on the context of an issue. These clauses in turn influence whether governments sign international accords and whether they follow through on them [1], [2].

The notional (i.e., negotiated) duration of international agreements is a topic for the first time in theoretical writing in this research. Since agreements are essentially contracts between states, with the crucial distinction that there is no external authority available to enforce them, my theoretical work uses the economic theory of contracts as its starting point. The key trade-off between the benefit of spreading the (assumed) fixed cost of contracting over additional periods and the loss of continuing in a suboptimal contract for additional periods is formalized in the economic literature on contract duration. This fundamental understanding is useful, but it falls short of explaining the variety of length and renegotiation clauses seen in even the limited group of agreements I take into consideration here. My hypothesis pinpoints important variables influencing the length and renegotiation options in these agreements. The degree of agreement uncertainty (formally, the variance of the distribution of gains from an agreement) and the degree of environmental noise (formally, the variance of confounding variables whose effect on outcomes may be confused with that of an agreement) are the two most crucial variables. States are more likely to desire to shorten the agreement's term and include renegotiation the more uncertain the pact is. Noise is one of the obstacles to negotiations. It gets harder to see how an agreement is truly operating the more noise there is, thus including limited term and renegotiation clauses loses value [3], [4].

The model offers a context for talking about the Nuclear Non-Proliferation Treaty (NPT). I outline the key components of the agreement and the information that is now accessible on how the parties themselves defined the length and renegotiation problems during the agreement's negotiation. The rest of this article is divided into the following sections. In the second part, I provide a formal model that allows for the renegotiation of an unclear agreement in order to take new knowledge into account. The parties will resolve this issue as they acquire experience with the agreement and it relates to how the profits under the agreement will be divided. This kind of uncertainty is comparable to the uncertainty that the parties to the international agreement, which I go into great length about in the third section, face. I provide conclusions in the fifth part [5], [6].

Model: learning about the workings of an agreement

An agreement is compared to an experiential good in this paradigm, where utilizing it is the only way to fully understand its impacts. The parties come to understand the true distribution of benefits produced by the agreement with increasing precision over time by observing the results obtained under the agreement and making an effort to differentiate the once-and-for-all effects of the agreement from the typical period-to-period fluctuation in outcomes. How can states utilize the information they have about how the profits from the agreement are distributed? They might decide to make their first agreement's term limited and then "re" negotiate a new agreement after the previous one expires. If they do, they may adjust how the advantages are distributed in the renegotiated agreement using the knowledge they have gathered from their experiences operating under the agreement. This planned renegotiation and realignment lowers ex ante uncertainty and, as a result, increases the predicted usefulness of the parties under certain circumstances (detailed below) [7], [8].

To put it another way, careful consideration of the length and renegotiation provisions enables the parties to reach effective agreements (agreements that enhance the amount of the pie accessible to the parties) when distributional issues could otherwise prevent such agreements from being reached about course, nations can also be unsure about the magnitude of possible profits from an agreement. I just consider distributional uncertainty in this study. My defense has both theoretical and empirical support. Probabilistically, distributional uncertainty is at least as pervasive as uncertainty over the absolute magnitude of profits. However, if extreme uncertainty prevented any kind of agreement from occurring, it would be intriguing from the perspective of cooperative theory. Are there many instances, in other words, where there was significant doubt about whether an agreement would result in a net benefit and where, as a result, provisions for a temporary agreement and renegotiation made collaboration possible? The environment is the only area of concern where complete uncertainty may take on this function. But distribution issues also loom big in that area of concern. In any case, the potentially more intriguing and at least as relevant distribution topic [9], [10].

Assumptions

The model is predicated on the following presumptions:

1. States have a discount factor that is not zero because they are concerned about the future.
2. States are fearful of danger.
3. The status of the globe in the future is unknown.
4. Because it is so expensive to make an agreement entirely dependent, parties almost never choose to do so.
5. It costs money to negotiate (and renegotiate) contracts.
6. Reneging on agreements has a price.

Think about the part each assumption plays. States would not bother to sign accords if they did not care about the future. States would always reach indefinite agreements if they were not risk adverse in order to avoid incurring renegotiation fees, and they would not worry ex ante how much the distribution of rewards could deviate from the initial agreement. If there were no uncertainty about how the world would develop in the future, there would be no new information to take into account during renegotiation, and all contracts would be indefinite to save money on the expense of renegotiation. States would make agreements fully dependent on the actual situation of the world if they could, saving money on renegotiation fees by doing away with the necessity for it. All agreements would be short-lived if negotiation and renegotiation were free. States would do this whenever new information became available. If reneging were free, nations would do it often (as long as the cost of renegotiation was not prohibitive) and would be less inclined to enact accords with fixed durations. In place of it, they would utilize reneging as a kind of contingent renegotiation in contracts of indefinite term.

II. DISCUSSION

Fundamentals of the Model

The arrangement will potentially include two parties. Each side receives a result every time if there is no consensus. Depending on the specific situation, this result may stand in for the gross national product (GNP) or a gauge of military security. Every time, each party has an expectation for what its results will be. For instance, state 1 anticipates its GNP to reach \$1 trillion. The party's preferred result is this. Of fact, the real result will seldom, if ever, match the base perfectly. The final result will be the base plus or minus a certain amount. For instance, the real GNP of state 1 may be \$0.9 trillion or \$1.1 trillion. I call this unexpected change the result shock or noise. I suppose the deal produces a total benefit that is known when the deal is finalized. The manner in which this gain will really benefit the two parties is unknown at that point. I rely on the parties' ability to specify the anticipated value of the two shares in the first contract. The first agreement's allocation of the gain reflects the relative negotiating strength of the two sides. Consider the scenario where states 1 and 2 enter into a joint research venture that would net them a combined \$25 billion in profit and have equal negotiating power. What cannot be predicted in advance is precisely how the venture's technology would help the economies of the two states' industries. Each state makes an equal initial investment, and the parties agree that the projected benefit will be \$12.5 billion for each state. Sorting out the impacts of the agreement from other random variations in outcomes is the main challenge confronting the parties to an agreement in this paradigm. Consider the scenario where state 1's GNP is \$1.05 trillion after the joint venture is finished. How can state 1 determine how much (if any) of the \$50 billion rise in GNP is attributable to the joint venture and how much is attributable to an agricultural boom brought on by a fortunate growing season? It cannot know precisely, but it can learn over time, is the response. The nations must decide between a deal with an infinite length and one with a limited term followed by a deal with an indefinite duration. In the straightforward two-period example I formally analyze, the option is between two one-period agreements with renegotiation in between to realign the distribution of profits, or one two-period agreement with no renegotiation.

When a finite-duration agreement expires, renegotiation takes happen. As a result, the no-agreement result is the worst conclusion for both sides in the renegotiation. The parties are essentially in the same position during the renegotiation as they were during the first discussion, with the exception that they have gained some knowledge about the realized distribution of profits from the agreement in the interval. No more negotiations are held once the parties decide on an agreement with an indefinite term. If and when the parties rewrite the agreement, I imagine they will include an adjustment factor to ensure that the projected benefit for each party will remain the same as it was in the initial agreement. This adjustment factor accounts for the knowledge learned on the distribution of profits' realized value throughout the time since the initial agreement was reached. For instance, imagine that states 1 and 2 find out after a number of years that state 1's sector is really benefiting from the research endeavor substantially more than state 2's business. When the parties renegotiate at the conclusion of an initial agreement, they will change the investment schedule such that state 1 invests more and state 2 invests less, if the parties first agreed to a finite-duration agreement followed by renegotiation. This modification would approximately align the actual distribution of profits with what was anticipated when the original agreement was reached. Another way to express that the relative negotiating strength of the two sides is assumed to stay consistent over time is to assume that the same projected division of profits is the outcome of every renegotiation.

Generally speaking, we would anticipate that as the two states' economic fortunes evolve, so too would their respective negotiating positions. If and when an agreement is renegotiated, we could assume in particular that the realized allocation of profits under the agreement will alter the negotiating leverage of the two states. The states would therefore agree to a new anticipated division of profits, which would be more advantageous to the party whose actual benefit surpassed its original expected gain, rather than going back to the previous expected division of gains in the renegotiated agreement. The variance of the outcomes contingent on renegotiation rises when bargaining power changes are included into the model in this way because the renegotiation no longer attempts to fully reverse the gap between the predicted and actual gain. This broadens the range of situations in which risk-averse governments might decide against renegotiation.

For four reasons, I do not include the impacts of shifting bargaining power in the model. First and foremost, I chose to concentrate only on the length issue since it has received zero attention in the literature to far, and I make the other context factors (such as the bargaining component) as simple as feasible. Second, adjusting for shifts in bargaining power has no impact on the comparable statistics that will be discussed later. The cutoff point at which parties convert from one kind of agreement to another is moved, but the overall comparative static findings stay the same. Third, in certain situations, the resources impacted by the agreement in issue are negligible in terms of GNP, making it unlikely that the realized distribution of profits under the agreement would

have much of an impact on the parties' bargaining position. Fourth, the agreement shocks will often average out for pairs of states that are parties to many agreements, maintaining a relatively constant level of relative bargaining strength.

There is no external body that can enforce agreements when it comes to international relations. States may thus break their promises. According to this approach, breaking the agreement is the same as renegeing. I presume that renegeing parties incur expenses. I also presume that when the previous agreement is abandoned, the parties may discuss a new one. Since minimizing the ex ante variance of the outcome resulting from agreement uncertainty is valuable to them in comparison to the cost of renegotiation, the primary premise of my model is that parties would include planned renegotiation into international agreements. By inserting an adjustment factor into the agreement, the distribution of profits at the time of the renegotiation is realigned to be more similar to the initial split, hence reducing the ex ante variance. It should be noted that the parties involved in the model choose the adjustment factor; it is not a model parameter for which static comparison results can be generated. To put it another way, it is an endogenous variable as opposed to an external one.

Treaty on nuclear non-proliferation

These points are made through this case study. It first demonstrates the empirical significance of this length and renegotiation provisional structure. One of the most significant international accords of our century is undoubtedly the NPT. Any examination of its achievements and failures must take into account its terms, and comprehending them also helps future agreements be designed effectively. At a fundamental level, the case also shows how important length and renegotiation clauses are to the parties to significant international accords. They debate them extensively during the negotiation process, they implicitly (and sometimes overtly) understand the trade-off that my model captures, and they make decisions on these provisions in a manner that my model demonstrates to be rational.

Third, the case study offers an illustration of how to operationalize the important model variables. The model's variables are more challenging to operationalize than, say, incomes are for an economist. This is true of many variables that political scientists normally analyze. In this scenario, operationalizing the profits from the agreement's distribution and the original ambiguity around it are given special consideration. Fourth, the case study shows how effective a framework my approach offers for arranging and systematizing discussions on the length and renegotiation clauses of international agreements. It directs the investigator in sorting through what is, in the case of the NPT, a very huge number of material by identifying the important factors that influence these provisions. It also identifies significant points of disagreement between the parties and demonstrates how the issues they encountered were resolved by the solutions they selected.

1. Background and Substance of the Agreement

The NPT was signed in 1968 and put into effect in 1970 for a 25-year term. The agreement's participants met again in 1995 and resolved to keep it in effect indefinitely. The early Cold War period nuclear-weapon states (NWS) feared that the spread of nuclear weapons to a sizable number of other nations would be hazardous and unstable, which led to the creation of the NPT. According to Thomas Graham, "In 1968, the United States Atomic Energy Commission predicted a world with up to twenty-eight nuclear powers. It is impossible to overestimate the risk that such a world would provide. He adds, quoting a Swiss official, "Between two nuclear powers it is a game of chess, among four it is a game of bridge, among a dozen it would be a game of poker, roulette, or any of those games controlled by chance." In response to this worry, the United States, the Soviet Union, and a number of other nations decided to work toward creating a treaty that forbade the spread of nuclear weapons.

The following are the treaty's principal provisions: Article 1 forbids the transfer of nuclear explosives to any recipient, whether or not that recipient is a signatory to the NPT, as well as any other assistance to a non-nuclear-weapon state (NNWS) in the development of nuclear explosives. The NNWS is required by Article 2 not to procure or produce nuclear explosive devices. The International Atomic Energy Association (IAEA) full-scope safeguards agreements must be negotiated by the parties individually or jointly, according to Article 3. The NNWS are reassured by Articles 4 and 5 that they will be allowed to enjoy nuclear energy and nuclear explosions without hindrance, and the NWS are required to provide the NNWS both material and technical support. Article 6 asks that the nuclear-armed states make progress in halting the arms race.

2. Duration and Renegotiation: The Role of Uncertainty

There was a lot of discussion over how the NPT's length and renegotiation provisions should be determined. From 1962 until 1968, the treaty's discussions were ongoing. The original treaty drafters, the United States and the Soviet Union, continued to push for a treaty with an indefinite length as late as 1967, but the Germans and the Italians emphasized the difficulties of adopting such a duration. Many NNWS paralleled Germany and Italy in being reluctant to tie their hands for an indefinite amount of time in an uncertain world due to their doubt over the distribution of rewards that would arise from the NPT.

First, there were questions over the treaty's effects on security. Regarding the effort that the NWS would make towards nuclear disarmament, the NNWS sensed a great deal of doubt. This and a contradiction found in the NPT's wording are closely linked. The prolonged deterrence the NWS offers to its NNWS allies would lose credibility if they really reduced their nuclear weapons as required by Article 6 and these governments would be more motivated to join the nuclear club. The non-nuclear NATO nations, according to George Bunn and Charles N. Van Doren, "spoke out against an NPT of longer duration than their alliances might turn out to be" because they "were most advanced in civilian nuclear technology and that relied on an alliance with the United States to deter a possible attack by the Soviet Union." Jenson conducted a content analysis of statements spoken during a 1968 UN General Assembly discussion on the proposed treaty in an attempt to identify and classify concerns. According to him, 62% of the speakers expressed worry about security assurances and questioned how NNWS would be safeguarded under the NPT.

Concerns concerning which nations would ultimately join the regime focused on another area of ambiguity about the allocation (and magnitude) of security gains under the NPT. With more nations joining, the total amount of profits rises, and the distribution of gains is significantly influenced by the signatories' geographic distribution. Second, the NNWS were worried about how the NPT might affect their technical advancement and economic wealth. They were concerned that the deal may limit their capacity to employ nuclear energy for peaceful purposes. A distinction between the use of nuclear energy for peaceful, non-military reasons and the use of nuclear energy for military objectives would need to be made in the treaty. There was a lot of skepticism among the NNWS over the feasibility of drawing this line and its potential distributional repercussions. Foreign Minister Brandt said that his "government and others are also seeking to ensure that the nonproliferation treaty does not further widen the already existing technological gap between the nuclear powers and the non-nuclear countries" in a speech to the Bundestag in 1967.

Many prospective NPT members were also concerned about how expensive the IAEA surveillance would end up becoming from an economic standpoint. According to George Quester, the Japanese nuclear power sector has expressed worries about the potential expenses of the intensive on-site monitoring mandated by the NPT, including the potential for plant shutdowns to enable for the verification of nuclear fuel information. The IAEA inspectorate may become imperiously bureaucratic, demanding greater access even where no increase at all in safeguards reliability is thereby achieved, due to personal vanity, institutional imperialism, or excessive legalism, according to Quester, who also notes that many states (including Japan) were concerned about this. Given worries that the IAEA would be controlled by those NWS whose specialists did the inspections, such states may alter the inspection costs to fit their political and economic objectives, these worries influence both the distribution and degree of gains.

The NPT's inability to adequately resolve the interaction between NNWS not party to the treaty who acquire nuclear technology and NNWS parties to the treaty who provide nuclear technology was another source of doubt about the allocation of economic rewards. The NNWS that signed the pact were concerned that NNWS who were not parties would be able to acquire nuclear technology with fewer limitations than signatory NNWS. Another unknown was the probable demise of the commercial nuclear business in the United States. Although this reduction was anticipated, as noted by Roger K. Smith, it was impossible to predict in advance when and who the new suppliers would be. States on both sides of the market for peaceful nuclear technology would be impacted by these shifts.

Third, there were questions over the political advantages and drawbacks of such an arrangement. They weren't sure whether the NPT would provide the NWS political clout that they could use to their advantage since it would make the NNWS importers of peaceful nuclear technology. Concerns were raised concerning gasoline supply in a similar manner. Furthermore, it was unclear how treaty observance would affect the NNWS's political influence and reputation. Prestige may result from acquiring nuclear weapons, or it may result from a state's readiness to ratify the pact. "If there is universal approval of the NPT, the few governments refusing to join are going to be

just that much more condemned," says Lloyd Jensen. How widely accepted the pact (and the norm it symbolized) would be would only become clear with time.

3. Duration and Renegotiation: The Compromise

In response to Article 7 of the draft treaty, which called for a treaty of unlimited duration, the Italian representative to the negotiating committee, Roberto Caracciolo, suggested a "certain flexibility in the provisions of the treaty relating to duration, amendments, and the right of withdrawal." He claimed that "it is not the lot of man to pledge eternity." Furthermore, there are very few noninstitutional treaties that have even managed to endure the ups and downs of one generation, much less attained immortality, when we look back over our thousands of years of history. Since this idea is so far removed from reality, we are concerned that affirming it might give the pact a weak rather than a strong component.³⁵ A Swiss aide-memoire responded to the same article by saying that "to subscribe to such a commitment seems hardly conceivable in a field where development is as rapid and unpredictable as that of nuclear science and its technical, economic, political, and military implications."

Therefore, it would be desirable for the treaty to be signed for a certain amount of time, after which a review conference would determine whether to extend it. The governments who wanted an indefinite term made the case that if the parties were aware that the pact would expire on a certain date in the future, they would feel pressure to acquire nuclear weapons by that date, weakening the treaty. Additionally, they claimed that it was crucial to ensure the pact a long enough lifespan so that it might serve as the foundation for future nuclear disarmament initiatives.

When Caracciolo proposed the following to replace the draft treaty's "unlimited duration" clause, the parties took a step toward reaching a compromise. "This treaty shall have a duration of X years and shall be renewed automatically for any party which shall have not given, six months prior to the date of expiry of the treaty, notice of its intention to cease to be a party to the treaty." He said, "The suggested modification might be seen as a workable middle ground between the concepts of limitless length and fixed term. It states that the pact will always be in effect for those who do not reject it, while also allowing individuals who are dissatisfied with how it is being implemented to withdraw after a certain period of time. The Italian amendment was changed to read, "The present Treaty shall have a duration of X years," a month later. For those countries that have not given notice of their decision to withdraw within six months, it will automatically be renewed for periods equivalent to its original lifespan.

The Soviet and American desires for an indefinite duration agreement and the preferences of the NNWS for a limited learning period during which they could assess whether the agreement as it actually operated was in their best interests were ultimately reconciled. "The Italian proposal for a fixed duration, including consecutive automatic renewals, was the most precise and the most essential before the American and Soviet co-chairmen when they developed the current wording of Article 10.2," Bunn and Van Doren said. The Co-Chairmen's draft of the current Article 10.2 proposed for a meeting to determine whether to extend the Treaty "indefinitely" or for an extra set period (or periods) after 25 years. Thus, it embraced the fundamental Italian notion of an initial period of years that would conclude with a chance for renewal. The drafters added additional alternatives, such as indefinite renewal and one defined time, to the Italian option for an indefinite number of successive renewal periods.

4. Resolving the Uncertainty through Learning

Economic, political, and security results have unclear origins. For instance, the impact of a state's choice not to create its own nuclear sector could not be immediately obvious if it has a low growth rate in a particular year. In the late 1960s and early 1970s, the costs and advantages of using nuclear energy as a source of electricity were not quite evident. It would thus take some time for nations to separate the NPT's impacts on their wellbeing from those of other causes. Or, to put it another way, there is a lot of noise. If my model holds true in this situation, there should be proof that the states involved started learning processes to aid them in differentiating the importance of the agreement shock from the background noise. The NPT context is not an exception to the rule that the actual world seldom has two phases. Both the occurrence and the time of renegotiation are addressed by the multiperiod variation of hypothesis 2.

Many additional parts of the ambiguity regarding the distribution of benefits from the NPT were mostly or entirely addressed during the first trial phase, in addition to the worries that were a prominent factor during the review conferences: The NPT significantly curbed the spread of nuclear weapons in terms of security compared to what would have most likely happened otherwise. The NPT's membership grew over the trial period to the

point where it was practically universal. Concerns that the NPT will obstruct European integration were unfounded in terms of the distribution of political advantages (and losses). Germany's GNP turned out to be more important for European unity than Britain's bombs. Time also put to rest Japan's concerns about its capacity to respond to a significant U.S. withdrawal from Asia.

The 163 parties to the treaty met in New York in 1995 after four review conferences to discuss whether the NPT would remain in effect forever or be extended for an additional defined time or periods. The majority of the parties seemed to have supported extension before to the meeting, according to interviews with conference attendees, which by itself is strong evidence of learning. The main point of contention was whether the extension would last indefinitely or for a string of 25-year increments. In the end, the NPT was extended by agreement indefinitely. According to Panofsky and Bunn, "possession of nuclear weapons and permanent membership in the UN Security council remain identical." The NWS had achieved what they anticipated in terms of keeping their power and influence, while the NNWS had discovered how the NPT really benefited them.

III. CONCLUSION

A trade-off between flexibility and limitation is necessary for pledges to be credible in the face of uncertainty. Some would counter that empirically, we do not see many breaches of international agreements, and infer that any term and renegotiation provisions would work in a particular situation. This is obviously untrue according to my model. I determine the utility that would have been lost if the best provisions hadn't been chosen. When there are minor deviations, the unrealized potential rewards from the agreement serve as the lost utility. Large deviations manifest themselves as renegeing on the deal or failing to start it at all. The fact that real agreements' term and renegotiation clauses have been designed in a manner that minimizes this expensive behavior is one of the reasons we do not see a lot of renegeing. For instance, agreements in regions subject to such disruptions will typically be of short duration, short enough that states experiencing sudden losses will stay with the agreement until it is renegotiated rather than breaking it. This is why we do not observe agreements failing because of uncontrollable economic circumstances. Additionally, my research responds to some recent work in international relations that uses game theory. James D. Fearon draws attention to a flaw in existing conceptions of international cooperation that concentrate too much emphasis on the implementation of treaties while disregarding the negotiations that lead to them in the first place. Fearon's approach incorporates the collaboration difficulty with negotiating the conditions of an agreement. This formulation shows that the same shadow of the future that permits self-enforcing agreements also increases the distributional implications of the choice of the initial equilibrium, which makes reaching an agreement more challenging.

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