Uncertainty and Ratification Failure

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Abstract

I study a game where two agents bargain on an agreement to replace the status quo. For their agreement to come into effect, they need the approval of a third agent. The preferences of this third agent is private information, but there is communication among agents. I study this game in the context of international agreements to provide an explanation for involuntary ratification failures. I show that under certain assumptions, the informational deficiency is incurable due to incentives to misrepresent preferences, and that a parliament whose majority is more hawkish than their executive prefers the executive to be risk averse.

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1 Introduction

On March 1st, 2003, the Turkish parliament voted to turn down a military cooperation agreement with the United States. The agreement would have enabled the US military to deploy 62000 American troops through southeastern Turkey to open a northern front against Saddam Hussein (Yetkin 2004; Lee 2003). But, it turned out that the Turkish executives brought home a deal that was not good enough for the majority in the parliament.

It included, among other things, too many American troops, too few guarantees about the future status of Iraqi Kurds, too little financial compensation for expected economic losses...(Pan 2003). The ratification failure aroused anger on the U.S. side. It caused the Bush administration to alter its war plans significantly at the last minute and according to some commentators, made the whole campaign a lot more costly (Pan 2003). On the Turkish side, the executive branch of the government was trying to minimize the damage by entertaining talks of resubmitting the deal to the parliament. In any case, the damage was done and nobody wanted to be in the shoes of the Turkish prime minister then.

Interestingly, this was not the first time that an agreement between the Turkish and American administrations failed to attract legislative support. The very first agreement signed between the two states suffered the same fate as well. On August 6, 1923, the American and Turkish representatives at the Lausanne Conference in Switzerland signed a Treaty of Amity and Commerce to establish normal diplomatic and commercial relations between the United States and the newly founded Turkish Republic. Unfortunately, the treaty failed ratification in the Senate. A majority of senators thought the State Department had failed to get enough concessions from the Turkish government, especially in terms of allowances for American intervention for the protection of the Christian minority in Turkey (Vander Lippe 1993).

Aside from both being interesting anecdotes from the history of Turkish-American relations, these two ratification failures share another interesting feature: they were both "involuntary defections" (Putnam 1988). In other words, the executives who signed these agreements had to involuntarily and unexpectedly defect from the agreements when their parliaments failed to ratify them. The failure of the 1923 agreement was unexpected because no one thought a simple amity treaty with a newly formed republic 10000 miles away from the United States to be an issue of contention in the Senate. The second failure 80 years later was even more unexpected (Bölükbaşı 2008; Robins 2003; Rubin 2005; Kapsis 2006; Hale 2007; Yetkin 2004; Mango 2003). So much so that Turkish ports had already been prepared to receive massive military deployments, and American military ships carrying 35000 American soldiers were already waiting for deployment off the Eastern Mediterranean coasts of Turkey (Yetkin 2004).[1]

History offers us other examples of involuntary defections as well. The Danish prime minister Poul Schlüter was not expecting the Single European Act to fail parliamentary ratification. But it did. And when the Danish parliament rejected the Act in 1986, he had to call for a referendum to save his minority government from falling (Worre 1988). In 1954, the French executives risked a similar humiliation but they maneuvered to withdraw the European Defence Community Treaty from the parliamentary agenda when it became obvious that it was destined for a ratification failure (Miller and Rosendorf 1997a; Van der Veen 2009). Similarly, the Clinton administration tried, and failed, to postpone the Senate ratification of the Nuclear Weapons Comprehensive Test Ban Treaty in 1999, when it became clear during the Committee hearings that the treaty was short of the votes needed for approval. And in a most dramatic case, President Wilson believed that the Senate was bound to ratify the Versailles Treaty because "he did not believe the Senate would dare incur the odium of committing so dastardly a crime against humanity" (Bailey 1947). And when he realized how mistaken he had been, he went on a 8000 mile tour of the country and worked so hard that he suffered a stroke trying to convince the public and, through the public, the isolationist senators who found the Versailles Treaty too interventionist, that the treaty was in the best interests of the American nation (Bailey 1947). Despite all his efforts, the Senate rejected the Versailles Treaty.

Involuntary defections are puzzling events. They are puzzling because the executive negotiating the agreement in the first place is expected to know and represent the preferences of her legislature, and bring home an agreement that would be ratified with no problem. Or conversely, the legislature is expected to exercise enough influence over the executive to eliminate the possibility that she would say yes to a domestically unpalatable deal. It is also politically damaging for a political leader to present to its parliament an international agreement only to find that the majority does not find it in the best interest of the nation.

[1] Shortly before the ratification the Turkish parliament passed a resolution to allow the arrival of American advance guards to modernize Turkish airports and seaports in preparation for massive military deployments. The head of the Turkish negotiating team, Ambassador Deniz Bölükbaşı, who later collected his memoirs in a book (Bölükbaşı 2008), explains in detail how the passage of this first resolution on February 6, 2003, misled both sides by creating false expectations.

But the failures I have discussed so far clearly demonstrate that executives may indeed lack information about domestic preferences. What is even more interesting is that executives can have these deficiencies despite all the communication that goes on between them and their legislatures.

In this paper, I develop and study a formal model of ratification to further our understanding of involuntary defections. I start by arguing that an executive may suffer from uncertainty about domestic preferences, and I examine the conditions under which her uncertainty remains unresolved even in the presence of communication, leading to a ratification failure.[2] Having said that, I must emphasize that my model does not predict ratification failures in all cases where the executive lacks information about domestic preferences. It only points out the possibility and demonstrates that communication does not reduce the probability of such an outcome. In that sense, the model is applicable to all international negotiations conducted by executives with less than perfect information about domestic preferences. Evans (1993) argues that such circumstances are more common than expected:

> "Our mistake was not in overestimating the importance of information: it was in overestimating the informational consequences of national boundaries. Chief of governments' estimates of what was ratifiable in their own domestic politics were often wrong ... the quality of information within domestic boundaries was lower than we had expected. Estimates from the other side of the international table are not always accurate but there is no evidence in our cases that negotiators' estimates about their own domestic tables are substantially more accurate."

Given that the domestic executive is to work under uncertainty, her attitude towards risk becomes important. In this paper, I also inquire whether leaders that differ in terms of their

[2] The informational deficiency might stem from different reasons. It might, for example, be that the executive is imperfectly informed about the costs alternative agreements will impose on the constituencies of the legislators while legislators are perfectly informed about them. If a legislator's stance towards alternative agreements depends on the costs the agreement imposes on his constituency then uncertainty about these costs translates into uncertainty about legislative preferences. I thank the associate editor for bringing to my attention that President Clinton might have suffered such an informational deficiency while signing the Kyoto Protocol, and that he might have underestimated the burden that would be imposed on America's businesses and taxpayers in complying with the agreement.

attitudes towards risk fare differently in managing international negotiations under domestic uncertainty. The signing of an international agreement that gets the national stamp of approval is a political success for a leader. Thus, this paper examines whether some leaders, due to their attitudes towards risk, are more likely to be successful than others in conducting foreign policy when they have to work with limited information about domestic preferences. It is a well-established result in the bargaining literature that there is an inverse relation between the degree of risk aversion of a player and her gains from a bargain (see for example, Kihlstrom, Roth, and Schmeidler 1981).[3] In our context, this negative relation between risk aversion and bargaining gains implies that a more risk averse executive is expected to do worse at the international table. Thus, in a scenario where she had full information about domestic politics, a risk averse executive would not be an ideal representative of the national interest. Interestingly, I find that an opposite result holds under incomplete information. A legislature whose majority is more hawkish than the executive towards cooperation with the foreign country prefers the executive to be risk averse rather than risk neutral. Moreover, the more hawkish the legislators the more risk averse they prefer the executive to be.

There are similar *"bargaining subject to veto by a third agent"* situations in various other economic and political areas, which provide further applicability for my model. One such area is domestic veto-bargaining in presidential bicameral systems where the president holds a veto over proposed legislation by the chambers. To adopt my model one needs only to think of the bargainers as legislative chambers bargaining on an alternative policy to replace the status quo, and the ratifier as the president. There is an extensively rich literature on veto bargaining between a president and her legislature (for a detailed review of this literature please see Cameron and McCarty 2004, and Cameron 2000). And the literature

[3] For example, previous research has shown that more risk averse workers are at a disadvantage when bargaining over wages (Pissarides 1974; Feinberg, 1977). Empirical support for this result often has been found in the observed wage differentials between men and women. While a large portion of this wage gap can be explained by factors that are thought to be correlated with productivity, a substantial portion of the wage gap remains unexplained (Bayard et.al. 1999; Light and Ureta 1995; Polachek and Kim 1994; Becker and Lindsay 1995), and researchers tie this unexplained gap to the differences between men and women in terms of their risk aversion (Vesterlund 1997) as women are found to be more risk averse than men (Eckel and Grossman 2008; Jianakoplos and Bernasek 1996).

contains some very influential works which have argued before that proposers of legislation may lack information about presidential preferences, and that this deficiency might explain presidential vetoes (Cameron 2000; McCarty 1997; Matthews 1989). Interestingly, most veto-bargaining studies treat the legislature as unicameral. For their results to be applicable to bicameral systems it must either be that (i) the chambers are congruent in terms of their policy preferences, or that (ii) one of them lacks enough leverage to keep the other from acting unilaterally. However, Heller (2007) argues that congruence should be rare as it is highly unlikely to have different chambers with identical preferences as long as legislative chambers are made up of different sets of individuals (for a detailed survey of the literature on bicameralism please see Heller 2007). Also, condition (ii) fails as long as each chamber has at the very least a veto over policy. Moreover, Tsebelis and Money (1997) show that even the ability to delay legislation should yield tangible policy influence. My model offers a way to incorporate bicameralism into studies of veto-bargaining in domestic policy making. It acknowledges that in bicameral systems the proposed legislation is itself an outcome of an initial intercameral bargain. My results then point to the possibility of presidential vetoes in cases where the chambers have uncertainty about policy preferences of the president. More importantly, we know that the possibility cannot be abated through communication between the chambers and the president.

My analysis is also applicable to delegated bargaining situations in which an agent conducts a bargain on behalf of a principal. Attorneys, for example, conduct pre-trial bargains on behalf of their clients who reserve the right to reject the outcome of the bargain. Litigation models usually analyze the litigation process as a two-player strategic game of incomplete information between the plaintiff and the defendant, and leave out attorneys as players because they assume attorneys and their clients have the same objectives. However, Watts (1994) argues that "an attorney paid by contingency fee may want to settle a case, even when it is not advantageous to her client, in order to avoid the cost of preparing for trial". And plaintiff lawyers are mostly paid by contingency contracts whereas defendant lawyers are typically paid at hourly rates (Trubek et al. 1983; Cai 2000). Hence, pre-trial negotiations can better be depicted as a bargain between the plaintiff's attorney and the defendant (or his attorney), a bargain whose outcome is subject to approval by the plaintiff.

Similarly, company executives conduct merger and acquisition bargains on behalf of their shareholders who, by law, have to approve the final deal. Stories of failed merger deals (which usually end with the executive losing her job) indicate that executives may sometimes fail to anticipate shareholder preferences.[4] My analysis can also be a used to better understand such interactions.

The paper is organized as follows: In the next section, I discuss the related literature, and how this paper contributes to it. In Section 3, I develop the "ratification game". In Section 4, I characterize the equilibria of the game. Finally, I conclude in Section 5 by discussing how my results further our understanding of the questions that have motivated the paper.

2 The literature

This paper contributes to the linkage politics literature which studies the interactions between domestic and foreign politics. Starting with Putnam's ground breaking work, the linkage politics literature has relied on the notion of a "two-level" game in which an executive is to thread between the domestic politics game table and the international politics game table (Putnam 1988; Evans et al. 1993; Iida 1993; Iida 1996; Mo 1994; Mo 1995; Milner and Rosendorf 1997a,b; Reinhardt 1996). This two-simultaneously-played-games structure includes three players; the foreign executive, the domestic executive, and the domestic ratifier. The executives negotiate an agreement which is then subject to ratification by the domestic ratifier. The linkage-politics literature acknowledges various informational asymmetries that may exist among players. The foreign executive may lack information about the preferences of the domestic ratifier (Mo 1994). Alternatively, the domestic ratifier may lack information about the preferences of the foreign and/or domestic executive (Iida 1993; Milner and Rosendorf 1997b).

Iida (1996), Milner and Rosendorf (1997a) and Reinhardt (1996) explore a third possibility, namely that the domestic executive may lack information about the preferences of the

[4] See for example, the 2001 merger between HP and Compaq which almost failed when some important shareholders did not like the deal the CEOs agreed upon (The Michigan Daily, Sept.5, 2001). The failed GM-Magna deal is another example (The Wall Street Journal, Nov.4, 2009).

domestic ratifier. Iida demonstrates that an executive with such an informational deficiency risks involuntary defection. He incorporates communication in his model, however, he does not allow strategic misrepresentation. Milner and Rosendorf (1997a) point to elections that take place after the negotiation but before the ratification of an international agreement as a possible explanation for how an executive can lack ratifiability information and end up with a ratification failure in her hands. Their model does not allow any kind of communication between the executive and the ratifier since elections change the composition of the parliament, and thus render any pre-negotiation communication useless. Reinhardt (1996) empirically tests the relationship between certain domestic institutional sources of uncertainty and international bargaining outcomes using a database of trade disputes conducted under the purview of the General Agreement on Tariffs and Trade (GATT).

In this paper I follow Iida (1996), Milner and Rosendorf (1997a), and Reinhardt (1996), and start with the argument that an executive may lack information about domestic preferences. I then take an additional step and argue that the informational deficiency cannot be an explanation to involuntary defection by itself since in most cases the executive has the opportunity to communicate with the ratifier to cure her deficiency. Consequently, my model incorporates communication between the ratifier and the executive. My model differs from Milner and Rosendorf's since I keep the players fixed throughout the game, which, consequently, makes communication possible. My analysis also extends Iida's work by allowing strategic misrepresentation and by demonstrating how it can render all communication ineffective.

This paper also contributes to the literature on the strategic transmission of private information via cheap-talk (for a detailed survey of the literature please see Ganguly and Ray 2006). My model is a variant of the canonical model for strategic cheap talk communication by Crawford and Sobel (1982). In their path-breaking work, Crawford and Sobel develop a model of strategic communication between a sender with private information and a receiver who after observing the message takes an action that determines the welfare of both. The authors demonstrate that under standard assumptions, equilibrium communications always take a certain form in which the sender partitions the support of the variable that represents his private information and reports only which element of the partition his information actually lies in. Crawford and Sobel argue that the equilibrium whose partition has the greatest number of elements is a reasonable one for agents to coordinate on as it is Pareto-superior to all other equilibria (before the sender observes his private information). In this paper, I identify the conditions under which the only equilibrium partition is the support set itself, and thus there is no information transmission. This paper is also closely related to Matthews (1989), who extends the Crawford-Sobel model and studies veto-bargaining in domestic policy making via a three-stage signaling game in which he has two players: a policymaker, who proposes a new policy to replace an existing one, and a ratifier, who chooses between the proposed and the existing policy. The preferences of the ratifier are private information. Matthews shows that in equilibrium communication transmits only a very limited amount of information between the ratifier and the policymaker, which means that the proposed policy runs the risk of being rejected by the ratifier. I extend Matthews' model and show that, under certain assumptions a stronger result holds, namely that in equilibrium, information transmission between the policy maker and the ratifier is not possible.

3 The ratification game

Two countries bargain on an international cooperation agreement to replace the existing state of affairs between them. The international bargain is conducted by executives from the two countries. For the result of their bargain to come into effect, it must be ratified by the legislatures of both countries. Ratification requires that at least a certain number of legislators approve the international agreement (e.g., the United States Constitution assigns the power to ratify treaties to the Senate, and ratification requires approval by two-thirds of the Senate). One of the executives knows for sure that she has enough legislative support at home backing her bargaining position. Whereas the other executive is not as lucky and cannot rely on party votes either because her party does not have enough seats (for example, it is extraordinarily rare for one political party to control two-thirds of the Senate's seats) or because there is a faction within her party that opposes cooperation with the other country.

Thus she needs the votes of another group in the parliament.[5][6] This group might be an opposition party, a faction within the executive's party, or a cross-party coalition of legislators who share similar views on cooperation with the foreign country. But she lacks information about that group's preferences. There is communication between the executive and the group of legislators. All communications are public, thus any information the executive gathers is available to her counterpart at the international negotiation table as well. Below, I model the above interaction as a signaling game.

The game has three players: the **foreign executive**, denoted by **F**, the **domestic executive**, denoted by **D**, and a **domestic ratifier**,[7] denoted by **P**. The policy space is one-dimensional and is represented by the real line $\Re$. The players have symmetric, single-peaked preferences on $\Re$. In other words, each has an ideal policy on $\Re$, and each prefers a policy closer to her ideal than a policy that is farther away.[8] Let $f, d, t \in \Re$ be the ideal policies of the foreign executive, the domestic executive, and the domestic ratifier respectively. And let the following payoff functions represent the preferences of the players in the same order:

$$U_F(a) = -|a - f|$$

[5] Admitedly, such scenarios would be more probable in presidential-like systems, in parliamentary minority systems like the Nordic countries, or, in parliamentary majority systems where the ruling party has weak discipline. For a detailed discussion of the effects of institutional setup on domestic uncertainty in international negotiation settings please see Reinhardt (1996).

[6] There may of course be multiple groups in the parliamanent with whom the executive can try to build a coalition. But communication with multiple agents is out of the scope of this article. So, I assume that there is only one group with whom the executive can form a ratification coalition. This is equivalent to assuming that in a setup with multiple groups available for coalition, the executive knows which one is the pivotal group.

[7] For treaties which require a simple majority for ratification the domestic ratifier corresponds to the median legislator. Some treaties require a super-majority (like two-thirds) for ratification. This merely changes the identity of the decisive legislator; the analysis is unchanged. I thank the associate editor for bringing this point to my attention.

[8] Note that this preference structure does not impose any restrictions on the motivations of legislators. For a policy oriented legislator, for example, his ideal policy would simply reflect his ideologically most preferred policy, whereas for an office or vote oriented legislator, his ideal policy would reflect the most preferred policy of his constituency.

for the foreign executive,

$$U_D(a) = -|a - d|^k$$

for the domestic executive, where $k \in \Re$, and $k \geq 1$; k determines the domestic executive's **attitude towards risk**. As k increases D becomes more risk averse. And finally,

$$U_P(a;t) = -|a - t|$$

for the domestic ratifier, where $a \in \Re$. In other words, the payoff that a player gets from a policy $a \in \Re$ depends on the distance between the ideal policy of the player and a.

The ideal policies of the executives, that is, f and d, are common knowledge. Without loss of generality, assume $f < d$. The ideal policy of the domestic ratifier P however, is private information to P. That is, F and D do not know the exact value of t. They, however, know that it is a random variable with distribution function G, and density function g, with domain $T \subset \Re$. I assume that $G(d) = 0$, which means that P is more hawkish in its stance towards F than D is. G is common knowledge. I will simply refer to t as P's **type**, and T as the **type space**.

There is a **status quo policy**, $\mathbf{q} \in \Re$, in place. If F and D can agree on a new policy and get P to vote for their agreement, they can replace the status quo with this new policy they agreed upon.

The game has three stages:

(i) At stage one, P observes its type which is a draw by Nature from its distribution, and makes a declaration about it by sending a message $m(t) \in M$, where M is the **set of messages** P can send. If, for example, P chooses to truthfully reveal her type, then her message will be $m(t) = t$. But, note that the ratifier can always choose to strategically misrepresent her type. The ratifier's **declaration strategy** is then a function $p : T \longrightarrow \triangle(M)$ that maps the true preferred policy of P to a probability distribution on the set of messages. $p(m;t)$ then denotes the probability that P will send the message m given that its ideal policy is t.

(ii) At stage two D and F bargain on a new policy to replace the status quo q using the information they get from P's message m. Let $\mu(a;m)$ denote F and D's common belief about the probability of ratification of an agreement a given that P has sent the message m at stage one. Note that F and D should have the same belief since they are exposed to the same information. I use the Nash Bargaining Solution (Nash, 1950) to model the international negotiation which means the result of the international bargain solves the following maximization problem,

$$\max_{a\in\Re}\mu(a;m)^2[U_D(a)-U_D(q)][U_F(a)-U_F(q)] \qquad (1)^9$$

There may be multiple agreements that maximize the objective function in (1). I assume that there is a commonly known protocol in place that determines the resulting agreement in such cases. It will be clear in the following sections that my results do not depend on the choice of a specific protocol, so any protocol is acceptable as long as it clearly states out a selection rule among Nash Bargaining solutions. Let $N : M \Longrightarrow \Re$ be a correspondence that gives for each message the associated Nash Bargaining outcomes of the international negotiation. And let $\pi : M \to \Re$ be a refinement of the correspondence N that for each m maps $N(m)$ to $\pi(m) \in N(m)$, the resulting agreement of the international negotiation when P sends the message m.

(iii) At stage three, P makes a choice between the agreement $\pi(m)$ that D and F reach at stage two and the status quo policy q. If P chooses the agreement over the status quo, the agreement replaces the status quo, if not, the status quo prevails. The ratifier's **ratification strategy** is then a function $v : \Re \to \{0,1\}$ that maps each policy proposal to a ratification decision. P accepts an agreement a if $v(a) = 1$, and rejects if $v(a) = 0$.

A **strategy** for P is then a pair (p, v) where (i) $p : T \longrightarrow \triangle(M)$ is a declaration strategy, and (ii) $v : \Re \to \{0,1\}$ is a ratification strategy. Given p, v, and π, say a **type** t **sends message m** if $p(m;t) > 0$. **Message** m **induces agreement a** if $\pi(m) = a$. Similarly, **a is induced by type t** if it is induced by a message sent by type t.

Let the status quo policy be such that $f < d < q$. Note that the other cases are trivial and uninteresting for the purposes of our analysis. For $q < f$, the Nash bargain results in f, which F and D know is ratifiable since it is closer to all possible types of P than q is.[10]

[9] Derived from the following maximization problem:

$$\max_{a\in\Re}[\mu(a;m)U_D(a)+(1-\mu(a;m))U_D(q)-U_D(q)][\mu(a;m)U_F(a)+(1-\mu(a;m))U_F(q)-U_F(q)]$$

[10] For $k = 1$, the Nash bargain results in f whenever $q \leq f$, and in q whenever $f < q < d$. Kihlstrom, Roth

For $f \leq q \leq d$, there is no room for international cooperation since there is no alternative policy that F and D both prefer to the status quo. Only when $d < q$, does P's type become important for F and D.

Finally, I assume that t is uniformly distributed over T, and that $T = [d, q]$. In other words, I limit T to only those types that are more hawkish in their stance towards F than D is, but nonetheless, are not against cooperation with F. It can easily be shown that all the results that I derive in the following sections remain valid under a uniform type distribution over an interval that also includes types that are against cooperation with F (that is, T can be extended to some $[d, r]$, where $r > q$). But, this extension only brings further notational complication without changing the results. So, I limit the type space to $[d, q]$. This limitation enables us to see whether D and P can communicate to eliminate, or at least mitigate, the danger of ratification failure when it is common knowledge that both support cooperation with F. Without loss of generality, normalize $f = -1$, $d = 0$, and $q = 1$. Hence, $T = [0, 1]$.

Definition 2 *An* ***equilibrium*** *in the above game is, i) a strategy couple (p^*, v^*), for P, composed of a declaration strategy and a ratification strategy; ii) a function π^* that maps each received message to an international agreement; and a belief μ^* held by the domestic and the foreign executives about ratifiability of alternative agreements where*

1)*For all $t \in [0, 1]$, $\int_M p^*(m; t)dm = 1$ and if m^* is in the support of $p^*(.; t)$ then m^* solves*

$$\max_{m \in M} - |\pi^*(m) - t|$$

2)*For all $t \in [0, 1]$,*

$$v(a; t) = \begin{cases} 1 & if \ \ |a - t| \leq |q - t| \\ 0 & if \ otherwise \end{cases}$$

3)*For all $m \in M$, $\pi^*(m) \in [f, q]$, and $\pi^*(m) \in N(m)$, that is, $\pi^*(m)$ solves*

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and Schmeidler prove that 'the utility which Nash's solution assigns to a player increases as his opponent becomes more risk averse' (Kihlstrom, Roth and Schmeidler, 1981, p.67). Then, as k increases, the Nash bargaining should result in an agreement that would give F a higher utility than she would get if she were to bargain with a risk neutral D. This implies that as k increases, there would be no change in the Nash bargaining solution while $q \leq d$ regardless of how risk averse the domestic executive is. For $q > d$, Kihlstrom, Roth and Schmeidler's result implies that for $k > 1$, the international negotiation would yield an agreement a such that $f \leq a < d$.

$$\max_{a\in\Re}[\mu^*(a;m)]^2[U_D(a)-U_D(q)][U_F(a)-U_F(q)] \qquad (1)$$

where $\mu^*(a;m)$ *is the conditional probability that* a *will be accepted.*

4) *For all* $m \in M$ *such that* $p^*(m;t) > 0$ *for some* $t \in [d,q]$, $\mu^*(a;m)$, *satisfies*

$$\mu^*(a;m) = \frac{\int_d^q v^*(a;t)p^*(m;t)g(t)dt}{\int_d^q p^*(m;t)g(t)dt}.$$

The first item in the equilibrium definition requires that P's declaration strategy is a best response to π^*. The second item requires P to vote yes for an agreement that it weakly prefers to the status quo. The third item requires that the outcome of the international negotiation should be a solution to the Nash Bargain between F and D, and if multiple solutions exist, the solution agreed-to must be agreed upon in accordance with the prespecified, commonly known international protocol. Finally, the fourth item in the equilibrium definition requires that, based on the equilibrium declaration of P, players F and D revise their prior belief about t via Bayesian updating. What is important here is that, for any message that has a positive probability of being sent in equilibrium, the revised belief of F and D following that message should be consistent with the declaration strategy of P. If, for example, P's equilibrium declaration strategy is to declare twice its ideal policy, the revised belief should assign probability one to $t = \frac{m^*}{2}$.

4 Equilibria

In this section I conduct an equilibrium analysis of the ratification game. In any equilibrium, my main point of interest is the amount of information transmission accomplished in that equilibrium. I try to see if the game has equilibria in which communication resolves or attenuates the informational deficiency of the domestic executive, and thus eliminates or mitigates the risk of ratification failure. I define **the size of an equilibrium** as the number of induced agreements in that equilibrium, and classify the equilibria of the ratification game accordingly. The analysis below shows that the ratification game has only size one equilibria. Moreover, in any size one equilibria, the induced agreement is the same agreement that would be induced by a completely uninformative declaration strategy. In other words, the ratification game has no equilibrium in which P can convey any information about its preferences to D and F by communication. This result demonstrates how domestic uncertainty can lead to ratification failure. Given that only the same specific agreement can be induced in any equilibrium, I then set out to see how that agreement and the risk of ratification failure it carries change as the domestic executive's attitude towards risk changes. It turns out that as the domestic executive becomes more risk averse, the induced equilibrium agreement shifts towards the status quo and thus, the risk of ratification failure it carries decreases.

A simple kind of equilibrium that always exists in signaling games is a "**babbling equilibrium**" in which all types of the message sender send the same message with the same probability rendering the declaration strategy completely uninformative. A **babbling declaration strategy** is also called a **fully pooling strategy** since all types pool on one probability distribution over the message set. In my model, the following declaration strategy, for example, would be a babbling one:

$$p(m;t) = p(m;t') > 0 \text{ for all } t, t\prime \in [d,q] \text{ and for all } m \in M$$

Similarly,

$$p(m;t) = \begin{cases} 1 & \text{if } m = m' \\ 0 & \text{if } m \neq m' \end{cases}$$

is a babbling declaration strategy. Given that the message received is uninformative the receiver of the message then acts on her prior belief as she has not received any new information.

In a babbling equilibrium then, P employs a fully pooling declaration strategy in which all types send the same message with the same probability. And since the message is uninformative about t, F and D rely on their prior beliefs in conducting the international negotiations. Since messages are being ignored, it is a best response for P to "babble".

Proposition 1 *The ratification game has babbling equilibria in which the domestic ratifier employs an uninformative, babbling declaration strategy, and the international negotiation results in the agreement $a_{bab} \in [d, q)$.*

Proof. Please see Appendix A. ■

Note that the ratification game has multiple babbling equilibria since there are multiple babbling strategies P can employ. But all babbling equilibria have the same induced agreement. Since the declaration strategy is uninformative, D and F bargain based on their prior belief (that t is uniformly distributed on $[d, q]$). Thus, all babbling declaration strategies lead to the same Nash bargaining equation (which also has a unique maximizer), and thus, to the same agreement. And since there is only one induced agreement in a babbling equilibrium, all babbling equilibria are size one.

Proposition 2 *When D is risk neutral the induced agreement in a babbling equilibrium, a_{bab}, corresponds to D's ideal agreement d, but as she becomes more and more risk averse a_{bab} moves towards the status-quo away from the ideal agreements of both F and D. Since F and D are incompletely informed about the preferences of P, there is a possibility that a_{bab} will be voted down, but that possibility decreases as D becomes more risk averse.*

Proof. Please see Appendix A. ■

A babbling declaration strategy does not resolve the uncertainty about domestic preferences, and thus, the induced agreement faces the risk of ratification failure. Interestingly, that risk is negatively related to the risk aversion of the domestic executive. In other words, an international agreement that is signed by a risk averse leader who lacks information about domestic preferences is less prone to ratification failure than an agreement that she would have signed if she had been less risk averse.

Remark 1 *The induced agreement in any size one equilibria of the ratification game is the agreement induced in a babbling equilibrium.*

Proof. Please see Appendix A. ■

What is of more interest is whether the ratification game has any equilibrium in which P is able to convey some information about its preferences.

Proposition 3 *The ratification game has no "fully separating" equilibrium. Thus, full information transmission is not possible.*

Proof. A **fully separating equilibrium** requires P to employ a declaration strategy that would reveal its type by sending a different message for each possible type (hence the declaration strategy "separates" each type from another). Given an equilibrium message m then, F and D can solve for $p^{*-1}(m) = t$. With p^* *invertible*, $\mu^*(a;m)$ should be as follows;

$$\mu^*(a;m) = \begin{cases} 1 & if\ a \geq 2p^{*-1}(m) - q \\ 0 & otherwise \end{cases}$$

where $t = p^{*-1}(m)$. The result of the Nash Bargain, $\pi^*(m)$, then solves

$$\max_{a \in [f,q]} (1 - |a|^k) \times (1 - a) \qquad subject\ to\ 2p^{*-1}(m) - q \leq a \qquad (2)$$

Note that the objective function in (2) cannot have a maximizer in $(d, q]$, and that it is strictly decreasing in $\Re^+$ which implies that any maximizer it has in $[f, q]$ must be in $[f, d]$. Thus, for $t > \frac{d+q}{2}$, a fully separating declaration strategy induces $2t - q$ as the international agreement. But this cannot be an equilibrium because any type t with $t > \frac{d+q}{2}$ can increase its payoff simply by sending the message of type $\frac{t+q}{2}$. ■

The ratification game has no fully separating equilibrium which means that communication cannot get rid of uncertainty completely. The most we can hope for now is partial information transmission. Note that with full information transmission ruled out, we know that in equilibrium, we cannot get rid of the risk of ratification failure. The question now is whether we can have some communication in equilibrium that would mitigate that risk. The following results demonstrate that we cannot.

Proposition 4 *In any equilibrium, there can be at most one induced agreement in the (d, q) interval.*

Proof. Suppose two distinct agreements $x, y \in (d, q)$ are both induced in some equilibrium. Without loss of generality, assume $x < y$. Since $\pi^*(m)$ is by definition unique for each m, it must be that x and y are induced by different messages. Let $t' = \frac{x+y}{2}$. Then $U_P(x; t') = U_P(y; t')$. Moreover, for each $t > t'$, $U_p(x; t) < U_p(y; t)$. Thus, a type $t > t'$ never sends a message that induces x. So, when F and D receive a message that they respond to by agreeing on x they know that the message comes from a type in $[d, t\prime]$. Note that, since $x < q$

and $y < q$, it must be that $U_P(x; t') > U_P(q; t')$. Thus, by continuity of $U_P(.; t)$, type t' would accept an agreement slightly to the left of x with probability one and so does any type $t < t'$. But then we have a contradiction since agreeing on x cannot be optimal for F and D when they receive the message m. They can both increase their utilities by agreeing on something slightly to the left of x. ■

We know by incentive compatibility that, in equilibrium, there cannot be an induced agreement outside $[f, q]$. Proposition 4, facilitates our search further by demonstrating that in any equilibrium, there can only be one induced agreement in (d, q).

Proposition 5 *In any equilibrium, there can be at most one induced agreement in the* $[f, d]$ *interval.*

Proof. First note that for any received message $m \in M$, $\pi^*(m)$ is unique by construction. Thus, if there exists multiple induced agreements in the $[f, d]$ interval in an equilibrium, it must be that each is induced by a different message. Take any two induced agreements $x, y \in [f, d]$ and without loss of generality let $y < x$. Since I have restricted the type space to the $[0, 1]$ interval, it must be that all types strictly prefer x to y. But then no type sends the message that induces y. Hence, we have a contradiction. ■

Proposition 4 and 5 together cover almost the whole set of incentive compatible agreements. I have only one other possible agreement that can be induced in an equilibrium, and that is the status quo itself;

Proposition 6 *The ratification game has no equilibrium in which the status quo is an induced agreement. In other words, there is no equilibrium in which, based on the message that* P *sends,* F *and* D *agree on* q.

Proof. We know, by Proposition 1, that q is not the induced agreement in a babbling equilibrium. Thus, q can only be an induced agreement in an equilibrium in which there is at least one other induced agreement $x \in [f, q)$. By Proposition 4, we know that there can be at most one other induced agreement in (d, q). By Proposition 5, we know that there can be at most one other induced agreement in $[f, d]$. (Note that an induced agreement in equilibrium cannot be to the right of q since it is not individually rational for F and D to agree on anything that is worse for them than the status quo.) Let x be the maximum of the other induced agreements in equilibrium. Let $t' = \frac{x+q}{2}$. Then, it must be that $U_P(x; t') = U_P(q; t')$. Moreover, for each $t < t'$, it must be that $U_P(x; t) > U_P(q; t)$. Thus, a type $t < t'$ would never send a message that induces q. Similarly, for each $t > t'$, it must be that $U_P(x; t) < U_P(q; t)$. Thus, a type $t > t'$ would never send a message that induces x, nor a message that induces anything to the left of x for that matter. Thus, when F and D receive a message that they respond to by agreeing on q, they know that the message must have come from a type $t \geq t'$. Take any $y \in (t', q)$. All types in $[t', \frac{y+q}{2}]$ strictly prefer y to q. And, since for all $t \in [d, q]$, $\int_M p^*(m; t)dm = 1$, there must be at least one message, say m', that these types send with positive probability. Note that when F and D observe a message that is sent by a type in $[t', \frac{y+q}{2}]$ with positive probability, they would be better of agreeing on y than q. Suppose F and D observe m'. Since all types in $[t', q]$ induce q, m' must induce q. But, then we have a contradiction since with positive probability m' is coming from a type in $[t', \frac{y+q}{2}]$. ■

To summarize,

- we know, by incentive compatibility that, all induced agreements in equilibrium must be in $[f, q]$;
- we know, by Proposition 6 that, q is not an induced agreement in any equilibrium;
- we know, by Proposition 4 that, in any equilibrium, there can be at most one induced agreement in (d, q);
- we know, by Proposition 5 that, in any equilibrium, there can be at most one induced agreement in $[f, d]$;
- we know, by Proposition 1, that the ratification game has size one equilibria, and all size one equilibria have the same induced agreement that is in $[d, q)$.

Thus, we can conclude that the ratification game can have only two types of equilibria: size one equilibria with a_{bab} as the induced agreement and size two equilibria in which there are two induced agreements, one in $[f, d]$, and one in (d, q). Now, I will investigate and if it exists, characterize this second type of equilibria.

An equilibrium with two induced agreements $y \in [f, d]$,and $x \in (d, q)$, implies a partition of the type space into two parts. Let $\bar{t} = \frac{x+y}{2}$. Then a type $\bar{t}$ would be indifferent between the two agreements. Moreover, for each $t < \bar{t}$, t would strictly prefer y to x, and thus would never send the message(s) that induce x. Similarly, for each $t > \bar{t}$, t would strictly prefer x to y, and thus would never send the message(s) that induce y. Hence, when F and D receive a message that respond to by agreeing on x (y), they know the message is coming from a type $t \geq t'$ ($t \leq t'$). To characterize size two equilibria then, I need to find out if such equilibrium partitions of the type space exist. Note that there cannot be an equilibrium partition with $\bar{t} > \frac{1}{2}$ since that would require both x and y to be in (d, q). We know by Proposition 4 that there is no such equilibrium.

Take any $\bar{t} \in (0, \frac{1}{2}]$ and let P send the signal h (high) if $t > \bar{t}$ and l (low) if $t \leq \bar{t}$.[11]

Lemma 1 *When D and F receive the message l, the international Nash Bargain results in $\pi^*(l)$, where $f \leq \pi^*(l) \leq d$.*

Proof. Please see Appendix A. ■

Now, suppose that the equilibrium message is h, which signals that the ideal policy of P is above $\bar{t}$;

Lemma 2 *When D and F receive the message h, the international Nash Bargain results in $\pi^*(h)$, where $d < \pi^*(h) < q$.*

Proof. Please see Appendix A. ■

Now we can summarize the international bargain given that P employs the declaration strategy $p(t) = \begin{cases} l & \text{with } p(l;t)=1 \text{ if } \quad t \leq \bar{t} \\ h & \text{with } p(h;t)=1 \text{ if } \quad t \geq \bar{t} \end{cases}$. The international agreement induced by the message l is $\pi^*(l)$, and the international agreement induced by the message h is $\pi^*(h)$. For an equilibrium to exist it must be that P has no incentive to deviate from her signaling strategy. For P to have no incentive to deviate from the above signaling strategy it must be that neither a low type nor a high type should have any incentive to mimic the other. This happens only when each type prefers what its signal brings to what the other signal

[11] One can use other messages. To facilitate the discussion, I am using a maximal size two pooling strategy in which all types that induce a particular agreement send the same message.

would have brought. In other words, for an equilibrium to exist it must be that for some $\bar{t}$, $\frac{\pi^*(l)+\pi^*(h)}{2} = \bar{t}$. Note that in such a situation neither a high type nor a low type could get an agreement closer to its ideal by mimicking the other.

Proposition 7 *The ratification game only has size one equilibria. In other words, there is no equilibrium in which it is possible for the domestic ratifier to convey information to the executive.*

Proof. Please see Appendix A. ■

Proposition 7 states that there is no $k \geq 1$, and $\bar{t} \in (0,1)$, for which $\frac{\pi^*(l)+\pi^*(h)}{2} = \bar{t}$. This means the game has no size two equilibrium and hence we are left with only size one equilibria with a_{bab} as the induced agreement. This result implies that the executives have to conclude the international negotiations with nothing but their prior beliefs about the preferences of the domestic legislators. And thus, there is always a risk that the agreement will fail ratification.

5 Conclusion

International agreements are usually reached at the end of a bargain between the executives of the countries negotiating the deal, and the agreement comes into effect only after parliamentary ratifications. History offers us puzzling examples of involuntary ratification failures of international agreements, the latest of which is the failed military cooperation agreement between Turkey and United States. These failures are involuntary because the executives who signed them had done so with the anticipation that they would pass ratification. They are puzzling because the executive negotiating the agreement in the first place is expected to know and represent the preferences of her legislature, and bring home an agreement that would be ratified with no problem. Or conversely, the legislature is expected to exercise enough influence over the executive to eliminate the possibility that she would say yes to a domestically unpalatable deal. In this paper, I argue that informational deficiencies an executive may have about domestic legislative preferences can explain this puzzle.

I develop a game in which two agents bargain on an agreement to replace the status quo state of affairs between them. For their agreement to come into effect, they need the approval of a third agent whose payoff is also determined by the prevailing state. The two bargainers have uncertainty about the preferences of this third agent, but they can always communicate with her to resolve their uncertainty. I demonstrate that uncertainty about the preferences of the veto holder may lead the bargainers to shake hands on an agreement only to see it suffer a veto. More importantly, I show that communication may fail to resolve this uncertainty. These results indicate that an executive who suffers from uncertainty about domestic legislative preferences, risks facing a ratification failure despite all the communication she may have with her legislature.

I model communication as cheap talk which means conveying messages does not carry any consequential costs on the part of the legislators. The cheap-talk design is preferred over a costly-signaling one because I believe it better represents the real-life cases that motivate this article. Legislators actually have a wide variety of actions that can act as signals. They, for example, can initiate a round of hearings, pass resolutions, vote in straw polls, hold press conferences, make speeches on the floor, call upon regulatory agencies to tighten enforcement of existing legislation, or even personally visit the executive. It can be argued that most of these acts may carry reputational costs, but it is difficult to argue that such reputational costs would be a distinguishing factor among legislators since that requires these costs to vary with the preferences of legislators on the outcome of the international negotiation. While it is true that an involuntary ratification failure can be costly for legislators as well as the executive, and that legislators would try to avoid such a situation by communicating their preferences, it seems that the array of signaling devices they have at their disposal are limited in their ability to carry information (Reinhardt 1996). Nevertheless, there might be cases for which costly signaling arguments can be made, and thus it is a useful exercise to consider a costly-signaling version of the model. I conduct this exercise in Appendix C.

Another interesting result my analyses demonstrate is that, with communication channels devalued, legislators with similar preferences to those of the executive prefer a leader that can take risks, whereas legislators whose preferences diverge from those of the executive prefer a more risk averse leader. And in the latter case, the probability of a ratification failure decreases as the executive becomes more risk-averse.

This study is motivated by some puzzling observations from the international relations arena. Nevertheless, the model can easily be adapted to study domestic veto bargaining situations in presidential bicameral systems where the president holds a veto over proposed legislation. The results then point to the possibility of presidential vetoes in cases where the chambers are uncertain about policy preferences of the president. More importantly, that possibility cannot be abated by communication between the chambers and the president.

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References

Bailey, T. A. (1947). *Wilson and the peacemakers: Combining Woodrow Wilson and the lost peace and Woodrow Wilson and the great betrayal.* Macmillan.

Bayard, K. et al. (1999). New evidence on sex segregation and sex differences in wages from matched employee-employer data. *NBER Working Papers* 7003, National Bureau of Economic Research Inc.

Becker, E., & Cotton M. L. (1995). Male/female disparity in starting pay. *Southern Economic Journal*, 61(3).

Bölükbaşı, D. (2008), *1 Mart vakası, Irak tezkeresi ve sonrası.* Istanbul: Doğan Kitap.

Cai, H. (2000). Bargaining on behalf of a constituency. *Journal of Economic Theory*, 92(2).

Cameron, C., & McCarty, N. (2004). Models of vetoes and veto bargaining. *Annual Review of Political Science*, 7.

Cameron, C. (2000). *Veto bargaining: Presidents and the politics of negative power.* New York: Cambridge University Press.

Crawford, V. P., & Sobel, J. (1982). Strategic information transmission. *Econometrica*, 50.

Eckel, C. C., & Grossman, P. J. (2008). Men, women, and risk aversion: Experimental evidence. *Handbook of Experimental Economics Results.* Elsevier.

Evans, P. B. (1993). Building an integrative approach to international and domestic politics, reflections and projections. In Evans, P.B., & Putnam, R.D., & Jacobson H.K. (Eds) *Double-*

edged diplomacy, international bargaining and domestic politics. University of California Press.

Evans, P.B., & Putnam, R.D., & Jacobson H.K. (Eds) *Double-edged diplomacy, international bargaining and domestic politics.* University of California Press.

Feinberg, R. M. (1977). Risk aversion, risk, and the duration of unemployment. *The Review of Economics and Statistics,* 59(3).

Ganguly, C., & Ray, I. (2006). Cheap-talk: Basic models and new developments. Mimeo.

Hale, W. (2007). *Turkey, the US and Iraq.* SOAS Middle East Series, London.

Heller, W. B. (2007). Divided politics: Bicameralism, parties, and policy in democratic legislatures. *Annual Review of Political Science*, 10.

Iida, K. (1993). Analytic uncertainty and international cooperation: Theory and application to international economic coordination. *International Studies Quarterly*, 37.

Iida, K. (1996). Involuntary defection in two-level games. *Public Choice*, 89.

Jianakoplos, N. A., & Bernasek, A. (1998). Are women more risk averse?. *Economic Inquiry*, 36(4).

Kapsis, J. E. (2006). The failure of US-Turkish pre-war negotiations: An over-confident United States, political mismanagement, and a conflicted military, *The Middle East Review of International Affairs*, 10(3).

Kihlstrom, R.E., Roth, A.E., & Schmeidler, D. (1981). Risk aversion and solutions to Nash bargaining problem. In Moeschlin, O. and Pallaschke, D. (Eds.) *Game Theory and Mathematical Economics.* Amsterdam: North Hollland.

Lee, M. (2003). *Turkey's refusal stuns US.* Agence France Presse, March 1st 2003.

Light, A., & Ureta, M. (1995). Early-career work experience and gender wage differentials. *Journal of Labor Economics,* 13.

Mango, A. (2003). Perplexed by Turkey. *Middle Eastern Studies*, 39(4).

Matthews, S. A. (1989). Veto threats: Rhetoric in a bargaining game. *The Quarterly Journal of Economics*, 104(2).

McCarty, N. (1997). Presidential reputation and the veto. *Economics and Politics*, 9(1).

Milner, H. V., & Rosendorff, B.P. (1997a). Democratic politics and international trade negotiations: Elections and divided government as constraints on trade liberalization. *The*

Journal of Conflict Resolution, 41(1).

Milner, H. V., & Rosendorff, B.P. (1997b). A model of the two-level game. In Milner, H.V. *Interests, institutions, and information, domestic politics and international relations.* Princeton University Press.

Mo, J. (1994). Two-level games with endogenous domestic coalitions. *The Journal of Conflict Resolution,* 38.

Mo, J. (1995). Domestic institutions and international bargaining: The role of agent veto in two-level games. *American Political Science Review,* 89.

Nash, J. (1950). The bargaining problem. *Econometrica*, 18.

Pan, P.P. Turkey rejects U.S. use of bases. *Washington Post*, March 2nd, 2003.

Pissarides, C. (1974). Risk, job search, and income distribution. *Journal of Political Economy*, 82(6).

Polachek, S. W., & Moon-Kak K. (1994). Panel estimates of the gender earnings gap: Individual-specific intercept and individual-specific slope models. *Journal of Econometrics*, 61(1).

Putnam, R. (1988). Diplomacy and domestic politics: The logic of two-level games. *International Organization*, 42.

Reinhardt, E. (1996). *Posturing parliaments: Ratification, uncertainty, and international bargaining.* Ph.D. diss. Columbia University.

Robins, P. (2003). Confusion at home, confusion abroad: Turkey between Copenhagen and Iraq. *International Affairs,* 79(3).

Rubin, M. (2005). A comedy of errors: American-Turkish diplomacy, and the Iraq war. *Turkish Policy Quarterly*, spring.

Trubek, D. M., et al. (1983). The costs of ordinary litigation. *UCLA Law Review*, 31.

Tsebelis, G. (1995). Decision making in political systems: Veto players in presidentialism, parliamentarism, multicameralism and multipartism. *British Journal of Politica1 Science,* 25.

Tsebelis, G., & Money, J. (1997). *Bicameralism.* Cambridge, UK: Cambridge University Press.

Van der Veen, M. (2009). Defending integration or integrating defense? Ratifying the EDC in Belgium and the Netherlands. Mimeo.

Vander Lippe, J. M. (1993). The other treaty of Lausanne: The American public and official debate on Turkish-American relations. *The Turkish Yearbook*, 23.

Vesterlund, L. (1997). The effects of risk aversion on job matching: Can differences in risk aversion explain the wage gap. Mimeo.

Watts, A. (1994). Bargaining through an expert attorney. *Journal of Law, Economics, and Organization*, 10(1).

Worre, T. (1988). Denmark at the crossroads: The Danish referendum of 28 February 1986 on the EC reform package. *Journal of Common Market Studies*, 26(4).

Yetkin, M. (2004). *Tezkere, Irak krizinin gerçek öykűsű.* Istanbul:Remzi Kitabevi.

6 Appendix A: Proofs

Proof of Proposition 1. At the international negotiation stage, F and D bargain on an agreement and the outcome of their bargain solves the following maximization;

$$\max_{a\in[f,q]} [\mu^*(a;m)]^2(U_D(a) - U_D(q))(U_F(a) - U_F(q))$$

When P employs a babbling declaration strategy, she sends an uninformative message. F and D update their belief via Bayes' Rule which, in this case, results in their prior belief. Since both executives base their expectations on their shared prior belief about t, $\mu^*(a;m) = G(\frac{a+1}{2})$, and the above maximization becomes

$$\max_{a\in[-1,1]} \left[(1-|a|^k)\left(\frac{a+1}{2}\right)\left(\frac{1-a^2}{2}\right)\right] \qquad (A2)$$

For any $a \in (0,1]$, the Nash Bargaining objective function in $(A2)$ evaluated at a yields a higher value than the same function evaluated at $(-a)$, which implies that I can rewrite $(A2)$ as

$$\max_{a\in[0,1]} \left[(1-a^k)\left(\frac{a+1}{2}\right)\left(\frac{1-a^2}{2}\right)\right] \qquad (A2')$$

Let

$$n_1(a) = (1-a^k)\left(\frac{a+1}{2}\right)\left(\frac{1-a^2}{2}\right)$$

an let $b(a) = (1 - a^k)$, and $c(a) = (\frac{a+1}{2})(\frac{1-a^2}{2})$, where $k \geq 1$. Then, $n_1(a) = c(a) \times b(a)$. Note that both b and c are continuous, concave functions. Moreover, $c(a)$ is maximized at $a = \frac{1}{3}$ and $b(a)$ is maximized at $a = 0$, which implies, in the interval $(\frac{1}{3}, 1]$ both functions are decreasing. Thus n_1 cannot have a maximum in $(\frac{1}{3}, 1]$. The first derivative of n_1 is a continuously decreasing (second derivative is negative for $a \leq \frac{1}{3}$) function and it is positive at $a = 0$ and, negative at $a = \frac{1}{3}$ which implies there exists a unique maximizer within the interval $[0, \frac{1}{3}]$. ■

Proof of Proposition 2. For any message m, $\pi^*(m)$ solves

$$\max_{a \in [-1,1]} (E(U_D(a)) + 1)(E(U_F(a)) + 2))$$

where $E(U(a))$ denotes the expected value of U at a. If an interior solution to this maximization problem exists, call it a^*, then it solves the following first order condition,

$$(E(U'_F(a^*))(E(U_D(a^*)) + 1) + E(U'_D(a^*))(E(U_F(a^*)) + 2)) = 0$$

where

$$U'(a) = \frac{\partial U(a)}{\partial a}$$

Let

$$Q(a, k) = (E(U'_F(a))(E(U_D(a)) + 1) + E(U'_D(a))(E(U_F(a)) + 2))$$

then,

$$\begin{aligned} \frac{\partial a^*}{\partial k} &= -\frac{\partial Q(a,k)/\partial k}{\partial Q(a,k)/\partial a} |_{a=a^*} \\ &= -\left[\frac{\frac{\partial E(U_D(a))}{\partial k} E(U_F\prime(a)) + \frac{\partial E(U'_D(a))}{\partial k}(E(U_F(a)) + 2))}{\frac{\partial Q(a,k)}{\partial a}}\right]_{a=a^*} \end{aligned}$$

Note that the denominator is negative since a^* is a maximizer of n_1. From the first order condition, we know that

$$(E(U'_F(a^*)) = -\frac{E(U'_D(a^*))(E(U_F(a^*)) + 2))}{(E(U_D(a^*)) + 1)}$$

then,

$$\frac{\partial Q(a,k)}{\partial k} |_{a=a^*} = -(E(U_F(a^*)) + 2)) \left[\frac{\partial E(U'_D(a))}{\partial k} - \frac{\partial E(U_D(a))}{\partial k} \times \frac{E(U'_D(a))}{(E(U_D(a)) + 1)}\right]_{a=a^*}$$

I need to show that $\frac{\partial Q(a,k)}{\partial k} > 0$ when $a = a_{bab}$.

Claim 2.1: $E(U_D'(a_{bab})) \geq 0$.

Proof of Claim 2.1: When P employs a fully pooling strategy, D's expected utility from an agreement a is

$$E(U_D(a)) = (1 - |a|^k)\left(\frac{a+1}{2}\right) - 1 \qquad (A3)$$

Suppose we were to maximize $(A3)$ on $[-1, 1]$. Note that for all $a \in (-1, 0)$, $E(U_D(a)) < E(U_D(-a))$, thus $(A3)$ cannot have a negative maximizer. Then maximizing $(A3)$ is equivalent to maximizing the following,

$$\max_{a \in [0,1]} E(U_D(a)) = (1 - a^k)\left(\frac{a+1}{2}\right) - 1$$

This is a continuous, single-peaked function in a compact interval, thus it has a unique maximizer. Let a_D denote this maximizer, then a_D solves the following first order condition,

$$\frac{\partial E(U_D(a))}{\partial a} = 1 - a^k - ka^k - ka^{k-1} = 0$$

When $k = 1$, the first order condition implies $a = 0$. At $a = 0$, $\frac{\partial^2 E(U_D(a))}{\partial a^2} \leq 0$, thus $a = 0$ is the unique maximizer when $k = 1$. When $k > 1$, $\frac{\partial E(U_D(a))}{\partial a}$ is a continuous, and strictly decreasing function on $[0, 1]$. It is positive at $a = 0$ and negative at $a = 1$. Thus, it is equal to zero at a single point between 0 and 1, which means that, given k, a_D is unique.

The maximization in $(A2)$ can be rewritten as

$$\max_{a \in [-1,1]} \left(\frac{1 - a^2}{2}\right)(E(U_D(a)) + 1)$$

with the following first order condition,

$$-a(E(U_D(a) + 1) + \left(\frac{1 - a^2}{2}\right)(\frac{\partial E(U_D(a)}{\partial a}) = 0 \qquad (A4)$$

At $a = a_D$, $\frac{\partial E(U_D(a))}{\partial a} = 0$, and thus $(A4)$ evaluated at $a = a_D$ is equal to $-a_D(E(u_D(a_D) + 1)$ which is weakly less than zero, which implies $a_{bab} \leq a_D$. Note that this inequality becomes strict when $k > 1$. And, since $a_{bab} \leq a_D$, $E(U_D'(a_{bab})) \geq 0$. (End of Proof of Claim 2.1)

Note that

$$(E(U_F(a_{bab}))+2)) = \frac{1-a^2}{2} \geq 0 \qquad \text{for all } a \in [0,1]$$

and,

$$(E(U_D(a_{bab}))+1) = (1-a^k)\left(\frac{a+1}{2}\right) \geq 0 \qquad \text{for all } a \in [0,1].$$

Then,

$$\frac{\partial E(U_D(a))}{\partial k}\,|_{a=a_{bab}} = -\frac{a_{bab}+1}{2} \times a_{bab}^k \times \log(a_{bab}) > 0, \text{ since } a_{bab} \in [0,1]$$

$$\frac{\partial E(U_D'(a))}{\partial k}\,|_{a=a_{bab}} = -\log(a_{bab})(a_{bab}^k + ka_{bab}^k + ka_{bab}^{k-1}) - a_{bab}^k - a_{bab}^{k-1}$$

Claim 2.2: $k \log a_D < -1$.

Proof of Claim 2.2: $k \log a_D < -1$ implies $a_D < e^{-\frac{1}{k}}$. At $a_D = e^{-\frac{1}{k}}$

$$\frac{\partial E(U_D(a))}{\partial a} = 1 - e^{-\frac{1}{k}(k)} - ke^{-\frac{1}{k}(k)} - ke^{-\frac{1}{k}(k-1)} < 0$$

thus, $a_D < e^{-\frac{1}{k}}$. (End of Proof of Claim 2.2)

Since, $k \log a_D < -1$ and, $a_{bab} \leq a_D$, $\frac{\partial E(U_D'(a))}{\partial k}\,|_{a=a_{bab}}$ is positive. Thus if

$$\frac{\partial E(U_D\prime(a))}{\partial k}\,|_{a=a_{bab}} > \frac{\partial E(U_D(a))}{\partial k}\,|_{a=a_{bab}} \times \frac{E(U_D\prime(a_{bab}))}{(E(U_D(a_{bab}))+1)}$$

then we can conclude that $\frac{\partial a_{bab}}{\partial k} > 0$. Note that the above inequality implies

$$-\log(a_{bab})(ka_{bab}^k + ka_{bab}^{k-1}) - a_{bab}^k - a_{bab}^{k-1} > \frac{a_{bab}^{2k}\log(a_{bab}) + ka_{bab}^{2k}\log(a_{bab}) + ka_{bab}^{2k-1}\log(a_{bab})}{1-a_{bab}}$$

This inequality holds since $k \log a_{bab} < -1$ ($a_{bab} \leq a_D < e^{-\frac{1}{k}}$) and $0 < 1 - a_{bab} < 1$, which together imply that the left hand side is positive and the right hand side is negative. ■

Proof of Remark 1. Take any size one equilibrium and let M^+ be the set of messages sent with positive probability in that equilibrium. If M^+ has only one element then this must be a babbling equilibrium and we know in any babbling equilibrium the unique induced agreement is a_{bab}. Let M^+ contain $n > 1$ messages. Then it must be that $\pi(m) = a^*$ for all $m \in M^+$. Let p be the declaration strategy of P in this equilibrium. Then, $\sum\limits_{m \in M^+} p(m;t) = 1$, for all $t \in T$, $p(m;t) \geq 0$, and $\int p(m;t)g(t)dt > 0$, for all $m \in M^+$. The belief that D and F hold about ratifiability of alternative agreements given p should be

$$\mu(a;m) = \frac{\int_d^q v(a;t)p(m;t)g(t)dt}{\int_d^q p(m;t)g(t)dt}$$

and a^* maximizes $\mu(a;m)^2[U_D(a)-U_D(q)][U_F(a)-U_F(q)]$.

Let p' be a declaration strategy in which each type sends each message in M^+ with equal probability. Then p' is a babbling declaration strategy, and for each $t \in T$, I can write

$$p'(m;t) = \sum_{m \in M^+} \frac{1}{n} p(m;t)$$

and the belief that D and F hold about ratifiability of alternative agreements given p' should be

$$\mu'(a;m) = \frac{\int_d^q v(a;t)\left(\sum_{m\in M^+}\frac{1}{n}p(m;t)\right)g(t)dt}{\int_d^q \left(\sum_{m\in M^+}\frac{1}{n}p(m;t)\right)g(t)dt} = \sum_{m\in M^+}\int_d^q v(a;t)p(m;t)g(t)dt = \sum_{m\in M^+}\mu(a;m)\times c_m$$

where $0 \leq c_m \leq 1$ is some constant for each $m \in M^+$. Since p' is a babbling declaration strategy, we know that in equilibrium, a_{bab} will be induced. That is, a_{bab} will maximize

$$\mu'(a;m)^2[U_D(a)-U_D(q)][U_F(a)-U_F(q)]$$

which can be rewritten as

$$\left(\sum_{m\in M^+}\mu(a;m)\times c_m\right)^2[U_D(a)-U_D(q)][U_F(a)-U_F(q)]$$

Note that each element of this summation is maximized at a^* which means their sum is also maximized at a^*. But we know the induced agreement in a babbling equilibrium is unique and it is equal to a_{bab}. Thus, $a^* = a_{bab}$. ■

Proof of Lemma 1. After observing the message l, D's expected utility from signing an international agreement a becomes,

$$E(U_D(a)) = \begin{cases} -|a|^k & if \quad a \geq 2\bar{t}-1 \\ \frac{a+1}{2\bar{t}}(1-|a|^k)-1 & if \quad a \leq 2\bar{t}-1 \end{cases}$$

and F's expected utility of signing an international agreement a becomes,

$$E(U_F(a)) = \begin{cases} -(a+1) & if \quad a \geq 2\bar{t}-1 \\ \frac{a+1}{2\bar{t}}(1-a)-2 & if \quad a \leq 2\bar{t}-1 \end{cases}$$

and thus, $\pi^*(l)$ solves,

$$\max\left\{\max_{a\in[2\bar{t}-1,1]}(1-|a|^k)(1-a),\ \max_{a\in[-1,2\bar{t}-1]}\frac{1}{\bar{t}^2}\left(\frac{a+1}{2}\right)(1-|a|^k)\left(\frac{1-a^2}{2}\right)\right\}$$

Let

$$n_2(a) = (1-|a|^k)(1-a)$$

and

$$n_3(a) = \frac{1}{\bar{t}^2}\left(\frac{a+1}{2}\right)(1-|a|^k)\left(\frac{1-a^2}{2}\right)$$

Note that $n_2(2\bar{t}-1) = n_3(2\bar{t}-1)$. Moreover, since $\bar{t} \leq \frac{1}{2}$,

$$\max_{a\in[-1,2\bar{t}-1]} \frac{1}{\bar{t}^2}\left(\frac{a+1}{2}\right)(1-|a|^k)\left(\frac{1-a^2}{2}\right) = \max_{a\in[-1,2\bar{t}-1]} \frac{1}{\bar{t}^2}\left(\frac{a+1}{2}\right)(1-(-a)^k)\left(\frac{1-a^2}{2}\right)$$

with

$$\frac{\partial \frac{1}{\bar{t}^2}\left(\frac{a+1}{2}\right)(1-(-a)^k)\left(\frac{1-a^2}{2}\right)}{\partial a} |_{a\in[-1,0]} > 0$$

which means

$$\arg\max_{a\in[-1,2\bar{t}-1]} \frac{1}{\bar{t}^2}\left(\frac{a+1}{2}\right)(1-(-a)^k)\left(\frac{1-a^2}{2}\right) = 2\bar{t}-1$$

Then,

$$\begin{aligned} & \max\left\{\max_{a\in[2\bar{t}-1,1]}(1-|a|^k)(1-a), \max_{a\in[-1,2\bar{t}-1]}\frac{1}{\bar{t}^2}\left(\frac{a+1}{2}\right)(1-|a|^k)\left(\frac{1-a^2}{2}\right)\right\} \\ = & \max\left\{\max_{a\in[2\bar{t}-1,1]}(1-|a|^k)(1-a), (1-\left|2\bar{t}-1\right|^k)(1-(2\bar{t}-1))\right\} = \max_{a\in[2\bar{t}-1,1]}(1-|a|^k)(1-a) \end{aligned}$$

For $a \in [2\bar{t}-1, 0]$, $n_2(a) = (1-(-a)^k)(1-a)$ and,

$$\frac{\partial n_2(a)}{\partial a} = \frac{\partial(1-(-a)^k)(1-a)}{\partial a} = k(-a)^{k-1}(1-a) + (-a)^k - 1$$

At $a = -1$, $\frac{\partial n_2(a)}{\partial a} = 2k > 0$, and $a = 0$, $\frac{\partial n_2(a)}{\partial a} = -1$. Moreover, $\frac{\partial^2 n_2(a)}{\partial a^2} < 0$ for all $a \in [-1, 0]$. Thus, $\frac{\partial n_2(a)}{\partial a}$ must be equal to zero at exactly one point within $[-1, 0]$.

For $a \geq 0$, $n_2(a) = (1-a^k)(1-a)$. This is a strictly decreasing function in a. Thus,

$$\arg\max_{a\in[2\bar{t}-1,1]}(1-|a|^k)(1-a)$$

is unique and it is in $[2\bar{t}-1, 0]$. In other words, $(1-|a|^k)(1-a)$ is single peaked in $[-1,1]$, and its maximizer is in $[-1, 0]$. ■

Proof of Lemma 2. After observing the message h, D's expected utility from submitting an international agreement a for ratification becomes

$$E(U_D(a)) = \begin{cases} -1 & if \quad a \leq 2\bar{t}-1 \\ -\frac{a+1-2\bar{t}}{2(1-\bar{t})}|a|^k - 1\left(1-\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right) & if \quad a \geq 2\bar{t}-1 \end{cases}$$

and F's expected utility from signing an agreement a becomes

$$E(U_F(a)) = \begin{cases} -2 & if \quad a \leq 2\bar{t}-1 \\ -\frac{a+1-2\bar{t}}{2(1-\bar{t})}(1+a) - 2\left(1 - \frac{a+1-2\bar{t}}{2(1-\bar{t})}\right) & if \quad a \geq 2\bar{t}-1 \end{cases}$$

Since both F and D obtain higher expected utilities from an agreement a that satisfies $a \geq 2\bar{t}-1$, we can characterize $\pi^*(h)$ as

$$\pi^*(h) = \underset{a\in[2\bar{t}-1,1]}{\arg\max} \left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)^2 (1-a)(1-|a|^k) \qquad (4)$$

Let the objective function in (4) be denoted by $n_4(a)$, then,

$$\frac{\partial n_4(a)}{\partial a} = \left(\frac{a+1-2\bar{t}}{4(1-\bar{t})^2}\right)\left[2(1-a)(1-|a|^k)-(a+1-2\bar{t})(1-|a|^k)-k\,|a|^{k-1}\,\frac{|a|}{a}(1-a)(a+1-2\bar{t})\right]$$

$$\frac{\partial n_4(a)}{\partial a}\,|_{a=2\bar{t}-1}= 0 \qquad \text{and} \qquad \frac{\partial^2 n_4(a)}{\partial a^2}\,|_{a=2\bar{t}-1}> 0 \qquad \Longrightarrow a = 2\bar{t}-1 \text{ is a minimum.}$$

$$\frac{\partial n_4(a)}{\partial a}\,|_{a=1}= 0 \qquad \text{and} \qquad \frac{\partial^2 n_4(a)}{\partial a^2}\,|_{a=1}> 0 \qquad \Longrightarrow a = 1 \text{ is a minimum.}$$

Since $\bar{t} < \frac{1}{2}$, we have $2\bar{t}-1 < 0$. Moreover, $\frac{\partial n_4(a)}{\partial a} > 0$ for all $a \in (2\bar{t}-1, 0)$, which implies $0 \leq \pi^*(h) < 1$. For $a = 0$ to be feasible, it must be that $\bar{t} = \frac{1}{2}$, but we know that $2\bar{t}-1$ is a minimum, thus, we can conclude $0 < \pi^*(h) < 1$. Then, we can rewrite $\pi^*(h)$ as

$$\pi^*(h) = \underset{a\in[\max(0,2\bar{t}-1),1]}{\arg\max} \left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)^2 (1-a)(1-a^k)$$

$\left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)^2(1-a)(1-a^k)$ is a continuous function and $[\max(0, 2\bar{t}-1), 1]$ is a compact interval, thus it has a maximum within this interval. Note that for $a \in [\max(0, 2\bar{t}-1), 1]$,

$$E(U_D) = \left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)(1-a^k) - 1$$

This is a continuous, and strictly concave function. Similarly, for $a \in [\max(0, 2\bar{t}-1), 1]$,

$$E(U_F) = \left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)(1-a) - 2$$

which, again, is a continuous and strictly concave function. Moreover, $[\max(0, 2\bar{t}-1), 1]$ is a convex set. Then, it must be that the Nash bargaining solution is unique. Moreover,

$$\left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)^2(1-a)(1-a^k) = \left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)(1-a)\left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)(1-a^k)$$

and this is the multiplication of two positive-valued functions that are single peaked in $[0,1]$, which means that their product is also single peaked in $[0,1]$. ■

Proof of Proposition 7. **Claim 7.1**: $\pi^*(l)$ is weakly decreasing in k.

Proof of Claim 7.1:

$$\pi^*(l) = \arg\max_{a\in[2\bar{t}-1,1]}(1-|a|^k)(1-a)$$

I have shown in the proof of **Claim 1** that $(1-|a|^k)(1-a)$ is single peaked in $[-1,1]$, and its peak is in $[-1,0]$ which means

$$\max_{a\in[-1,1]}(1-|a|^k)(1-a) = \max_{a\in[-1,0]}(1-(-a)^k)(1-a)$$

Let $a^*(k) = \arg\max_{a\in[-1,0]}(1-(-a)^k)(1-a)$, and let,

$$F(a,k) = \frac{\partial(1-(-a)^k)(1-a)}{\partial a} = k(-a)^{k-1}(1-a)+(-a)^k-1$$

Then $F(a^*(k),k)=0$. Using the implicit function theorem,

$$\begin{aligned}\frac{\partial a^*(k)}{\partial k} &= -\frac{\partial F(a,k)/\partial k}{F(a,k)/\partial a}\,|_{a=a^*(k)} \\ &= -\left[\frac{(-a)^{k-1}(1-a)+(-a)^{k-1}(1-a)k\log(-a)+(-a)^k\log(-a)}{F(a,k)/\partial a}\right]_{a=a^*(k)}\end{aligned}$$

The denominator is negative since $a^*(k)$ is a maximum. The numerator is negative if $k\log(-a^*(k)) < -1$ which implies $a^*(k) > -e^{-\frac{1}{k}}$.

$$F(-e^{-\frac{1}{k}},k) = (ke^{\frac{1-k}{k}}+ke^{-1}+e^{-1}-1)$$

Note that $F(-e^{-\frac{1}{k}},k) > 0$ for $k=1$, and it is increasing in k which implies $a^*(k) > -e^{-\frac{1}{k}}$ for all $k \geq 1$. Thus, the above numerator is negative and $\frac{\partial a^*(k)}{\partial k} < 0$.

We know that $a^*(k) = \pi^*(l)$ if $a^*(k) \in [2\bar{t}-1,0]$, and that $\pi^*(l) = 2\bar{t}-1$ if $a^*(k) < 2\bar{t}-1$. Thus, for those k values for which $a^*(k) \in [2\bar{t}-1,0]$, $\pi^*(l)$ is strictly decreasing in k. Since $\frac{\partial a^*(k)}{\partial k} < 0$, given $\bar{t}$, there exists $\bar{k}$ such that for all $k > \bar{k}$, $a^*(k) < 2\bar{t}-1$. Then, $\frac{\partial \pi^*(l)}{\partial k}\,|_{k>\bar{k}} = 0$. Thus, $\frac{\partial \pi^*(l)}{\partial k} \leq 0$. (End of Proof of Claim 7.1)

Claim 7.2: $\pi^*(h)$ is increasing in k.

Proof of Claim 7.2:

$$\pi^*(h) = \arg\max_{a\in[2\bar{t}-1,1]} \left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)^2 (1-a)(1-|a|^k)$$

I have already proven (Proof of Claim 2) that this maximization problem has a unique, nonnegative maximizer. Hence, we can write,

$$\pi^*(h) = \arg\max_{a\in[2\bar{t}-1,1]} \left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)^2 (1-a)(1-a^k)$$

Let

$$n_5(a) = \left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)^2 (1-a)(1-a^k)$$

and let $F(a,k) = \frac{\partial n_5(a)}{\partial a}$. Then, $F(\pi^*(h),k) = 0$. We can use the implicit function theorem to analyze $\frac{\partial \pi^*(h)}{\partial k}$.

$$\begin{aligned}
\frac{\partial \pi^*(h)}{\partial k} &= -\frac{\partial F(a,k)/\partial k}{\partial F(a,k)/\partial a}\,|_{a=\pi^*(h)} \\
&= -\frac{\left(\frac{a+1-2\bar{t}}{2(1-\bar{t})^2}\right) a^k \log(a)(\frac{a+1-2\bar{t}}{2} - 1 + a) + \left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)^2 a^{k-1}(a - k\log(a) + ka - 1)}{\partial F(\pi^*(h),k)/\partial a}\,\Big|_{a=\pi^*(h)}
\end{aligned}$$

Claim 7.2.1: $\frac{\pi^*(h)+1-2\bar{t}}{2} - 1 + \pi^*(h) \le 0$

Proof of Claim 7.2.1: Let

$$b(a) = \left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)^2 (1-a)$$

and $c(a) = (1-a^k)$. Then, $n_5(a) = b(a)\times c(a)$. Note that $b(a)$ has a local maximum at $a = \frac{1}{3} + \frac{2}{3}\bar{t}$, and that for all $a > \frac{1}{3} + \frac{2}{3}\bar{t}$, both $b\prime(a)$ and $c\prime(a)$ are negative. Thus, $\pi^*(h)$ cannot be greater than $\frac{1}{3} + \frac{2}{3}\bar{t}$.

$$\frac{\pi^*(h)+1-2\bar{t}}{2} - 1 + \pi^*(h) = \frac{3\pi^*(h)-1-2\bar{t}}{2}$$

and $\frac{3\pi^*(h)-1-2\bar{t}}{2} \le 0$ since $\pi^*(h) \le \frac{1}{3} + \frac{2}{3}\bar{t}$. (End of Proof of Claim 7.2.1)

Claim 7.2.2: $(\pi^*(h) - k\log(\pi^*(h)) + k\pi^*(h) - 1) > 0$

Proof of Claim 7.2.2: For $k = 1$,

$$(\pi^*(h) - k\log(\pi^*(h)) + k\pi^*(h) - 1) = (2\pi^*(h) - \log(\pi^*(h)) - 1)$$

which is positive for all $\pi^*(h) \in [0,1]$. Moreover,

$$\frac{\partial(\pi^*(h) - k\log(\pi^*(h)) + k\pi^*(h) - 1)}{\partial k} = \pi^*(h) - \log(\pi^*(h))$$

which is also positive for all $\pi^*(h) \in [0,1]$. That is, the expression is increasing in k, which means

$$(\pi^*(h) - k\log(\pi^*(h)) + k\pi^*(h) - 1) > 0$$

for all $k \geq 1$. (End of Proof of Claim 7.2.2)

Note that $\frac{\pi^*(h)+1-2\bar{t}}{2(1-\bar{t})^2} > 0$, and $\log(\pi^*(h)) < 0$. Thus, the numerator of $\frac{\partial \pi^*(h)}{\partial k}$ is positive. The denominator is negative since $\pi^*(h)$ is the maximizer of $n_5(a)$, which then imply $\frac{\partial \pi^*(h)}{\partial k} > 0$. (End of Proof of Claim 7.2)

Claim 7.3: $\pi^*(h)$ is increasing in $\bar{t}$.

Proof of Claim 7.3: To calculate $\frac{\partial \pi^*(h)}{\partial \bar{t}}$, we can again make use of the implicit function theorem and the first order condition we have from the maximization of $n_5(a)$. Let $F(a,k,\bar{t}) = \frac{\partial n_5(a)}{\partial a}$. Then,

$$F(a,k,\bar{t}) = \frac{a+1-2\bar{t}}{2(1-\bar{t})^2}\left[(1-a^k)(1-a) - \frac{a+1-2\bar{t}}{2}(1-a^k+ka^{k-1}-ka^k)\right]$$

and $F(\pi^*(h),k,\bar{t}) = 0$. Then, using the implicit function theorem,

$$\frac{\partial \pi^*(h)}{\partial \bar{t}} = -\frac{\partial F(a,k,\bar{t})/\partial \bar{t}}{\partial F(a,k,\bar{t})/\partial a}\,|_{a=\pi^*(h)}$$

Let,

$$b(a,\bar{t}) = \frac{a+1-2\bar{t}}{2(1-\bar{t})^2}$$

and

$$c(a,\bar{t}) = \left[(1-a^k)(1-a) - \frac{a+1-2\bar{t}}{2}(1-a^k+ka^{k-1}-ka^k)\right]$$

Then, $\frac{\partial F(a,k,\bar{t})}{\partial \bar{t}} = \frac{\partial b(a,\bar{t})}{\partial \bar{t}}c(a,\bar{t}) + \frac{\partial c(a,\bar{t})}{\partial \bar{t}}b(a,\bar{t})$. Note that at $a = \pi^*(h)$,

$$c(a,\bar{t}) = \left[(1-a^k)(1-a) - \frac{a+1-2\bar{t}}{2}(1-a^k+ka^{k-1}-ka^k)\right] = 0$$

from the first order condition of the maximization of $n_5(a)$. So, $\frac{\partial F(a,k,\bar{t})}{\partial \bar{t}} = \frac{\partial c(a,\bar{t})}{\partial \bar{t}}b(a,\bar{t})$. And

$$\frac{\partial c(a,\bar{t})}{\partial \bar{t}} = (1-a^k+ka^{k-1}-ka^k) > 0 \text{ for all, } a \in [0,1]$$

so it must be positive at $a = \pi^*(h)$. Since $\pi^*(h) > 2\bar{t} - 1$, $\frac{\pi^*(h)+1-2\bar{t}}{2(1-\bar{t})^2}$ is also positive Thus, $\partial F(\pi^*(h), k)/\partial \bar{t} > 0$. We know that $\partial F(\pi^*(h), k)/\partial a < 0$, since $\pi^*(h)$ is a maximum. Thus, we can conclude that $\frac{\partial \pi^*(h)}{\partial \bar{t}} > 0$. (End of Proof of Claim 7.3)

We know that, given $\bar{t} \in (0, \frac{1}{2}]$,

$$\pi^*(h) = \arg\max_{a \in [2\bar{t}-1,1]} \left(\frac{a + 1 - 2\bar{t}}{2(1-\bar{t})} \right)^2 (1-a)(1-a^k)$$

When $k = 1$,

$$\pi^*(h) = \arg\max_{a \in [2\bar{t}-1,1]} \left(\frac{a + 1 - 2\bar{t}}{2(1-\bar{t})} \right)^2 (1-a)^2$$

and it solves the first order condition

$$\left(\frac{a + 1 - 2\bar{t}}{2(1-\bar{t})^2} \right) (1-a)(-2a + 2\bar{t}) = 0$$

which implies $\pi^*(h) = \bar{t}$. And, as k increases infinitely, $(1 - a^k)$ converges to one and $\pi^*(h)$ then maximizes $\left(\frac{a+1-2\bar{t}}{2(1-\bar{t})}\right)^2 (1-a)$, which, as I have shown, is maximized at $\pi^*(h) = \frac{1}{3} + \frac{2}{3}\bar{t}$. Given that $\pi^*(h)$ is increasing in both k and $\bar{t}$, it must be that $\pi^*(h) \in [\bar{t}, \frac{1}{3} + \frac{2}{3}\bar{t}]$. We also know that when $k = 1$, $\pi^*(l) = 0$. Thus, when $k = 1$, the ratification game does not have a size two equilibrium. Moreover, we know that $\frac{\partial \pi^*(l)}{\partial k} \leq 0$ and $\frac{\partial \pi^*(h)}{\partial k} \geq 0$. Then, if $\frac{\partial \pi^*(l)}{\partial k} + \frac{\partial \pi^*(h)}{\partial k} < 0$ we can conclude that our signaling game has no size two equilibrium. Unfortunately it is not possible to evaluate these derivatives and reach a conclusion but intuitively, one can expect $\frac{\partial \pi^*(l)}{\partial k} + \frac{\partial \pi^*(h)}{\partial k}$ to be smaller than zero since as $\pi^*(h)$ gets larger it moves away from the ideal points of both negotiators and thus faces stronger resistance whereas as $\pi^*(l)$ gets lower it gets closer to F's ideal point.

Although we cannot evaluate the derivatives directly we can use the available information to narrow down the parameter space in order to facilitate our search. First of all, note that $\frac{\pi^*(l)+\pi^*(h)}{2} = \bar{t}$ implies that at equilibrium $\pi^*(h) = 2\bar{t} - \pi^*(l)$. Given that $\pi^*(l) < 0$ for all $k > 1$, it must be that at equilibrium $\pi^*(h) > 2\bar{t}$. Since $\frac{1}{3} + \frac{2}{3}\bar{t}$ is the highest value $\pi^*(h)$ can take, we can conclude that there cannot be an equilibrium if $2\bar{t} > \frac{1}{3} + \frac{2}{3}\bar{t}$, that is, there can only be an equilibrium if $\bar{t} \leq \frac{1}{4}$.

We know that at an equilibrium $\frac{\pi^*(l)+\pi^*(h)}{2} = \bar{t}$ and that $\bar{t} > 0$. Thus, there cannot be an equilibrium if $\pi^*(l) + \pi^*(h) < 0$. We know the highest value $\pi^*(h)$ can attain is $\frac{1}{2}$ in the parameter interval we are investigating. If $\pi^*(l)$ (which is negative and which can be calculated by going through the maximization of $n_2(a)$) is smaller than $-\frac{1}{2}$ for some k values within the k interval at hand, then we can exclude those k values as there can be no equilibrium at those values. It can easily be shown that for all $k \geq 3.6$, $\pi^*(l) < -\frac{1}{2}$. Thus, in equilibrium it must be that $k < 3.6$. With some k values eliminated, we can go back and recalculate the highest value $\pi^*(h)$ can get and eliminate those $\bar{t}$ values that exceed half the highest value $\pi^*(h)$ can attain. Then we can eliminate again those k values for which $\pi^*(l)$ is smaller than $-\pi^*(h)$. Iteratively we can eliminate k and $\bar{t}$ values in this fashion. Appendix B contains the R code that does these iterations reducing the parameter space which can harbor a size two equilibrium to $\bar{t} \in (0, 0.001)$, and $k \in (1, 1.0008)$.It is possible to continue and narrow down the parameter space further but the calculations are limited by the precision limits of my computer and the marginal benefit of continuing. I argue that there is only size one equilibria in this signaling game and so it is not possible for the legislature to convey information to the executive. ■

7 Appendix B: The code

```
m=1
    h=seq(0,m,by=0.000001)
    k=3.60000
    t=0.250000
    i=1
    while (i<length(h)){
    f=2*((h[i]+1-2*t)/((2-2*t)^2))*(1-h[i]^k)*(1-h[i])-(((h[i]+1-2*t)^2)/(2-2*t)^2)
    *(h[i]^(k-1))*k*(1-h[i])-(((h[i]+1-2*t)^2)/(2-2*t)^2)*(1-h[i]^k)
    if (f>0.000000)
    i=i+1
    else { cat("h="," ", h[i],"\n")
    if (t>h[i]/2)
    {t=h[i]/2
    i=1 }
```

```
else {cat(”t=”,” ”,t,”\n”)
g=((2*t)^(k-1))*k*(1+(2*t))-1+((2*t)^k)
n=k
while (g<0 & k>=1){
n=n-0.000001
g=((2*t)^(n-1))*n*(1+(2*t))-1+((2*t)^n)}
n=n+0.000001
if (n<k)
{k=n
cat(”k=”,” ”,k,”\n”)
i=1}
else
i=2000000 }}}
```

8 Appendix C: Costly signaling

I will not go into detailed formal derivations, and leave it to for future study, but we can get an idea about possible results of costly signaling by a simple exercise which incorporates costly signaling into the model in a theoretical fashion:

Let $m(t) \in [0, 1]$ be P's declaration at stage one, after P observes its type which is a draw by Nature from its uniform distribution on the $[0, 1]$ interval. But this time assume that there is a cost associated with making a declaration and that the cost is $\frac{m(t)}{t}$. Note that the declaration cost varies with P's type. Let $a(t)$ be the agreement induced by a message sent by a type t ratifier. Then by incentive compatibility it must be that in equilibrium no type t can obtain a strictly higher payoff by emulating the behavior of another type, say typet'. Thus, in equilibrium, for any $t, t \in T$ the following inequalities must hold:

$$-|a(t) - t| - \frac{m(t)}{t} \geq -|a(t') - t| - \frac{m(t')}{t}$$

$$-|a(t') - t'| - \frac{m(t')}{t'} \geq -|a(t) - t'| - \frac{m(t)}{t'}$$

Without loss of generality, assume $t' < t$. Note that by incentive compatibility on the part of the foreign and domestic executives it must be that $a(t) < t$ and $a(t') < t'$, and thus $a(t') < t$ Since these inequalities must hold for any $t, t' \in T$, let us take t' such that $a(t) < t'$. Then the above inequalities can be rewritten as:

$$-a(t) + t - \frac{m(t)}{t} \geq -a(t') + t - \frac{m(t')}{t}$$

$$-a(t') + t' - \frac{m(t')}{t'} \geq -a(t) + t' - \frac{m(t)}{t'}$$

Subtracting the RHS of the second inequality from the LHS of the first, and the LHS of the second from the RHS of the first implies

$$m(t) \geq m(t')$$

which means in any sequential equilibrium $m(t)$ must be weakly monotone increasing in t. This means for almost all $t \in T$, either $\frac{\partial m}{\partial t} > 0$ or $\frac{\partial m}{\partial t} = 0$. [12]In the former case, the declaration by the ratifier is separating, whereas in the second $m(.)$ is a pooling strategy since an interval of types send the same message. Thus, we can conclude that this costly signaling game has pooling, semi-pooling, and separating equilibria. With an abundance of equilibria, the question then becomes which ones should be relevant for us. Note that it is possible to narrow down the set of possible equilibria by applying one of the equilibrium refinement concepts that are available in the theoretical literature (Banks, 2001). I also leave such extensions for future studies.

References

Banks, J. S. (2001). *Signaling games in political science.* Harwood Academic Publishers.

[12]Monotonicity implies differentiability almost everywhere (Banks, 2001)