Lies, Defection, and the Pattern of International Cooperation

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This article characterizes how incentives to lie affect international cooperation and the design of cooperation agreements. I study the optimal structure of cooperation agreements in an environment where the costs of cooperation fluctuate over time. Cooperation is complicated by the fact that the costs of cooperation are private information and participants can benefit from lying about them. When the extent of asymmetries of information between the cooperating governments can be measured in terms of the transparency of the political process, democracies face greater contracting opportunities than authoritarian regimes. However, this article shows that even under asymmetries of information, a limited extent of cooperation can be achieved when the design of cooperation agreements recognizes incentives to lie.

Several recent empirical findings in the international organization literature indicate that democracies are better cooperators than authoritarian regimes. Bliss and Russett (1998) and Morrow, Siverson, and Tabares (1998) show that democracies trade more, and Mansfield, Milner, and Rosendorff (2002) study data that suggests that democracies sign more preferential trading agreements than authoritarian regimes or mixed dyads.

Theoretical justifications for this regularity include claims that democracies favor voters over special interests (Remmer 1998; Verdier 1998), have an advantage at the bargaining stage (Mansfield, Milner, and Rosendorff 2000), create incentives for politicians to comply with treaties (Mansfield, Milner, and Rosendorff 2002; McGillivray and Smith 2000), and benefit from similarity in political system and foreign policy orientation (Dixon and Moon 1993).

These arguments emphasize the role of elections in creating incentives that ultimately result in greater cooperation among democracies than authoritarian regimes. However, claims relying on electoral incentives should also recognize that electoral competition frequently leads to policies that make cooperation difficult to achieve. This may be because candidates propose policies that favor a subgroup of the electorate that is decisive for office (Dixit and Londregan 1996), an informed minority over an uninformed majority (Baron 1994), or a combination of the two (Grossman and Helpman 1996).

Instead of relying on an electoral mechanism, this article addresses international cooperation across regime types as a part of a more general problem of optimal design of cooperation agreements under asymmetries of information. I argue that democracies face better agreement terms than autocracies because they are able to form cooperation arrangements that induce them not to exploit cooperation by lying. For this result, the key distinction between the two regime types is in the transparency of their political process rather than in different incentives to defect. Furthermore, this article demonstrates that even among autocracies, a limited extent of cooperation can be achieved when the design of cooperation agreements recognizes incentives to lie.

Nonetheless, electoral and other domestically generated costs of compliance are an important part of the setting considered here. This article adopts a more realistic view of the link between domestic politics and international cooperation and depicts governments as facing a trade-off between adhering to their international commitments and maximizing the likelihood of remaining in

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office. In his study of two-level games, Putnam calls politically motivated noncompliance "involuntary defection " (1998, 438).

To introduce the results in this article, the theoretical model studied here explains several important facts about international organization. This article explains why (a) governments are able to commit to nontrivial cooperation when domestically generated costs of compliance fluctuate over time and external enforcement is not available; (b) cooperating governments form flexible institutional arrangements that induce truthful information sharing even when governments could achieve more favorable outcomes by lying; and (c) democracies cooperate more than authoritarian regimes. To the author's knowledge, the arguments for (b) and (c) are new to the literature on international organization. Meanwhile, the argument for (a) establishes a benchmark to which the results in (b) and (c) are compared.

The Argument

As a starting point, this article shows that governments that face fluctuating costs of compliance over time design agreements that account for political pressures to defect in such a way as to make cooperation most politically viable. From the point of view of the cooperating governments, *politically efficient* cooperation implies a cooperation rule that will impose the lowest participation requirements on the government that faces the highest costs of compliance in a given period. Such a cooperation rule is politically more efficient than one that would not take domestic circumstances into account: It allows sustaining cooperation under circumstances when defection by one of the governments would be necessary because of excessively high costs of compliance. I call the inclusion of such a rule in cooperation agreements *domestic conditionality* as it permits cooperators to condition the extent of cooperation on domestic circumstances.

In most settings, an essential element of conditioning cooperation on domestic circumstances is the need for cooperating governments to communicate credibly about those circumstances to each other. Once the cooperating governments cannot perfectly observe each others' domestic circumstances, the benefits of institutional flexibility may be compromised by an incentive to misrepresent private information in order to achieve a more favorable outcome.[1]

Consider, for instance, an OPEC member who would like to temporarily exceed its production quota in order to resolve a domestic political crisis or reduce an unexpected budget deficit. Given the critical role of oil production in financing its public expenditures, the OPEC government would benefit from a temporary increase in oil production under most circumstances, not only if domestic political pressures were extreme. If these political pressures are unobservable, the cooperation partners of the OPEC government will understand that it may overstate its costs of compliance at any time. In contrast, when President Bush invoked an escape clause that is part of the WTO trade rules and increased steel tariffs in March 2002, U.S. trade partners as well as the WTO clearly saw that the reason was to win political support for the upcoming congressional elections in the swing states of West Virginia, Pennsylvania, and Ohio, rather than a crisis of the steel industry caused by import competition.[2]

This article shows that the possibility that some governments would misrepresent their domestic circumstances in order to achieve a more favorable cooperation outcome limits the potential for cooperation. The intuition is as follows: In order to prevent lying about domestic circumstances, a reasonable price must be attached to the messages from which the cooperators could benefit when lying. This can be done by assigning smaller future cooperation benefits to those that report high costs of compliance. However, the minimal level of future cooperation benefits that can be assigned to those that report high costs of compliance is bounded from below in the absence of external enforcement, or else those facing an adverse shock will abandon cooperation. If an appropriate price cannot be attached to high costs announcements, agreement flexibility must be curtailed. This will reduce the temptation to overstate the costs of compliance by those facing a favorable domestic shock. As a result, the best feasible cooperation agreement under asymmetries of information will be less politically efficient.

While incentives to lie impede cooperation, cooperators can design cooperation rules that prevent misrepresentation between asymmetrically informed states. I discuss two simple cooperation rules that are self-enforcing and allow for information sharing even when *no information* on domestic shocks is observable between the cooperating governments. The first rule, *restraint*, instructs the government that last took advantage of flexible cooperation provisions to refrain from doing so again for a specific number of subsequent periods. The second, *rotation*, is a

[1] A similar issue arises in the context of crisis bargaining. See, for example, Fearon (1995) and Sartori (2002).

[2] See "Steel Tariffs Put G.O.P. on the Spot in Campaigns," *New York Times*, 24 August 2002, C1.

rule under which low participation in cooperation under adverse domestic circumstances is allowed only in turns.

More intuitively, both rules capture the common sense that is part of many everyday interactions. Restraint says, "If you ask for a favor too often, I can't trust that you are not exploiting my good will!" Rotation says, "Do not ask for another favor until you get a chance to return the last one!" And a common theme to both rules is "Those who ask for a favor at the wrong time may lose the chance to ask for it when they really need it!" A prominent example of an institutional arrangement that captures this intuition is the WTO Agreement on Safeguards under which safeguards can not be reapplied until after a period equal to the duration of the original safeguard has elapsed.[3] The formal argument in this article clarifies why rules like this one induce truthful information sharing between cooperating governments.

Furthermore, this article considers the interaction of governments with varying degrees of transparency of domestic political environment. I find that as the lack of transparency increases, the optimal cooperation rule becomes less flexible. Although information about domestic circumstances can be credibly communicated between less transparent regimes, it comes at the cost of designing politically efficient cooperation agreements. In particular, governments facing adverse shocks cannot opt out when they would need it most. Nontransparent governments therefore face more rigid agreement terms and gain less from cooperation than transparent regimes.

When the extent of asymmetries of information between the cooperating governments can be measured in terms of the transparency of the political process, democracies face greater contracting opportunities than authoritarian regimes. Electoral competition in democracies creates incentives for the opposition to inform voters about the incumbent's policies and performance. Such incentives are either suppressed or absent in authoritarian regimes. The political process is therefore more transparent in democracies than in authoritarian regimes, and the magnitude of political pressures to defect from international agreements is more transparent to the cooperation partners of democracies.

This article intentionally focuses on the transparency of the political process as the key difference between the two regime types, maintaining the assumption that both democracies and autocracies sometimes face domestic pressures to defect from cooperation. In democracies, public discontent with government policies is reported by the press, while the electoral mechanism determines how government performance affects its survival. In authoritarian regimes, public discontent with government policies and the mechanism by which it affects government survival take a different form. Although authoritarian governments try to suppress public displays of discontent, these still occur in the form of strikes or riots, and government change is more often the consequence of revolts, coups, or assassinations than elections.[4] I therefore assume that interests that are affected by international cooperation exert pressure on government policies in authoritarian regimes as well as in democracies. In order to present the effect of transparency on cooperation across regime types as clearly as possible, I assume that the extent of such domestic pressures is the same across both regime types despite the different forms that these pressures take.

The formal setting in this article involves two governments that decide on a level of cooperation in each period of an infinitely repeated game. A domestic variable that impacts the costs of compliance, costs of cooperation, is realized each period in each country and fluctuates probabilistically across periods. While the governments perfectly observe the cooperation levels that they choose each period, their own costs of cooperation may be private information. An imperfect signal of cooperation costs is observed at the end of each period, after cooperation choices have been made. The privately informed governments can communicate their costs of cooperation, but face incentives to overstate them as political efficiency implies that governments facing high costs of cooperation participate less than governments facing low costs. This formal setting intends to capture a wide range of international scenarios where (a) costs of cooperation may be private information and fluctuate over time; (b) the extent of cooperation varies over time and across countries; and (c) imperfect information about the actual costs of cooperation is observed only after the cooperation decisions have been made.

The article is organized as follows. In the next section, I relate my argument and findings to related work in the international organization literature. The fourth section introduces the key elements of the formal model, and the fifth section studies a model of cooperation under changing domestic circumstances and complete information. In the sixth section, I introduce private information and discuss its implications for institutional design. The seventh section studies the implications of political transparency for the contracting opportunities of different regime types. The final section concludes. All formal

[3] Article 7 of the Agreement on Safeguards.

[4] Data on political discontent in authoritarian regimes have been studied by Alesina and Perotti (1996) and Przeworski et al. (2000, chapter 4).

statements of results and their proofs are in the appendix. Simple numerical examples illustrate each main result.

The Contribution and Related Literature

Several earlier works explore the impact of domestic politics on the possibilities for international cooperation and institutional design. However, the extent to which governments' inability to share relevant cooperation information or the extent to which potential exploitation of institutions by lying accounts for cooperation failures has been addressed only marginally in the literature on international cooperation.

Putnam (1988) points to the domestic political environment as a key constraint on the feasibility of international agreements at the bargaining stage. Instead, this article studies the optimal agreement structure that takes the division of the cooperation surplus at the bargaining stage as given. I focus on the problem of designing a lasting agreement when both parties expect domestic circumstances to vary over time. The key properties of the agreement structure derived here hold *regardless* of the division of the cooperation surplus at the bargaining stage.[5]

In important contributions, Downs and Rocke (1995) and Rosendorff and Milner (2001) also derive the flexibility of compliance provisions from variation in domestic political pressures.[6] Downs and Rocke (1995) build on Green and Porter's (1984) model of oligopolistic collusion where *imperfect observability of cooperation levels* is at the heart of the cooperation problem. In contrast, I focus on the *unobservability of domestic circumstances* as the source of incentives to lie. Such a focus is more appropriate empirically as actual cooperation levels are easily observed in most international cooperation scenarios, while it is domestic circumstances reported in diplomatic communication or agreement disputes that are frequently in question.[7]

[5]Although the bargaining stage precedes the actual cooperation stage, understanding the optimal cooperation terms under *any* division of the cooperation surplus is key to knowing what is being divided at the bargaining stage.

[6]Rosendorff (2005) shows how the Dispute Settlement Procedure of the WTO increases the flexibility of the trading system. Koremenos (2001) studies a related aspect of agreement flexibility, duration, and renegotiation provisions.

[7]For instance, tariffs, exchange rates, or budget deficits are typically observable. On the other hand, political pressures, coalition crises, or industry recessions are much harder to credibly assert, even in democracies.

The difference between these two settings is also important from the incentive point of view. Downs and Rocke (1995) study strategies under which cooperation is suspended for a fixed number of "reversionary" periods after a "trigger event." Such strategies are appropriate in settings where cooperators cannot infer with sufficient precision which player defected. When the mechanism generating information relevant to cooperation is independent across the cooperators, as is typically the case with domestic politics, trigger strategies do not take advantage of all the available information. More precisely, incentives for truthful communication or compliance can be provided by conditioning continuation strategies on the independent signal realizations across the cooperators. Such strategies can avoid the wasteful "reversionary periods" and expand the potential for cooperation.[8] To my knowledge, this is the first article that applies this insight to the study of institutional design in international cooperation.

Rosendorff and Milner (2001) show that flexible treaty provisions make agreements easier to conclude under conditions of domestic uncertainty. Their finding corresponds to the benchmark model presented in the fifth section. My central focus then shifts to the optimal design of cooperation agreements under asymmetries of information. While Rosendorff and Milner (2001) argue that the cost of exercising escapes should balance the frequency of escapes and the benefits from cooperation, I explicitly characterize the limits to cooperation that the potential to exploit flexible institutions by lying implies when the extent of asymmetries of information between the cooperating governments varies. Furthermore, I demonstrate how the costs of exercising escapes can be translated into simple institutional rules, such as rotation and restraint, that induce truthful communication by varying the future gains from cooperation rather than monetary transfers. Such an agreement design may be more appropriate in settings where monetary transfers are implausible for institutional or political reasons.

In contrast to Downs and Rocke (1995) and Rosendorff and Milner (2001), this article also addresses the possibility that governments may try to communicate the nature of domestic circumstances. I demonstrate that the neglect of the potential for communication leaves possibilities for efficient cooperation under asymmetries of information unexploited. In particular, communication allows governments to design cooperation rules under which future benefits from cooperation are conditioned on present messages about cooperation costs. Governments' ability to communicate is essential for the

[8]See Fudenberg, Levine, and Maskin (1994) for a general argument.

implementation of cooperation rules, such as restraint and rotation, that induce truthful information sharing even when no information on domestic shocks is observable across the governments.

Most explicit treatments of communication in international politics have been cast in the costly signaling framework (Fearon 1994, 1997; Schultz 1998). Here, instead, communication is costless. In this setting, cooperation partners face the problem of designing cooperation terms that provide incentives for truthful communication. In the context of crisis bargaining, Sartori (2002) studies a repeated cheap-talk game in which the threat of a wasteful noncommunicative equilibrium creates incentives to communicate truthfully. The key theoretical difference in this article is that truthful communication is induced by a transfer of the cooperation surplus that occurs *on* the equilibrium path: governments facing high cooperation costs today announce them, understanding that they will face lower cooperation surplus later. In another related article, Morrow (1994) considers communication as a way of coordinating on efficient cooperation outcomes and shows how incentives to coordinate are compromised by distributional problems. However, he does not study the enforcement of the coordination outcome under anarchy. International agreements studied here are *self-enforcing* in the sense that no rational government would want to defect from them (even under anarchy). Furthermore, I derive the properties of international agreements as a result of efficient contracting among governments. In that respect, this article shares the motivation of Koremenos, Lipson, and Snidal (2001).

This article assumes that the extent of asymmetries of information about governments' costs of cooperation reflects the transparency of the political process in the cooperating countries. In the present context, the costs of cooperation can be thought of as capturing electoral shocks, coalition crises, industry crises, or union strikes. Some of these are public information in most democracies, but have only limited observability in authoritarian regimes. A growing literature emphasizes the informational role of domestic political institutions in international politics (Broz 2002; Fearon 1994; Lipson 2003; Schultz 1998). This article contributes to this literature by studying a new mechanism that explains why democracies cooperate more than authoritarian regimes: Democracies face greater contracting opportunities because they can credibly sign cooperation agreements that accommodate political pressures to defect as a part of a flexible agreement.

Finally, the game-theoretic methodology applied in this article combines insights from the literature on mechanism design and repeated games. The repeated political environment considered here allows governments to condition future cooperation on the announced history of their domestic circumstances in each period. In formalizing this setting, I follow Abreu, Pearce, and Stacchetti (1990), who demonstrate how recursive formulation can be applied to the study of repeated games. This methodology allows for a convenient characterization of the entire Pareto frontier of cooperation agreements sustainable under the lack of enforcement. My treatment of incentive problems associated with asymmetries of information builds on the static mechanism design literature, particularly Sappington (1983) and Riordan and Sappington (1988). To incorporate these in a repeated setting, I draw on techniques for repeated games with imperfect public information developed by Fudenberg, Levine, and Maskin (1994) and applied in Athey and Bagwell (2001).

A Model of International Cooperation

Suppose that two governments, denoted by $i = \{1, 2\}$, cooperate and each faces costs of cooperation that fluctuate over time. *Costs of cooperation* c_i can be high or low, denoted c^H and c^L, respectively, and belong to the set $C = \{c^H, c^L\}$.[9] I index the costs of Government 1 by j and the costs of Government 2 by k. I denote the four possible states (j, k); for instance (H, L) denotes the state when Government 1 faces high costs while Government 2 faces low costs. The probability that government i faces low costs in any period is $\Pr(c_i = c^L) = p$, and the probability of high costs is $\Pr(c_i = c^H) = 1 - p$. These probabilities are independent across time and governments. The joint probability of the state (j, k) is written as p_{jk}, where $p_{jk} = \Pr(c^j)\Pr(c^k)$. I assume that $p > 1/2$ so that realizations of high costs are relatively rare.

Cooperation choices are denoted by *actions* $a_i^{jk} \in A$, where A is a finite set on the interval $[0, 1]$. The action $a_i^{jk} = 0$ denotes noncooperation, $a_i^{jk} = 1$ denotes full cooperation, and intermediate values denote the extent of participation. The cooperation levels governments choose are perfectly observed.

The stage-game payoff from cooperation to government i in the state (j, k) is

$$b_i\left(a_1^{jk}, a_2^{jk}\right) - a_i^{jk} c_i,$$

and I refer to it as the *stage-game cooperation surplus*. The stage-game cooperation surplus represents the difference between the *benefits from cooperation* $b_i(a_1^{jk}, a_2^{jk})$ and the

[9] The main findings should remain unchanged in a model with a larger number of cost levels.

costs of cooperation weighted by the extent of cooperation by government i, $a_i^{jk} c_i$. That is, the level of cooperation chosen by government i determines the actual negative impact of i's costs of cooperation on its payoff.

Benefits from cooperation depend on cooperation levels chosen by both governments in the *Prisoners' Dilemma* (PD) fashion, with $b_i\left(a_1^{jk}, a_2^{jk}\right) = -sa_i^{jk} + ra_{\sim i}^{jk}$ for $r, s > 0$ and $r > s$. The assumption $r > s$ ensures that in the state (L, L) cooperation is strictly preferred to alternating between the action profiles $a^{LL} = (1, 0)$ and $a^{LL} = (0, 1)$. Note that government i's benefits from cooperation, $b_i(a_i^{jk}, a_{\sim i}^{jk})$, are increasing in $a_{\sim i}^{jk}$ and decreasing in a_i^{jk}. The stage-game cooperation surplus then ranges from $b_1(1, 0) - c^H$ to $b_1(0, 1)$ for Government 1, with appropriate substitution in participation levels for Government 2.

Assume that the costs of cooperation are such that joint cooperation is preferred to noncooperation when the costs of cooperation in that period are low, $b_i(1, 1) - c^L > b(0, 0)$, while noncooperation is preferred to joint cooperation when the costs of cooperation are high, $b_i(1, 1) - c^H < b(0, 0)$. Thus in the state (L, L) the incentives in this game follow a PD, while in the state (H, H) the incentives resemble the game of *Deadlock*. Note that irrespective of its costs of cooperation, each government prefers noncooperation to any positive level of cooperation. But if the cooperative outcome could be enforced, variation in the costs of cooperation creates incentives for variation in participation levels. The game matrix in Figure 1 illustrates this setting.

In the sixth section, I study an environment where costs of cooperation are private information. In order to allow governments to condition their cooperation levels on domestic circumstances, I assume that they can communicate, perhaps untruthfully, the costs of fully cooperating in each period by sending a *message* $m_i^{jk} \in M$, where $M = \{H, L\}$, before choosing their participation levels. H and L represent announcements of high and low costs of cooperation, respectively.

In the seventh section, I introduce the possibility that an imperfect *cost signal* $\theta \in \Theta$, where $\Theta = \{H^*, L^*\}$, of one government's costs is observed after cooperation choices have been made. In order for such a signal to be informative, I assume that a high costs signal is more likely the result of a high rather than a low costs realization in a given country. Let $\pi_i^{c\theta}$ be the probability that a cost signal θ is publicly observed when the actual costs of government i are c. Then for $i = 1, 2$ this assumption implies $1/2 < \pi_i^{LL^*} < 1$ and $1/2 < \pi_i^{HH^*} < 1$.

FIGURE 1 A Cooperation Game with Varying Costs of Cooperation

		Government 2	
		$a_2^{jk} = 1$	$a_2^{jk} = 0$
Government 1	$a_1^{jk} = 1$	$r - s - c_1, \quad r - s - c_2$	$-s - c_1, \quad r$
	$a_1^{jk} = 0$	$r, \quad -s - c_2$	$0, \quad 0$

The timing of the stage-game in each period captures a setting where governments (1) privately observe their own costs of cooperation, (2) announce their costs of cooperation in that period, (3) decide on a level of cooperation, and (4) observe an imperfect public signal of the other government's costs of cooperation. All aspects of the game except for the governments' privately observed domestic costs of cooperation are common knowledge. Thus in each stage-game, a (pure) strategy in period t for player i, $\sigma_i^t(\alpha_i, \rho_i)$, specifies a cooperation level a_i^{jk} and a message m_i^{jk} about i's costs realization. The choice of cooperation level α_i is a function of government i's costs c_i and the other government's message $m_{\sim i}$, $\alpha_i : C \times M \to A$. The choice of message ρ_i is a function of government i's costs c_i, $\rho_i : C \to M$.

Since the benefits from cooperation have a PD structure, for government i any positive level of cooperation, $a_i^{jk} > 0$, is strictly dominated by noncooperation, $a_i^{jk} = 0$. The realized costs of cooperation are therefore irrelevant for the Bayesian Nash equilibrium of the stage-game, which yields the payoff $b_i(0, 0)$ to both governments. I therefore study the possibilities for cooperation under infinitely repeated interaction. I characterize the public perfect equilibria of this repeated game.[10] That is, players will condition their actions only on the publicly observed history of the game. A public history h^t in period $t \in \{2, \ldots, \infty\}$ of the repeated game is a sequence of actions and reports in periods $1, \ldots, t-1$; $h^1 = (\varnothing)$.

I focus on grim-trigger strategies under which the play starts by cooperation and, after a defection, reverts forever to the Bayesian Nash equilibrium of the stage-game. Since multiple equilibria can be supported by such strategies, I will restrict attention to those that maximize the joint cooperation surplus. An appealing feature of this approach is that it studies strategies under which no gains from cooperation are left unexploited. To keep the meaning of cooperation and communication intuitive in the context of international cooperation, I restrict attention to pure strategy equilibria.

Consider repeated interaction where the expected discounted cooperation surplus of government i is

[10] See Fudenberg, Levine, and Maskin (1994) for a formal definition.

$$V_i \equiv \sum_{t=1}^{\infty} \sum_{j,k} p_{jk} \delta^{t-1} \left[b_i\left(a_1^{jk}, a_2^{jk}\right) - a_i^{jk} c_i \right],$$

where δ denotes a common discount factor $\delta \in [0, 1)$. I will refer to V_i as *the cooperation surplus*, omitting "expected discounted" whenever unambiguous. Rewriting V_i recursively in terms of the stage-game cooperation surplus and the promised cooperation surplus from the next period on yields

$$V_i = \sum_{j,k} p_{jk} \left[b_i\left(a_1^{jk}, a_2^{jk}\right) - a_i^{jk} c_i + \delta V_i^{jk} \right].$$

I refer to the promised cooperation surplus from the next period on, $V_i^{jk} \in [V_i^{Aut}, V_i^{max}]$, as the *continuation payoff*. The lowest self-enforcing continuation payoff under anarchy is the *autarchic cooperation surplus*

$$V_i^{Aut} = \frac{b_i(0, 0)}{1 - \delta}.$$

On the other hand, V_i^{max} is the highest continuation payoff that can be implemented through some assignment of participation levels. Both the stage-game cooperation surplus $b_i(a_1^{jk}, a_2^{jk}) - a_i^{jk} c_i$ and continuation payoffs V_i^{jk} are contingent on cost realizations in the states (j, k). This formulation allows for a convenient representation of the equilibrium cooperation path in terms of stage-game payoffs and continuation payoffs that will recur throughout.

Recognizing the lack of enforcement under anarchy as a fundamental feature of international politics, I require that in no period are the gains from compliance with the assigned equilibrium actions lower than the gains from defection in the current period and the autarchic surplus V^{Aut} forever after. The lack of enforcement under anarchy is then captured by the following *enforcement constraints* for the two governments

$$b_1\left(a_1^{jk}, a_2^{jk}\right) - a_1^{jk} c^j + \delta V_1^{jk} \geq b_1\left(0, a_2^{jk}\right) + \delta V^{Aut} \quad \text{for all } j, k, \qquad \left(enf_1^{jk}\right)$$

$$b_2\left(a_1^{jk}, a_2^{jk}\right) - a_2^{jk} c^k + \delta V_2^{jk} \geq b_2\left(a_1^{jk}, 0\right) + \delta V^{Aut} \quad \text{for all } j, k. \qquad \left(enf_2^{jk}\right)$$

I refer to a cooperation agreement as *self-enforcing* if it satisfies the above constraints. The severity with which the enforcement constraints limit the choice cooperation levels a_i^{jk} varies with cost realizations c_i and continuation payoffs V_i^{jk}. But note that autarchy is trivially self-enforcing since noncooperation by both governments is the equilibrium of the stage-game in all states. In the remainder of the article, I consider only cases when the discount factor δ is large enough that at least one nonautarchic cooperation outcome is self-enforcing.

Agreement Structure under Complete Information

As a benchmark, I first show that when governments perfectly observe each others' costs of cooperation, the optimal cooperation rule does not require full cooperation in each period. Instead, governments would like to reduce the costs of compliance for the government that faces excessive pressures to defect. For example, in the state (H, L), the government facing low costs is better off fully cooperating while allowing the government facing high costs to participate less. However, the lack of enforcement implies that such a cooperation rule will be self-enforcing only if the government that participates fully in the state (H, L) can expect a similar favor in the state (L, H). For some parameter values, this rule allows for cooperation among governments that would not be able to achieve it if the cooperation agreement required full participation in each period. I call a cooperation rule that implements this strategy *domestic conditionality*. The following formalizes this intuition.

I denote the Pareto frontier of the expected discounted cooperation surpluses $V_1(V_2)$. Note that the cooperation surplus of Government 1, $V_1(V_2)$, is written as a function of the cooperation surplus of Government 2, V_2. Given the assumption that at least one nonautarchic surplus is sustainable under anarchy, $V_1(V_2)$ traces a Pareto frontier with the cooperation surplus of Government 1 on the interval $V_1(V_2) \in [V^{Aut}, V_1(V_2^{Aut})]$. $V_1(V_2)$ then corresponds to the Pareto frontier of self-enforcing cooperation agreements. To characterize it, I maximize $V_1(V_2)$ with respect to a_1^{jk}, a_2^{jk}, V_2^{jk} for all j, k, subject to a given level of cooperation surplus of Government 2 and the enforcement constraints

$$V_1(V_2) = \max_{a_1^{jk}, a_2^{jk}, V_2^{jk}} \sum_{j,k} p_{jk} \left[b_1\left(a_1^{jk}, a_2^{jk}\right) - a_1^{jk} c^j + \delta V_1\left(V_2^{jk}\right) \right] \qquad (1)$$

$$\text{subject to} \quad V_2 = \sum_{j,k} p_{jk} \left[b_2\left(a_1^{jk}, a_2^{jk}\right) - a_2^{jk} c^k + \delta V_2^{jk} \right] \qquad (2)$$

$$\text{and } \left(enf_1^{jk}\right), \left(enf_2^{jk}\right), a_1^{jk} \in [0, 1], a_2^{jk} \in [0, 1], \quad V_2^{jk} \in \left[V_2^{Aut}, V_2^{max}\right] \quad \text{for all } j, k.$$

Note that equation (2) constrains the cooperation agreement to deliver a given expected discounted cooperation surplus, V_2, to Government 2. I refer to equation (2) as the *promise-keeping constraint.* There will be a range of self-enforcing cooperation surpluses that can be promised to

Government 2, and it will always contain the autarchic surplus V^{Aut}. V_2 is then a parameter that reflects the division of the cooperation surplus between the two governments. I interpret it as the outcome of bargaining that precedes the actual cooperation. I denote $\bar{V} \equiv V_1(V_2) + V_2$ as the *joint cooperation surplus*. Then a bargain divides the joint cooperation surplus evenly when $V_1(V_2) = V_2$.

Assign λ as the multiplier on the promise-keeping constraint (2). Substitute $b_i(a_1, a_2) = -sa_i + ra_{\sim i}$ and $V^{Aut} = 0$ in the above optimization problem to obtain

$$V_1(V_2) = \max_{a_1^{jk}, a_2^{jk}, V_2^{jk}} \sum_{j,k} p_{jk}\big[a_1^{jk}(\lambda r - s - c^j) + a_2^{jk}(r - \lambda s - \lambda c^k) + \delta V_1\big(V_2^{jk}\big) + \delta\lambda V_2^{jk} - \lambda V_2\big]$$

$$\text{subject to} \quad 0 \le -a_1^{jk}(s + c^j) + \delta V_1\big(V_2^{jk}\big) \quad \text{and}$$

$$0 \le -a_2^{jk}(s + c^k) + \delta V_2^{jk} \quad \text{for all } j, k.$$

Note that λ will always be positive, and $\lambda = 1$ when governments divide the joint cooperation surplus evenly.

Suppose that the governments divide the joint cooperation surplus evenly. Also suppose that the enforcement constraints are not binding. That is, the inequalities (enf_1^{jk}) and (enf_2^{jk}) are strict and do not limit the choice cooperation levels. Then an agreement that achieves the highest joint cooperation surplus instructs governments facing high costs to withdraw from cooperation and governments facing low costs to participate fully. Note it is optimal to set $a_i^{jk} = 1$ when $r - s - c_i \ge 0$ and to set $a_i^{jk} = 0$ when $r - s - c_i < 0$. Recall that $r, s > 0$, $r > s$, $0 < c^L < r - s$, and $c^H > r - s$. Then it is optimal to set $a_i^{jk} = 1$ when the costs of cooperation are low for government i, and to set $a_i^{jk} = 0$ when the costs of cooperation are high for government i. Since this is the unique maximum of the stage-game, optimal continuation payoffs V_i^{jk} will also be unique with $V_i^{jk} = V_1(V_2) = V_2$.

Now consider what happens when the division of the joint cooperation surplus favors one side, that is $V_1(V_2) \neq V_2$. Then in some costs states, governments will have to depart from the rule outlined above and transfer a part of the joint cooperation surplus to the government that is favored by the division. This can be done by decreasing the participation of the government favored by the division when it faces low costs ($a_i^{jk} < 1$) or by increasing the participation of the disadvantaged government when it faces high costs ($a_i^{jk} > 0$). Which is the optimal option depends on the relative wastefulness of the two, but both may be required when the division of the surplus is extremely uneven.

How does the lack of enforcement limit domestic conditionality? When governments divide the joint cooperation surplus evenly, defection brings no benefit in the high costs states since governments do not participate in these states. On the other hand, for some discount factors, enforcement constraints may be binding for governments facing low costs since they participate fully. That is, the government asked to participate fully in this period may not be patient enough to do so in exchange for the promise of receiving a similar favor in the future. However, the same government may be patient enough to participate less than fully, at some $a_i^{jk} < 1$. This is how the lack of enforcement limits domestic conditionality.[11]

When the division of the joint cooperation surplus is uneven, enforcement constraints may be binding in all states and bind the disadvantaged government more severely. Intuitively, an uneven division of the joint cooperation surplus exacerbates the enforcement problem. I summarize these results in the following proposition.

Proposition 1. *Domestic conditionality is the optimal cooperation rule for governments whose costs of cooperation fluctuate over time. The lack of enforcement under anarchy limits the extent of domestic conditionality.*

Note that the argument in this section suggests that governments can "cooperate too much" when cooperation terms require full cooperation in each period. The joint expected cooperation surplus under a "rigid" cooperation agreement that requires full cooperation in each period is

$$\bar{V}^R = \frac{2[1 - c^H + p(c^H - c^L)]}{1 - \delta},$$

when $b_i(a_1^{jk}, a_2^{jk}) = -a_i^{jk} + 2a_{\sim i}^{jk}$, as in the traditional PD, and the cooperation surplus is divided evenly. On the other hand, the joint expected cooperation surplus under a "flexible" cooperation rule that implements domestic conditionality is

$$\bar{V}^{DC} = \frac{2p(1 - c^L)}{1 - \delta}.$$

It can be checked that $\bar{V}^{DC} > \bar{V}^R$. When $c^L = 0.5$, $c^H = 2$, and $p = 0.6$, cooperation under flexible cooperation rules is self-enforcing for $\delta \ge 0.84$. However, a rigid cooperation agreement is not self-enforcing for any $\delta < 1$. This example illustrates that flexible cooperation rules are capable of sustaining cooperation under circumstances when, under rigid cooperation rules, defection by one of the governments would be necessary because of excessively high costs of compliance.

[11] Note that increasing participation of the high costs government to $a_{\sim i}^{jk} > 0$ will not relax i's enforcement constraint, which is independent of government $\sim i$'s level of cooperation.

Agreement Structure under Asymmetries of Information

The previous discussion demonstrated the optimality of domestic conditionality as a cooperation rule, but proceeded under the strong assumption that governments could perfectly observe each others' costs of cooperation. This section will analyze domestic conditionality when governments' information about their own costs of cooperation is *private*. I impose this new, strong assumption in order to highlight the limits to domestic conditionality that result from incentives to misrepresent domestic circumstances. Then in the next section, I consider a more realistic, intermediate case, when a noisy signal of cooperation costs becomes available *after* cooperation choices have been made.

When information about costs is private, enforcing cooperation requires inducing governments *both* to choose the cooperation levels prescribed by the equilibrium *and* to report their costs levels truthfully. Therefore, it is useful to distinguish the following two types of defection. Defection by choosing a lower level of cooperation than prescribed by the equilibrium is perfectly observable to both sides; I call this *noncompliance*. On the other hand, defection by lying about one's costs of cooperation cannot be detected; I refer to this as *misreporting*.

Since noncompliance is publicly observable, the threat of reversion to autarchy guarantees that, in equilibrium, neither government wants to defect by noncompliance if it is sufficiently patient. However, governments have incentives to misreport by announcing high costs since they expect to participate less after such an announcement. In contrast to noncompliance, misreporting is not publicly observable. We should therefore expect governments to anticipate misreporting and design cooperation agreements to prevent such a problem.

In the present context, incentives against misreporting can be provided by conditioning future cooperation benefits on the announcement of present costs. More specifically, in order to induce truthful reporting of cooperation costs, greater future benefits from cooperation can be assigned to governments that report low costs. Or conversely, governments that claim high costs of cooperation may participate less at present, but carry a larger participation burden in the future. Under this incentive structure, misreporting high cooperation costs will not be beneficial since present benefits from cooperation are tied to future ones in a way that makes any misreporting disadvantageous.

The following upward (inc_2^{jL}) and downward (inc_2^{jH}) *incentive* constraints make the provision of incentives against misreporting more precise.[12] For Government 2, the gains from truth telling must be greater than either the gains from overstating (inc_2^{jL}) or the gains from understating (inc_2^{jH}) its costs of cooperation

$$b_2\left(a_1^{jL}, a_2^{jL}\right) - a_2^{jL}c^L + \delta V_2^{jL} \geq b_2\left(a_1^{jH}, a_2^{jH}\right) - a_2^{jH}c^L + \delta V_2^{jH} \quad \text{for all } j, k, \qquad \left(inc_2^{jL}\right)$$

$$b_2\left(a_1^{jH}, a_2^{jH}\right) - a_2^{jH}c^H + \delta V_2^{jH} \geq b_2\left(a_1^{jL}, a_2^{jL}\right) - a_2^{jL}c^H + \delta V_2^{jL} \quad \text{for all } j, k. \qquad \left(inc_2^{jH}\right)$$

Incentive constraints for Government 1 are constructed correspondingly.[13] I call international cooperation agreements that respect these constraints *incentive compatible*.

I show in the appendix that only upward incentive constraints will be relevant under the optimal cooperation rule. That is, governments only need to worry about misreporting that overstates the costs of cooperation when designing cooperation terms. This is quite intuitive: Since domestic conditionality implies that governments facing low costs participate more, governments will never want to understate the costs they face to their cooperation partners.

What are the terms of the most flexible cooperation agreement that satisfies these incentive constraints? Combining upward incentive constraints of both governments at equality, we obtain

$$\begin{aligned} V_1^{HL} \leq V_1^{LL} \leq V_1^{LH},\ V_1^{HL} \leq V_1^{HH} \leq V_1^{LH}, \\ V_2^{LH} \leq V_2^{LL} \leq V_2^{HL},\ V_2^{LH} \leq V_2^{HH} \leq V_2^{HL}. \end{aligned} \qquad (3)$$

Inequalities in (3) imply that after announcing high costs in the state (L, H), Government 2 faces a lower continuation payoff than in the states (L, L) or (H, H) and is assigned the highest continuation payoff in the state (H, L). The lowest continuation payoff V_2^{LH} will be implemented by assigning greater participation to Government 2 in some future period. In other words, inducing truthful communication entails lower agreement flexibility in the future for those that report high costs at present.

Now I turn to the equilibrium behavior that satisfies *both* the incentive *and* enforcement constraints. Recall that under the lack of enforcement, the range of self-enforcing continuation payoffs is bounded both from

[12] Note that these are dominant strategy constraints. These are more appropriate for characterizing international cooperation settings since they do not presuppose institutional guarantees of simultaneous communication.

[13] There is also the possibility that a government would not comply and misreport at the same time. However, this kind of defection is fully captured by the enforcement constraints since the payoff from misreporting is never greater than the payoff from noncompliance.

above and from below. Promising a larger share of the cooperation surplus to one government in the future implies a smaller share for the other government, which may not be patient enough to resist the temptation to defect. But at the same time, the provision of incentives against misreporting requires such a variation in continuation payoffs after different costs announcements. Cooperators will have to take this into account and may have to settle on a less flexible agreement than would be self-enforcing under complete information.

Consider, for instance, an equal division of the cooperation surplus. Under complete information, cooperators are concerned about enforcement only when they face low costs, since that is when they fully participate. But the variation in continuation payoffs represented by the inequalities in (3) implies that now cooperators should also be concerned about Government 1's compliance in any state after the state (H, L) and Government 2's compliance in any state after the state (L, H), since these are the states when one of them could benefit from lying. The implementation of a lower continuation payoff after these states entails a transfer of the cooperation surplus between the two governments in the future, which may intensify the enforcement problem.

The following proposition characterizes how incentives to lie limit the potential for cooperation in terms of the lowest discount factor that achieves a particular joint cooperation surplus.

Proposition 2. *The lowest discount factor that achieves any joint cooperation surplus under asymmetries of information is strictly greater than the corresponding discount factor under complete information.*

Proposition 2 implies that if the cooperating governments are not sufficiently patient, greater participation under adverse domestic circumstances will be required precisely when flexibility would be needed most. As a result, joint gains from cooperation will be smaller, and cooperation agreements that would be signed under complete information will not be feasible under asymmetries of information.

To illustrate the rather abstract intuition about the role of continuation payoffs in the provision of incentives against misreporting, I describe two incentive compatible mechanisms: *restraint* and *rotation*. I chose these because of their intuitive appeal and resemblance to actual cooperation rules. Both restraint and rotation allow the cooperating governments to credibly communicate domestic circumstances despite the fact that domestic shocks are their private information. However, this comes at a cost: After the asymmetric costs states, asymmetric continuation values have to be implemented in order to provide incentives against misreporting. As I argued in this section, this can be achieved only at the cost of some efficiency. The joint cooperation surplus under these mechanisms is therefore lower than the one that would be attainable if information about domestic shocks was public.

To simplify the exposition, I will restrict my attention to scenarios in which the joint cooperation surplus is divided evenly, that is $V_1(V_2) = V_2$, the payoffs in the stage-game are $b_i(a_1^{jk}, a_2^{jk}) = -a_i^{jk} + 2a_{\sim i}^{jk}$ as the traditional PD, and the discount factor δ is high enough so that the enforcement constraints would not be binding under complete information.

Restraint

Restraint is a rule under which the government that was the last to participate less after facing high costs in an asymmetric state cooperates fully, irrespective of its actual costs for a fixed number of periods. Less formally, restraint says, "If you ask for a favor too often, I can't trust that you are not exploiting my good will!" The WTO Agreement on Safeguards mentioned in the introduction is one real-world example of this rule. Another one may be the Luxembourg Compromise of the European Union, where by tacit agreement, the right to veto was invoked only under exceptional circumstances.

Formally, restraint means that the low continuation payoffs, V_1^{HL} and V_2^{LH}, will be implemented by assigning full cooperation in all states and irrespective of cost realizations to the government that reported high costs in an asymmetric state. This regime will be in effect for a given number of periods unless the other government reports high costs in an asymmetric state in the meantime.

Restraint implies the following cooperation surplus for Government 2:

$$\begin{aligned} V_2 = {} & p^2\big[b_2(1,1) - c^L + \delta V_2\big] \\ & + p(1-p)\big[b_2(0,1) - c^L + \delta V_2^{HL}(k)\big] \\ & + p(1-p)\big[b_2(1,0) + \delta V_2^{LH}(k)\big] \\ & + (1-p)^2[b_2(0,0) + \delta V_2], \end{aligned}$$

where $k \geq 1$ is the number of periods during which restraint is exercised. V_1 is defined correspondingly.

Initially, the continuation payoffs assigned in the states (L, L) and (H, H) are the same as in the beginning of the game. However, once the low continuation payoff $V_2^{LH}(k)$ is implemented, the stage-game payoff of Government 2 in the state (L, H) is $b_2(1, 1) - c^H$ instead of $b_2(1, 0)$, and the payoff in the state (H, H) is

$b_2(0, 1) - c^H$ instead of $b_2(0, 0)$. $V_2^{LH}(k)$ lasts for k periods unless the state (H, L) occurs in the meantime. Set $r = \delta(1 - p + p^2)$, then $V_2^{LH}(k)$ is formally captured by

$$V_2^{LH}(k) = \underbrace{\frac{1-r^k}{1-r}\left(p^2\left[b_2(1,1)-c^L\right] + p(1-p)\left[b_2(1,1)-c^H\right] + (1-p)^2\left[b_2(0,1)-c^H\right]\right)}_{\text{“Full participation in the states } (L,L),\,(L,H),\text{ and } (H,H) \text{ for } k \text{ periods”}}$$

$$+ \underbrace{r^k V_2}_{\text{“Return to } V_2 \text{ after } k \text{ periods”}} + \underbrace{\frac{1-r^k}{1-r}\,p(1-p)\left(b_2(0,1) - c^L + \delta V_2^{HL}(k)\right)}_{\text{“Return favor and move to } V_2^{HL} \text{ if } (H,L) \text{ occurs in the meantime”}}.$$

For Government 1, the high continuation payoff $V_1^{LH}(k)$ also lasts for k periods unless the state (H, L) occurs in the meantime, which implies

$$V_1^{LH}(k) = \underbrace{\frac{1-r^k}{1-r}\left(p^2\left[b_1(1,1)-c^L\right] + p(1-p)\left[b_1(1,1)-c^L\right] + (1-p)^2 b_1(0,1)\right)}_{\text{“Domestic conditionality while in the states } (L,L),\,(L,H),\text{ and } (H,H) \text{ for } k \text{ periods”}}$$

$$+ \underbrace{r^k V_1}_{\text{“Return to } V_1 \text{ after } k \text{ periods”}} + \underbrace{\frac{1-r^k}{1-r}\,p(1-p)\left(b_1(0,1) + \delta V_1^{HL}(k)\right)}_{\text{“Receive favor and move to } V_1^{HL} \text{ if } (H,L) \text{ occurs in the meantime”}}.$$

Continuation payoffs in the state (H, L) are defined analogously. Clearly, $V_1^{LH}(k) > V_1^{HL}(k)$ and $V_2^{HL}(k) > V_2^{LH}(k)$.

How long does restraint need to be applied to induce governments to communicate truthfully? Combining the incentive constraints of Government 2, we obtain

$$V_2^{HL}(k) \geq V_2 + \frac{1+c^L}{\delta}, \quad \text{and} \quad V_2^{LH}(k) \leq V_2 - \frac{1+c^L}{\delta}. \tag{4}$$

Analogous expressions can be obtained by combining the incentive constraints of Government 1. For incentive constraints to be satisfied, I find the lowest k for which the inequalities in (4) hold. In addition, I need to check that the enforcement constraints are satisfied. These bind most severely in the state (H, L) for Government 1 when V_1^{HL} is being implemented and in the state (L, H) for Government 2 when V_2^{LH} is being implemented.

For example, when $p = 0.6$, $c^L = 0.5$, $c^H = 1.5$, and $\delta = 0.98$, the lowest k is 8. In that case, after the state (L, H), Government 2 will exercise restraint for the next eight periods unless the state (H, L) occurs in the meantime. If that happens, Government 1 will exercise restraint for the next eight periods unless the state (L, H) occurs in the meantime, and so on.

Rotation

When implementing rotation, the government facing high costs in an asymmetric state withdraws participation only if it is its turn to do so. If it is not its turn, it cooperates fully in all states irrespective of cost realizations. More intuitively, this rule may be described as a “favors regime,” under which the last government to “owe a favor” does not ask for another until it gets a chance to return it. Such a rule may be a good approximation of tacit cooperation rules in diplomatic relations, but also of everyday interpersonal cooperation.

Formally, after the state (L, H) occurs, Government 2 receives a lower continuation payoff, V_2^{LH}, while Government 1 receives a higher continuation payoff, V_1^{LH}. The lower continuation payoff captures the fact that Government 2 “owes a favor” while Government 1 is “expecting to receive one.” When Government 2 “owes a favor” it fully cooperates no matter what costs it faces until the state (H, L) occurs and it gets a chance to “return the favor.” After that, Government 1 “owes a favor” while Government 2 is “expecting to receive one.”

Rotation thus implies that the expected cooperation surplus of Government 2 is

$$\begin{aligned} V_2 = {} & p^2\left[b_2(1,1) - c^L + \delta V_2\right] \\ & + p(1-p)\left[b_2(0,1) - c^L + \delta V_2^{HL}\right] \\ & + p(1-p)\left[b_2(1,0) + \delta V_2^{LH}\right] \\ & + (1-p)^2\left[b_2(0,0) + \delta V_2\right]. \end{aligned}$$

V_1 is defined analogously. Initially, the continuation game after the states (L, L) and (H, H) is identical to the beginning of the game. However, once the state (L, H) occurs, Government 2 “owes a favor” and it receives

$$
\begin{aligned}
&V_2^{LH} \\
&= \underbrace{p^2\left[b_2(1,1) - c^L + \delta V_2^{LH}\right] + p(1-p)\left[b_2(1,1) - c^H + \delta V_2^{LH}\right]}_{\text{“Waiting to return a favor while in the states } (L,\,L) \text{ and } (L,\,H)\text{”}} \\
&\quad + \underbrace{(1-p)^2\left[b_2(0,1) - c^H + \delta V_2^{LH}\right]}_{\text{“Waiting to return a favor in the state } (H,\,H)\text{”}} \\
&\quad + \underbrace{p(1-p)\left[b_2(0,1) - c^L + \delta V_2^{HL}\right]}_{\text{“Favor returned in } (H,\,L)\text{”}}.
\end{aligned}
$$

Conversely, after the state (L, H) occurs, Government 1 "expects a favor " and it receives

$$
\begin{aligned}
V_1^{LH} = &\underbrace{p^2\left[b_1(1,1) - c^L + \delta V_1^{LH}\right] + p(1-p)\left[b_1(1,1) - c^L + \delta V_1^{LH}\right] + (1-p)^2\left[b_1(0,1) + \delta V_1^{LH}\right]}_{\text{“Waiting for a favor while in the states } (L,\,L),\,(L,\,H),\text{ and } (H,\,H)\text{”}} \\
&+ \underbrace{p(1-p)\left[b_1(0,1) + \delta V_1^{HL}\right]}_{\text{“Favor received in } (H,\,L)\text{”}}.
\end{aligned}
$$

Continuation payoffs V_2^{HL} and V_1^{HL} are constructed correspondingly. It can be easily checked that $V_1^{LH} > V_1^{HL}$ and $V_2^{HL} > V_2^{LH}$.

When rotation is implemented, only two continuation payoffs are ever awarded to each government once an asymmetric state occurs. These continuation payoffs are V_1^{LH} and V_1^{HL} for Government 1, and V_2^{LH} and V_2^{HL} for Government 2. This is implied by the idea of rotation: Once the first favor is awarded, somebody either expects a favor or owes one at any later moment during the interaction. Also note that unlike restraint, rotation cannot be calibrated to account for the severity of the incentive or enforcement constraints. Thus for some parameter values, rotation may be either too flexible to prevent misreporting or too rigid to be self-enforcing. A more general version of rotation would permit several high costs announcements before a government loses its turn.

When is rotation sufficient to discourage governments from overstating their actual costs of cooperation? As with restraint, we can combine the incentive constraints of each government and obtain expressions analogous to (4). As before, we also need to check that the enforcement constraints are satisfied. For example, when $p = 0.6$, $c^L = 0.5$, and $c^H = 2$, rotation is self-enforcing and induces truthful communication for $\delta \geq 0.99$.

Political Transparency and the Pattern of Cooperation

The previous two sections analyzed two cases of complete and private information about domestic politics, respectively. I used these to clarify the trade-off between the efficiency of domestic conditionality and the limits to contracting that arise from asymmetries of information about domestic circumstances. This section completes the theoretical argument in this article by establishing continuity between these two cases.

I introduce the possibility that, in addition to messages, an imperfect signal of one of the government costs is observed after the cooperation choices had been made. I demonstrate that cooperation agreements that condition participation on domestic circumstances become feasible under a wider set of circumstances as the informativeness of the signal about domestic circumstances improves.

To focus on the effects of transparency on optimal agreement structure, I consider the interaction between a perfectly transparent regime and one whose costs of cooperation can be only imperfectly observed. I associate the informativeness of a signal about domestic circumstances with the transparency of the agreement issue area. When the costs of cooperation can be plausibly measured as political costs, I suggest that the informativeness of the signal reflects the openness of the political system. This link between political transparency and regime type is consistent with other work that studies the impact of domestic political institutions on international politics (Broz 2002; Fearon 1994; Lipson 2003; Schultz 1998).

Two forms of transparency may be considered in international cooperation scenarios. I refer to *ex ante transparency* as the ability of cooperation partners to observe each others' domestic circumstances after announcing their costs of cooperation but *before* the decision to cooperate is taken. *Ex post transparency* captures the extent to which cooperation partners can observe each others' domestic circumstances *after* both communication and cooperation have occurred. Media reports, parliamentary debates, or electoral results are all examples of informative signals that contribute to ex post transparency when they occur after cooperation choices have been made. In terms of cooperation design, ex post transparency presents a harder case for appropriate incentive provision since any messages about domestic political pressures can be checked against an informative signal only after cooperation choices have been made. I therefore restrict attention to ex post transparency.

I assume that Government 1's costs of cooperation are perfectly observable, while only an imperfect ex post signal of Government 2's costs of cooperation is publicly observed. The signal assumes two values, $\theta \in \{H^*, L^*\}$. Recall that $\pi_i^{c\theta}$ is the probability that a cost signal θ is publicly observed when the actual costs of government i are c. Since it is Government 2's ex post signal that is observed, only $\pi_2^{c\theta}$ is relevant, and I will use $\pi^{c\theta}$ to simplify notation. Note that $\pi^{HH^*} = 1 - \pi^{HL^*}$ and $\pi^{LL^*} = 1 - \pi^{LH^*}$. A completely uninformative signal will therefore be such that $\pi^{HH^*} = \pi^{LL^*} = 1/2$. On the other hand, a signal is perfectly informative when $\pi^{HH^*} = \pi^{LL^*} = 1$. The restriction that π^{HH^*} and π^{LL^*} lie between 1/2 and 1 ensures that the signal is informative, but that Government 1 is never able to perfectly infer Government 2's costs of cooperation from the ex post signal alone. By assumption, a higher publicly observed cost signal is more likely the result of a high rather than a low costs realization. This implies $\pi^{HH^*}/\pi^{LH^*} \geq \pi^{HL^*}/\pi^{LL^*}$ and corresponds to the monotone likelihood property. I will say that a signal is more *informative* when its realization is more sensitive to changes in actual cost levels. I will therefore take the variation of $\pi^{HH^*}/\pi^{LH^*} - \pi^{HL^*}/\pi^{LL^*}$ on the interval $(0, \infty)$ as a measure of informativeness.

The availability of an informative ex post signal implies that continuation payoffs can now be conditioned not only on the announced costs, but also on the ex post signal realization. I therefore rewrite the maximization problem in expectation over the realization of the signal θ. The Pareto frontier of self-enforcing incentive compatible cooperation agreements is now

$$V_1(V_2) = \max_{a_1^{jk}, a_2^{jk}, V_2^{jkk^*}} \sum_{j,k} \sum_{k^*} p_{jk}\big[b_1\big(a_1^{jk}, a_2^{jk}\big) - a_1^{jk} c^j + \delta \pi^{kk^*} V_1\big(V_2^{jkk^*}\big)\big] \tag{1}$$

$$\text{subject to} \quad V_2 = \sum_{j,k} \sum_{k^*} p_{jk}\big[b_2\big(a_1^{jk}, a_2^{jk}\big) - a_2^{jk} c^k + \delta \pi^{kk^*} V_2^{jkk^*}\big] \tag{2}$$

$$b_1\big(a_1^{jk}, a_2^{jk}\big) - a_1^{jk} c^j + \delta \sum_{k^*} \pi^{kk^*} V_1\big(V_2^{jkk^*}\big) \geq b_1\big(0, a_2^{jk}\big) + \delta V^{Aut} \qquad \big(enf_1^{jk}\big)$$

$$b_2\big(a_1^{jk}, a_2^{jk}\big) - a_2^{jk} c^k + \delta \sum_{k^*} \pi^{kk^*} V_2^{jkk^*} \geq b_2\big(a_1^{jk}, 0\big) + \delta V^{Aut} \qquad \big(enf_2^{jk}\big)$$

$$b_2\big(a_1^{jk}, a_2^{jk}\big) - a_2^{jk} c^k + \delta \sum_{k^*} \pi^{kk^*} V_2^{jkk^*} \geq b_2\big(a_1^{j\hat{k}}, a_2^{j\hat{k}}\big) - a_2^{j\hat{k}} c^k + \delta \sum_{k^*} \pi^{kk^*} V_2^{j\hat{k}k^*} \qquad \big(enf_2^{jk}\big)$$

$$\text{and} \quad a_1^{jk} \in [0, 1],\ a_2^{jk} \in [0, 1],\ V_2^{jkk^*} \in \big[V_2^{Aut}, V_2^{max}\big] \quad \text{for all } j, k, k^* \text{ and } \hat{k} \neq k.$$

Above, $V_2^{jLH^*}$ denotes the continuation payoff assigned to Government 2 after it announces low costs, while the publicly observed signal is high. Then $\sum_{k^*} \pi^{Lk^*} V_2^{jLk^*}$ denotes the expected continuation payoff assigned to Government 2 after it announces low costs.

Since continuation payoffs are conditioned on signal realizations that occur *after* cooperation choices have been made, any assigned continuation payoff needs to be self-enforcing ex post. Any self-enforcing cooperation agreement therefore has to respect the following *ex post enforcement* constraints for both governments:

$$V_1\big(V_2^{jkk^*}\big) \geq V^{Aut} \quad \text{for all } j, k, k^*, \qquad \big(\text{ex post-}enf_1^{jkk^*}\big)$$

$$V_2^{jkk^*} \geq V^{Aut} \quad \text{for all } j, k, k^*. \qquad \big(\text{ex post-}enf_2^{jkk^*}\big)$$

The intuition of the argument in this section is as follows. To prevent Government 2 from misreporting, Government 1 compares the costs report to the ex post signal. Then continuation payoffs are assigned so as to make any misreporting unprofitable in expectation. In terms of incentive provision, continuation payoffs $V_2^{jLH^*}$ and $V_2^{jHL^*}$ are punishments for potential misreporting when the signal realization does not correspond to the costs announcement. On the other hand, continuation payoffs $V_2^{jLL^*}$ and $V_2^{jHH^*}$ are rewards for truthfulness when the signal realization is consistent with the costs announcement. As in the previous section, variation in continuation payoffs intensifies the enforcement problem. In the appendix, I show that the only relevant incentive constraint is the upward incentive constraint (inc_2^{jL}), which prevents Government 2 from overstating its costs of cooperation. This constraint binds less severely as $\pi^{HH^*}/\pi^{LH^*} - \pi^{HL^*}/\pi^{LL^*}$, which measures signal informativeness, increases. Greater signal informativeness therefore permits an assignment of punishments and rewards that will satisfy incentive and enforcement constraints for lower discount factors. The following proposition summarizes this result.

Proposition 3. *More transparent governments face greater contracting opportunities.*

Consider the application of the rule *restraint* introduced earlier in order to induce truthful communication by Government 2. In the present scenario, a low continuation payoff is implemented whenever Government 2's report of high costs is inconsistent with the ex post signal realization. Recall that the low continuation payoff

means that Government 2 will "exercise restraint" and participate fully irrespective of its actual costs for a positive number of periods. Suppose that $p = 0.6$, $c^L = 0.5$, $c^H = 2$, and $\delta = 0.98$. Suppose $\pi = \pi^{LL^*} = \pi^{HH^*}$. When $\pi = 2/3$ and the informativeness of the ex post signal is low, the lowest number of periods restraint needs to be exercised in order to prevent misreporting is 4. But then the low continuation payoff under restraint is too low for Government 2 to be willing to comply with the agreement. When the ex post signal informativeness improves to $\pi = 4/5$, the lowest number of periods restraint needs to be exercised in order to prevent misreporting drops to 3. This leads to an increase in the low continuation payoff and Government 2 is now willing to comply with the agreement.

Conclusion

This article presents a general argument that transparent countries face more contracting opportunities than nontransparent ones. While I stressed the transparency of the political process as the key property of democracies, in some cooperation contexts, the transparency of the political system may not be as important as that of certain bureaucracies or industries.

When the connection between transparency and political regime is appropriate, this article provides a new explanation for why democracies cooperate more than authoritarian regimes. In contrast to many explanations in the literature, the present model captures a politically realistic scenario in which even democratic governments may at times politically benefit from a defection on their cooperation agreements. Nonetheless, the agreement terms that democracies face are more flexible than those of autocracies because of their ability to credibly sign cooperation agreements that accommodate political pressures as a part of a flexible agreement.

The second major focus of this article was the design of international agreements when incentives to lie complicate cooperation. A large literature in international politics focuses on the role of international institutions as monitors of cooperation (Keohane 1984). This article takes a different approach by investigating the design of cooperation agreements when information relevant to cooperation cannot be realistically obtained by an international monitor. Domestic political pressures or the productivity of certain industries are two examples of such information. I have shown that the recognition of incentives to lie leads to the design of cooperation rules that can induce truthful communication, and the resulting compliance, even in these settings.

Appendix

Proposition 1. *The optimization problem defined by* (1), (2), *and* (enf_i^{jk}) *is solved by (a)* $a_i^{jk} = 1$ *if* $c_i = c^L$ *and* $a_i^{jk} = 0$ *if* $c_i = c^H$ *for all* i *when no* (enf_i^{jk}) *is binding and* $V_1 = V_2$; *(b)* $a_i^{jk} < 1$ *when* $c_i = c^L$ *or* $a_{\sim i}^{jk} > 0$ *when* $c_{\sim i} = c^H$ *or both when* $V_1 \neq V_2$; *(c)* $a_i^{jk} < 1$ *when* $c_i = c^L$ *or* $a_{\sim i}^{jk} > 0$ *when* $c_{\sim i} = c^H$ *or both when* (enf_i^{jk}) *is binding for some* i.

Proof of Proposition 1. (1) subject to (2) and (enf_1^{jk}) and (enf_2^{jk}) is a linear-programming problem; therefore it suffices to check the corner solutions. We can restrict attention to the choice of a_i^{jk} since for a given V_i, a risk-neutral Government i is indifferent between obtaining V_i through stage-game payoffs or continuation payoffs. By inspection, the optimum in part (a) is unique when no enforcement constraint is binding and $V_1 = V_2$. When $V_1 \neq V_2$ we can show that $a_i^{jk} < 1$ if $c_i = c^L$ and $c^H \geq 2(r - s) - c^L$, and $a_{\sim i}^{jk} > 0$ if $c_{\sim i} = c^H$ and $c^H < 2(r - s) - c^L$, or both. A decrease in a_i by Δ gains $\Delta(s + c^L)$ to i, while $\sim i$ loses Δr, with the joint surplus change $s - r + c^L < 0$. An increase in $a_{\sim i}$ by Δ results in a joint surplus change of $r - s - c^H < 0$. Thus $a_i^{jk} < 1$ when $c_i = c^L$ is optimal if $s - r + c^L \geq r - s - c^H$, that is $c^H \geq 2(r - s) - c^L$. However, both $a_i^{jk} < 1$ if $c_i = c^L$ and $a_{\sim i}^{jk} > 0$ if $c_{\sim i} = c^H$ may be necessary for a large surplus transfer. This proves (b). When (enf_i^{jk}) is binding for some i(c), we need to prove that at most one government's enforcement constraint binds in equilibrium. Note that $V_1(V_2)$ is decreasing in V_2. Then the assumption that at least one nonautarchic cooperation agreement is self-enforcing implies that actions a_1^{jk}, a_2^{jk} and cooperation surpluses $V_1(V_2)$ and V_2 exist such that $V_2 \geq a_1^{jk} r + \delta V^{Aut}$ and $V_1(V_2) \geq a_2^{jk} r + \delta V^{Aut}$, and at least one of these inequalities is strict. Suppose, to the contrary, that both governments' enforcement constraints are binding in some (j, k). Then (enf_1^{jk}) and (enf_2^{jk}) imply $V_2 = -a_2^{jk}(s + c^k) + a_1^{jk} r + \delta V_2^{jk} = a_1^{jk} r + \delta V^{Aut}$. If Government 1's enforcement constraint is binding in (j, k), then $V_1(V_2) = -a_1^{jk}(s + c^j) + a_2^{jk} r + \delta V_1(V_2^{jk}) = a_2^{jk} r + \delta V^{Aut}$. But then neither of the above inequalities is strict, which contradicts the assumption that at least one nonautarchic cooperation agreement is self-enforcing. It can be checked that for i, (enf_i^{jk}) can be binding only when $c_i = c^L$ if $V_1 = V_2$. If $V_1 \neq V_2$, any (enf_i^{jk}) can be binding. a_i^{jk} are then chosen by similar intuition as in part (b).

Proposition 2. *For any self-enforcing joint cooperation surplus* $\bar{V}$, *denote by* δ^{**} *the lowest discount factor that*

achieves $\bar{V}$ under asymmetries of information, and denote by δ^* the corresponding discount factor under complete information. Then $\delta^{**} > \delta^*$.

Proof of Proposition 2. First, I show that, in optimum, downward incentive constraints never bind. Proof is presented for (inc_2^{jH}), proof for (inc_1^{Hk}) is analogous. Substitute $b_i(a_1^{jk}, a_2^{jk}) = -sa_i^{jk} + ra_{\sim i}^{jk}$ into (inc_2^{jL}) and (inc_2^{jH}) and add them to obtain $a_2^{jL}(c^H - c^L) \geq a_2^{jH}(c^H - c^L)$. Since $c^H > c^L$, this implies $a_2^{jL} \geq a_2^{jH}$. Proposition 1 implies that $a_1^{jL} = a_1^{jH}$. Then (inc_2^{jL}) implies $V_2^{jL} \geq V_2^{jH}$. Hold (inc_2^{jL}) at equality and substitute the expression for $V_2^{jL} - V_2^{jH}$ into (inc_2^{jH}). (inc_2^{jH}) then reduces to $a_2^{jL}(c^H - c^L) \geq a_2^{jH}(c^H - c^L)$, which is always satisfied at optimum when $a_2^{jL} \geq a_2^{jH}$. Second, I show that, in optimum, $V_1^{HL} \leq V_1^{LL} \leq V_1^{LH}$, $V_1^{HL} \leq V^{HH}{}_1 \leq V_1^{LH}$, $V_2^{LH} \leq V_2^{LL} \leq V_2^{HL}$, $V_2^{LH} \leq V_2^{HH} \leq V_2^{HL}$. This follows from the result $V_2^{jL} \geq V_2^{jH}$, which implies $V_1(V_2^{jH}) \geq V_1(V_2^{jL})$ as $V_1(V_2)$ is decreasing in V_2. By the same argument, $V_1^{Hk} \leq V_1^{Lk}$ implies $V_2^{Hk} \geq V_2^{Lk}$. Finally, I show that $\delta^{**} > \delta^*$. Fix a joint cooperation surplus $\bar{V}$. Assume that under complete information, the equilibrium actions of government i are denoted $a_i^{jk^*}$ and the equilibrium continuation payoffs are denoted $V_i^{jk^*}$. Consider $i = 2$. Then either (enf_2^{jL}) binds most severely and imply $\delta^* = \frac{a_2^{jL*}(s+c^L)}{V_2^{jL*}}$, or (enf_2^{jH}) binds most severely and imply $\delta^* = \frac{a_2^{jH^*}(s+c^H)}{V_2^{jH^*}}$. Consider the case when $\delta^* = \frac{a_2^{jL*}(s+c^L)}{V_2^{jL*}}$. Hold (inc_2^{jL}) at equality. This implies $V_2^{jL} = V_2^{jH} + \frac{a_2^{jL}(s+c^L)}{\delta}$. Without a loss of generality, set $V_2 = V_2^{LL} = V_2^{HH}$. Suppose (j, H) occurred and V_2^{jH} is implemented. Then by similar argument as in Proposition 1, either $a_2^{jH} > a_2^{jH^*}$ or $a_1^{Lk} < a_1^{Lk^*}$ or both. Suppose $a_2^{jH} > a_2^{jH^*}$. Then (enf_2^{jH}) becomes $-a_2^{jH}(s + c^H) + \delta V_2^{jH} \geq 0$. Substituting $V_2^{jH} = V_2^{jL} - \frac{a_2^{jL}(s+c^L)}{\delta}$, (enf_2^{jH}) becomes $-a_2^{jH}(s + c^H) - a_2^{jL}(s + c^L) + \delta V_2^{LL} \geq 0$. Thus (enf_2^{jH}) binds more severely than (enf_2^{jL}) under complete information, and $\delta^{**} = \frac{a_2^{jH}(s+c^H)+a_2^{jL}(s+c^L)}{V_2^{jL}} > \delta^*$. Now consider $a_1^{Lk} < a_1^{Lk^*}$. Then $V_2^{LL^*}$ decreased to some V_2^{LL} and (enf_2^{LL}) binds more severely compared to when $a_1^{Lk} = a_1^{Lk^*}$. Thus $\delta^{**} = \frac{a_2^{jL}(s+c^L)}{V_2^{LL}} > \delta^*$. Now consider the case when (enf_2^{jH}) binds most severely and imply $\delta^* = \frac{a_2^{jH^*}(s+c^H)}{V_2^{jH^*}}$. Then holding (inc_2^{jL}) at equality implies $V_2^{jH} = V_2^{jL} - \frac{a_2^{jL}(s+c^L)}{\delta} < V_2^{jH^*}$. At the same time, $a_2^{jH} \geq a_2^{jH^*}$. As a result, $\delta^{**} = \frac{a_2^{jH}(s+c^H)}{V_2^{jH}} > \delta^*$. The argument for $i = 1$ is analogous.

Proposition 3. *For any self-enforcing joint cooperation surplus $\bar{V}$, the lowest discount factor that achieves $\bar{V}$, δ^{***}, is decreasing in the ex post signal informativeness $\frac{\pi^{HH^*}}{\pi^{LH^*}} - \frac{\pi^{HL^*}}{\pi^{LL^*}}$.*

Proof of Proposition 3. The proof uses the ex post signal formalization introduced in Riordan and Sappington (1988). I show that an optimal cooperation agreement can be without a loss of generality characterized by constructing a change in Government 2's continuation payoffs that makes its (ex post-$enf_2^{jkk^*}$) constraints hold at equality while keeping the objective function, the promise-keeping constraint, and the incentive constraints unchanged. Then the severity with which Government 1's (ex post-$enf_2^{jkk^*}$) constraints bind depends on the informativeness of the ex post signal. Suppose (ex post-$enf_2^{jLH^*}$) and (ex post-$enf_2^{jHL^*}$) do not hold with equality at optimum. Then make (ex post-$enf_2^{jLH^*}$) and (ex post-$enf_2^{jHL^*}$) hold with equality by setting $V_2^{jLH^*} = V_2^{jHL^*} = V^{Aut}$. Denote the adjustment $\triangle^{jLH^*}$ and $\triangle^{jHL^*}$, respectively. Then, to keep the promise-keeping constraint (2) unchanged, increase $V_2^{jLL^*}$ by $\triangle^{jLH^*}\frac{\pi^{LH^*}}{\pi^{LL^*}}$, and increase $V_2^{jHH^*}$ by $\triangle^{jHL^*}\frac{\pi^{HL^*}}{\pi^{HH^*}}$. This adjustment keeps (enf_2^{jk}) and $(int\text{-}enf_2^{jkk^*})$ unchanged, too. Now, consider the upward and downward incentive constraints (inc_2^{jLk}) and (inc_2^{jHk}). (inc_2^{jLk}) becomes $b_2(a_1^{jL}, a_2^{jL}) - a_2^{jL}c^L + \delta\sum_{k^*}\pi^{Lk^*}V_2^{jLk^*} \geq b_2(a_1^{jH}, a_2^{jH}) - a_2^{jH}c^L + \delta\sum_{k^*}\pi^{Lk^*}V_2^{jHk^*} + \delta\pi^{HL^*}\triangle^{jHL^*}[\frac{\pi^{LH^*}}{\pi^{HH^*}} - \frac{\pi^{LL^*}}{\pi^{HL^*}}]$. Note that $\triangle^{jHL^*} > 0$. The assumption that $\frac{\pi^{HH^*}}{\pi^{LH^*}} \geq \frac{\pi^{HL^*}}{\pi^{LL^*}}$ implies that $\frac{\pi^{LH^*}}{\pi^{HH^*}} - \frac{\pi^{LL^*}}{\pi^{HL^*}} \leq 0$. Therefore (inc_2^{jLk}) is either unchanged or relaxed. (inc_2^{jHk}) becomes $b_2(a_1^{jH}, a_2^{jH}) - a_2^{jH}c^H + \delta\sum_{k^*}\pi^{Hk^*}V_2^{jHk^*} \geq b_2(a_1^{jL}, a_2^{jL}) - a_2^{jL}c^H + \delta\sum_{k^*}\pi^{Hk^*}V_2^{jLk^*} + \delta\pi^{LH^*}\triangle^{jLH^*} \times [\frac{\pi^{HL^*}}{\pi^{LL^*}} - \frac{\pi^{HH^*}}{\pi^{LH^*}}]$. Note that $\triangle^{jLH^*} > 0$. The assumption that $\frac{\pi^{HH^*}}{\pi^{LH^*}} \geq \frac{\pi^{HL^*}}{\pi^{LL^*}}$ implies that $\frac{\pi^{HL^*}}{\pi^{LL^*}} - \frac{\pi^{HH^*}}{\pi^{LH^*}} \leq 0$. Therefore (inc_2^{jHk}) is either unchanged or relaxed, too. The constructed change in Government 2's continuation payoffs either relaxes or keeps all of its constraints unchanged. Now, I show how this change impacts the objective function and the enforcement constraints of Government 1. Denote joint cooperation surplus that obtains when enforcement constraints do not bind by $\bar{V}$. Then $\bar{V} = V_1(V_2^{jkk^*}) + V_2^{jkk^*}$. As a result, the constructed change in Government 2's continuation payoffs results in an increase in $V_1(V_2^{jLH^*})$ and $V_1(V_2^{jHL^*})$. That is $V_1(V_2^{jLH^*} - \triangle^{jLH^*}) = \bar{V} - V_2^{jLH^*} + \triangle^{jLH^*} = V_1(V_2^{jLH^*}) +$

$\triangle^{jLH^*}$ and $V_1(V_2^{jHL^*} - \triangle^{jHL^*}) = \bar{V} - V_2^{jHL^*} + \triangle^{jHL^*} = V_1(V_2^{jHL^*}) + \triangle^{jHL^*}$. On the other hand, $V_1(V_2^{jLL^*})$ and $V_1(V_2^{jHH^*})$ decreased as $V_1(V_2^{jLL^*} + \triangle^{jLH^*}\frac{\pi^{LH^*}}{\pi^{LL^*}}) = \bar{V} - V_2^{jLL^*} - \triangle^{jLH^*}\frac{\pi^{LH^*}}{\pi^{LL^*}} = V_1(V_2^{jLL^*}) - \triangle^{jLH^*}\frac{\pi^{LH^*}}{\pi^{LL^*}}$ and $V_1(V_2^{jHH^*} + \triangle^{jHL^*}\frac{\pi^{HL^*}}{\pi^{HH^*}}) = \bar{V} - V_2^{jHH^*} - \triangle^{jHL^*}\frac{\pi^{HL^*}}{\pi^{HH^*}} = V_1(V_2^{jHH^*}) - \triangle^{jHL^*}\frac{\pi^{HL^*}}{\pi^{HH^*}}$. The constructed change therefore keeps the objective function (1) and Government 1's enforcement constraint (enf_1^{jkk}) unchanged. Moreover, as $V_1(V_2^{jLH^*})$ and $V_1(V_2^{jHL^*})$ increased, (ex post-$enf_1^{jLH^*}$) and (ex post-$enf_1^{jLH^*}$) are relaxed. However, (ex post-$enf_1^{jLL^*}$) and (ex post-$enf_1^{jHH^*}$) tightened. When (ex post-$enf_1^{jLL^*}$) and (ex post-$enf_1^{jHH^*}$) bind, a_2^{jk} must be changed appropriately to satisfy (inc_2^{jLk}) and (inc_2^{jHk}). But note that the downward incentive constraint (inc_2^{jHk}) never binds by the same argument as in Proposition 2. Therefore, the relevant incentive constraint is (inc_2^{jLk}), which depends on $\delta\pi^{HL^*}\triangle^{jHL^*}[\frac{\pi^{LH^*}}{\pi^{HH^*}} - \frac{\pi^{LL^*}}{\pi^{HL^*}}]$, and determines δ^{***}. As signal informativeness improves, $\frac{\pi^{HH^*}}{\pi^{LH^*}} - \frac{\pi^{HL^*}}{\pi^{LL^*}}$ increases, $\delta\pi^{HL^*}\triangle^{jHL^*}[\frac{\pi^{LH^*}}{\pi^{HH^*}} - \frac{\pi^{LL^*}}{\pi^{HL^*}}] < 0$ decreases, which means (inc_2^{jLk}) can be satisfied for lower δ^{***}.

References

Abreu, Dilip, David G. Pearce, and Ennio Stacchetti. 1990. "Toward a Theory of Discounted Repeated Games with Imperfect Monitoring." *Econometrica* 58(5):1041–63.

Alesina, Alberto, and Roberto Perotti. 1996. "Income Distribution, Political Instability, and Investment." *European Economic Review* 40(6):1203–28.

Athey, Susan, and Kyle Bagwell. 2001. "Optimal Collusion with Private Information." *RAND Journal of Economics* 32(3):428–65.

Baron, David P. 1994. "Electoral Competition with Informed and Uninformed Voters." *American Political Science Review* 88(1):33–47.

Bliss, Harry, and Bruce Russett. 1998. "Democratic Trading Partners: The Liberal Connection, 1962–1989." *Journal of Politics* 60(4):1126–48.

Broz, J. Laurence. 2002. "Political System Transparency and Monetary Commitment Regimes." *International Organization* 56(4):861–87.

Dixit, Avinash, and John Londregan. 1996. "The Determinants of Success of Special Interests in Redistributive Politics." *Journal of Politics* 58(4):1132–55.

Dixon, William J., and Bruce Moon. 1993. "Political Similarity and American Foreign Trade Patterns." *Political Research Quarterly* 46(1):5–25.

Downs, George W., and David M. Rocke. 1995. *Optimal Imperfection? Domestic Uncertainty and Institutions in International Relations*. Princeton: Princeton University Press.

Fearon, James D. 1994. "Domestic Political Audiences and the Escalation of International Disputes." *American Political Science Review* 88(3):577–92.

Fearon, James D. 1995. "Rationalist Explanations for War." *International Organization* 49(3):379–414.

Fearon, James D. 1997. "Signaling Foreign Policy Interests: Tying Hands versus Sinking Costs." *Journal of Conflict Resolution* 41(1):68–90.

Fudenberg, Drew, David Levine, and Eric Maskin. 1994. "The Folk Theorem with Imperfect Public Information." *Econometrica* 62(5):997–1039.

Green, Edward J., and Robert H. Porter. 1984. "Noncooperative Collusion under Imperfect Price Information." *Econometrica* 52(1):87–100.

Grossman, Gene M., and Elhanan Helpman. 1996. "Electoral Competition and Special Interest Politics." *Review of Economic Studies* 63(2):265–86.

Keohane, Robert O. 1984. *After Hegemony*. Princeton: Princeton University Press.

Koremenos, Barbara. 2001. "Loosening the Ties That Bind: A Learning Model of Agreement Flexibility." *International Organization* 55(2):289–325.

Koremenos, Barbara, Charles Lipson, and Duncan Snidal. 2001. "The Rational Design of International Institutions." *International Organization* 55(4):761–99.

Lipson, Charles. 2003. *Reliable Partners: How Democracies Have Made a Separate Peace*. Princeton: Princeton University Press.

Mansfield, Edward D., Helen V. Milner, and B. Peter Rosendorff. 2000. "Free to Trade: Democracies, Autocracies, and International Trade." *American Political Science Review* 94(2):305–21.

Mansfield, Edward D., Helen V. Milner, and B. Peter Rosendorff. 2002. "Why Democracies Cooperate More? Electoral Control and International Trade Agreements." *International Organization* 56(3):477–513.

McGillivray, Fiona, and Alastair Smith. 2000. "Trust and Cooperation Through Agent-specific Punishments." *International Organization* 54(4):809–24.

Morrow, James D. 1994. "Modeling the Forms of International Cooperation: Distribution versus Information." *International Organization* 48(3):387–423.

Morrow, James D., Randolph M. Siverson, and Tressa E. Tabares. 1998. "The Political Determinants of International Trade: The Major Powers, 1907–90." *American Political Science Review* 92(3):649–61.

Przeworski, Adam, Michael E. Alvarez, Jose Antonio Cheibub, and Fernando Limongi. 2000. *Democracy and Development*. New York: Cambridge University Press.

Putnam, Robert. 1988. "Diplomacy and Domestic Politics: The Logic of Two-Level Games." *International Organization* 43(3):427–60.

Remmer, Karen L. 1998. "Does Democracy Promote Interstate Cooperation ? Lessons from the Mercosur Region." *International Studies Quarterly* 42(1):25–52.

Riordan, Michael H., and David E. M. Sappington. 1988. "Optimal Contracts with Public ex post Information." *Journal of Economic Theory* 45(1):189–99.

Rosendorff, B. Peter. 2005. "Stability and Rigidity: Politics and Design of the WTO's Dispute Settlement Procedure." *American Political Science Review* 99(3):389–400.

Rosendorff, B. Peter, and Helen V. Milner. 2001. "The Optimal Design of International Trade Institutions: Uncertainty and Escape." *International Organization* 55(4):829–57.

Sappington, David E. M. 1983. "Limited-liability Contracts Between Principal and Agent." *Journal of Economic Theory* 29(1):1–21.

Sartori, Ann E. 2002. "The Might of the Pen: A Reputational Theory of Communication in International Disputes." *International Organization* 56(1):121–49.

Schultz, Kenneth A. 1998. "Domestic Opposition and Signaling in International Crises." *American Political Science Review* 92(4):829–44.

Verdier, Daniel. 1998. "Democratic Convergence and Free Trade." *International Studies Quarterly* 42(1):1–24.