Lies, Defection, and
the Pattern of International Cooperation

Milan Svolik[*]

Department of Political Science

University of Chicago

msvolik@uchicago.edu

First version: May 2003
This version: October 2004

Abstract

This paper gives a new explanation for why democracies cooperate more than authoritarian regimes. I study the optimal structure of international cooperation agreements in an environment where the costs of cooperation fluctuate over time. Cooperation is complicated by the fact that the cooperation costs are private information and only an imperfect public signal is observed in each period after cooperation decisions have been made. I show that the possibility that some governments would misrepresent their domestic circumstances in order to achieve a more favorable cooperation outcome leads to the inability of reaching efficient cooperation outcomes in a range of plausible scenarios. An optimal cooperation agreement between governments which cannot perfectly observe their domestic circumstances entails a trade-off between political efficiency of international cooperation and incentives to misrepresent domestic circumstances. When the extent of asymmetries of information between the cooperating governments can be measured in terms of the transparency of the political process, this argument implies greater contracting opportunities for democracies than authoritarian regimes.

1   Introduction

Several recent empirical findings in the international organization literature indicate that democracies are better cooperators than authoritarian regimes (Bliss and Russett 1998, Morrow, Siverson and Tabares 1998, Mansfield, Milner, and Rosendorff 2000, 2002). Theoretical justifications for this regularity include claims that democracies are better at distinguishing each other's intentions to cheat (Gaubatz 1996), favor voters over special interests (Verdier 1998, Remmer 1998), have advantage at the bargaining stage (Mansfield, Milner, and Rosendorff 2000), create incentives for politicians to comply with treaties (McGillivray and Smith 2000, Mansfield, Milner, and Rosendorff 2002), and benefit from similarity in political system and foreign policy orientation (Dixon and Moon 1993).

Most of these claims are hard to reconcile with the characterization of political competition in democracies. Electoral competition frequently requires that political parties 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). Compliance with international cooperation agreements by democracies should therefore not be easy to achieve even if cooperation is welfare improving. Instead, candidates may face a trade-off between adhering to their international commitments and maximizing the likelihood of remaining in office the next term. In their study of U.S. trade policy, Bayard and Elliot (1994, p. 94) refer to such incentives as the "political cost of compliance" and Robert Putnam calls such politically motivated non-compliance "involuntary defection" (1988, p. 438).

Consider the following recent cases. In 1999, the French government indicated that it might need to postpone its target for a balanced budget under the EMU as a result of electoral pressures on the Gaullist block of President Chirac for tax cuts and domestic security spending increases.[1] In March 2002, President Bush increased steel tariffs to win political support for the coming congressional elections in the

---

[1] Formally, these were the convergence criteria in preparation for the EMU under the Maastricht Treaty. See "In Role Switch, Socialists Fault Chirac Team's Pledge to Spend", *New York Times*, 14 October 1999, A3.

swing states of West Virginia, Pennsylvania and Ohio and violated the WTO trade rules.[2] And in February 2003, several members of NATO limited their support for planning of defense of Turkey in case of a war in Iraq, even after Turkey invoked Article IV of NATO treaty. Germany, France, and Belgium referred to domestic political repercussions their governments faced if they took part in military actions associated with a war in Iraq.[3]

Importantly, we observe institutional arrangements that accommodate electoral pressures to defect from international cooperation. The Luxembourg Compromise of 1966 was an early example of flexibility in international cooperation. Under the Luxembourg Compromise, the EU Council of Ministers would decide by unanimity when "issues very important to one or more members are at stake" (Dinan 1999, p. 49), regardless of whether majority voting applied to the issue. The adjustable peg of the European Monetary System accommodated domestic pressures on exchange rate devaluation by specifying a range of permissible exchange rate fluctuations (Frieden 2002). And the WTO escape clause mechanism allows countries to increase tariffs temporarily if an industry is suffering from a recession (Rosendorff and Milner 2001).

This paper presents a theoretical framework that relates several important facts about international organization to domestic political institutions. In particular, the formal model in this paper demonstrates how: a) governments are able to commit to nontrivial cooperation when incentives to defect fluctuate over time and external enforcement is not available, b) democracies cooperate more and sign more international agreements with each other than authoritarian regimes or mixed dyads, and c) cooperating states form flexible institutional arrangements that induce truthful information sharing even when participants could achieve more favorable outcomes by lying.

I argue that, optimally, governments that face fluctuating cost of compliance over

---

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

[3]In particular, Belgium, who opposed the agreement on assistance to Turkey longest, faced national elections in May with public opinion strongly opposed to the war on Iraq. See "Europe's Groundswell: Public Opinion", *New York Times*, 17 February 2003, A10, and "Schroeder's Antiwar Stance Becomes a Balancing Act", *New York Times*, 20 January 2003, A13.

time sign agreements that take political pressures to defect into account 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 weakest participation requirements on the government that faces the highest cost 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 in a given period. I call the inclusion of such terms in cooperation agreements *domestic conditionality* as they permit cooperators to condition the extent of cooperation on domestic circumstances.

I extend this argument and study how the properties of cooperation agreements change when the cooperating countries differ in political stability. Briefly, when a politically unstable country cooperates with a stable one, it gives up a favorable division of gains from cooperation in favor of higher flexibility of compliance criteria. Another extension concerns cooperation across issue areas with differing conflict of interest. In general, the flexibility of compliance criteria in issue areas that entail greater conflict of interest, such as security affairs, will be limited.

An essential element of conditioning cooperation on domestic circumstances is the need to credibly communicate such information between the cooperating governments. Once governments cannot perfectly observe the domestic circumstances of their cooperation partners, the benefits of flexibility may be compromised by an incentive to misrepresent their private information in order to achieve a more favorable outcome. Consider, for instance, an OPEC member who would like to temporarily exceed its production quota in order to resolve a political crisis or reduce an unexpected budget deficit. Given the critical role of oil production in financing its public expenditures, the OPEC government would politically benefit from a temporary increase in oil production under most circumstances, not only if political pressures were extreme. Therefore, when cooperation may be conditioned on domestic circumstances that are unobservable, governments face incentives to overstate the costs of compliance in their communication.

3

I show 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, a reasonable cost needs to be attached to the messages that the cooperators could benefit from. This can be done by assigning greater future cooperation benefits to those governments that report low cost of compliance than to those that report high cost. However, the difference in future cooperation benefits that can be credibly promised after different reports is limited under the lack of enforcement. If large enough difference in future cooperation benefits cannot be credibly promised, governments facing a favorable shock will want to overstate their cost of compliance. In such a case, the extent of flexibility allowed to governments that report adverse circumstances needs to be reduced. As a result, the optimal cooperation rule under asymmetries of information will be less flexible and the cooperating governments will not take their domestic circumstances fully into account. An optimal cooperation agreement between governments that cannot observe their domestic circumstances therefore entails *a trade-off between political efficiency of cooperation and incentives to misrepresent domestic circumstances.*

I demonstrate how cooperators can design international agreements that prevent misrepresentation between asymmetrically informed states. I study two simple cooperation rules that are self-enforcing and allow for information sharing even when *no information* on domestic shocks is observable across the cooperating governments. The first, *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 rule under which low participation under adverse circumstances is allowed only in turns. More intuitively, both rules capture the common sense that is a part of many everyday interactions. Restraint says, "If you ask for a favor too often, I can't trust that you are not misusing 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 is, "Those who ask for a favor at the wrong time may lose the chance to ask for it when they really need it!" The formal argument in this paper clarifies how these rules induce truthful information-sharing.

Furthermore, I consider the interaction of governments with varying degree of transparency of domestic political environment. I find that the optimal cooperation rule decreases in flexibility as the lack of transparency becomes more severe. Although information can be credibly communicated among less transparent regimes, it comes at the cost of designing less flexible cooperation agreements. In particular, governments facing adverse shocks cannot participate less when they would need it most. Nontransparent governments therefore face more rigid agreement terms, defect on their cooperation agreements more often, 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, this argument implies different contracting opportunities for democracies and autocracies. Democracies are credibly capable of signing agreements that take domestic circumstances into account. On the other hand, the lack of political transparency in autocracies limits their capacity to credibly do so.[4] With respect to the observed cooperation pattern of the two regime types, this argument provides a new explanation for why democracies sign more international agreements, cooperate more, and defect from fewer international agreements than authoritarian regimes.

The formal setting in this paper involves two governments that decide on a level of cooperation in each period of an infinitely repeated game. A domestic variable that impacts the benefits from cooperation, cost of cooperation, is realized each period in each country and fluctuates probabilistically across periods. While the governments observe perfectly the cooperation levels they choose each period, costs of cooperation are their 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 requires that governments facing low cost of cooperation participate more than governments facing high cost.

---

[4] While fluctuations of political pressures in democracies are easily accepted, authoritarian regimes are sometimes misperceived as stable. Haggard and Kaufman (1995) present empirical evidence showing that economic crises in authoritarian regimes strengthen opposition and frequently result in regime change.

This formal setting intends to capture a wide range of international scenarios where a) costs of cooperation are private information and fluctuate over time, b) the extent of cooperation varies over time and across countries, and c) imperfect information about the communicated costs of cooperation is observed only after the cooperation decisions have been made. Some scenarios this formal setting intends to capture are:

- A trade agreement between two countries where the costs of free trade change depending on the political leverage of the import competing sector. In democracies, this can reflect the electoral significance of organized labor or producers, while in autocracies this can be the importance of special interests for the stability of the ruling coalition.[5] Each government can apply a temporary tariff as a part of the trade agreement in case of an adverse political shock. In autocracies, however, the magnitude of political pressures is observed with noise and only after decisions on cooperation have been made.[6]

- International monetary cooperation consisting of coordination of monetary policies and exchange rates where the pressures to devaluate are driven by the proximity of elections or the business cycle. An agreement consists of specifying a limit on government budget deficits or exchange rate variability. Information about political pressures or the business cycle is only imperfectly observed and depends on the transparency of monetary policies across governments.[7]

- Participation in an alliance or a peacekeeping agreement where the costs of supporting a military mission depend on the type of conflict. The costs of participation are distributed unevenly across countries and over time depending on the nature of the conflict, geography, and political relations with the target. Governments choose the amount of troops to contribute depending on the costs, but observe only imperfectly the costs others face.

---

[5] See Dixit and Londregan (1996) for an electoral model of special interests, and Acemoglu and Robinson (2001) and Bueno de Mesquita et al. (2003) for a model of political support in autocracies.

[6] For examples of this setting see Downs and Rocke (1995) and Rosendorff and Milner (2001).

[7] An example of this setting is Frieden (2002).

The paper is organized as follows. In Section 2, I relate my argument and findings to related work in the international organization literature. Section 3 introduces the key elements of the formal model. Section 4 presents a numerical example that highlights the intuition of the formal argument in the following sections. Section 5 studies a model of cooperation under changing domestic circumstances and complete information. In Section 6, I introduce private information and discuss its implications for agreement structure. Section 7 draws the implications of political transparency for contracting opportunities of different regime types. Section 8 concludes. All formal statements of propositions and proofs are in Appendix A. In Appendix B, I re-estimate the empirical results in Mansfield, Milner, and Rosendorff (2002) that provide support for the claim that democracies cooperate more than authoritarian regimes or mixed dyads.

2 Related Literature

Several earlier papers study the impact of domestic politics on the possibilities for international cooperation and effective institutional design. However, the question to what degree the inability to share relevant cooperation information accounts for cooperation failures has been addressed only marginally in the context of international cooperation.

Putnam (1988) points to domestic political environment as a key constraint on the feasibility of international agreements at the bargaining stage. Instead, I study the optimal agreement structure that takes the division of 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 in this paper are preserved under different divisions of cooperation surplus at the bargaining stage.

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.[8] Downs and Rocke build on Green and Porter's (1984) model

---

[8]Koremenos (2001) studies a related aspect of agreement flexibility, duration and renegotiation

of oligopolistic collusion where *imperfect observability of cooperation levels* is at the heart of the contracting problem. In contrast, I focus on the *unobservability of domestic circumstances* as the source of incentives to lie. Such focus is more appropriate empirically as actual cooperation levels are easily observed in most international cooperation scenarios, while domestic circumstances reported in diplomatic communication or agreement disputes are frequently in question.[9] The difference between these two settings is also important from an incentive point of view. Downs and Rocke implement Green and Porter's trigger strategies under which cooperation is suspended for a fixed number "reversionary" periods after a "trigger event." Such strategies are appropriate in settings where cooperators cannot infer with sufficient precision which player defected. When the process generating cooperation relevant information is independent across the cooperators, as is the case of domestic politics in this paper, incentives for truthful communication (or compliance) can be provided by conditioning continuation strategies on (possibly different) signal realizations across the cooperators. Such strategies avoid wasteful "reversionary periods" and expand the potential for cooperation.[10]

Rosendorff and Milner (2001) show that flexible treaty provisions, such as the WTO safeguards, make agreements easier to conclude under the conditions of domestic uncertainty. They also argue that the cost of exercising escapes should optimally balance the frequency of the use of escapes and the benefits from cooperation. The argument in this paper clarifies that no costs need to be associated with flexible compliance provisions when escape provisions relate to circumstances that are observable across the cooperating governments. Furthermore, I explicitly characterize the limits that the potential to exploit institutional mechanisms such as escape provisions under asymmetries of information implies for cooperation in international politics. Finally, this paper also demonstrates how cooperators can design simple rules that impose cost on the use of escapes in terms of future gains from cooperation rather

---

provisions.

[9] For instance, tariffs, exchange rates, or budget deficits are typically either perfectly observable or reported without much contention. On the other hand, political pressures, coalition crises, or industry recessions are much harder to credibly assert.

[10] See Fudenberg, Levine, and Masking (1994) for a general argument.

than monetary transfers. Such strategies 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), I also address the possibility that governments might try to communicate the nature of domestic circumstances in order to achieve more efficient outcomes. In particular, communication allows governments to design cooperation rules under which the benefits from future cooperation can be conditioned on the cost announcements at present. This extension is essential for the implementation of cooperation rules that induce truthful information sharing, such as restraint and rotation. The lack of communication therefore leaves possibilities for efficient cooperation under asymmetries of information unexploited. In that respect, the political environments considered in Downs and Rocke (1995) and Rosendorff and Milner (2001) can be considered special cases of this model when communication cannot occur for exogenous reasons.

Most explicit treatments of communication in international politics have been cast in the costly signaling framework.[11] In contrast, in this paper, communication is costless. Costless communication is natural to consider in the context of international cooperation as it accounts for the large evidence of seemingly costless diplomatic communication. In this environment, cooperation partners face the problem of designing cooperation terms that provide the right incentives for informative communication. In a related paper, Morrow (1994) considers communication as a way of coordinating on efficient cooperation outcomes and shows how incentives to coordinate are compromised by distributional problems. He, however, does not study the enforcement of the underlying coordination outcome and does not draw implications for agreement structure. International agreements studied in this paper are self-enforcing in the sense that no rational government would want defect from them. Furthermore, I derive the properties of international agreements as a result of efficient contracting among governments. In that respect, this paper is related to Downs and Rocke (1995), Koremenos, Lipson, and Snidal (2001), and Rosendorff and Milner (2001).

The repeated political environment considered in this paper allows governments to condition cooperation on the announced history of their domestic circumstances by

---

[11] See, for instance, Fearon (1997), Milner and Rosendorff (1997), and Schultz (1998).

choosing asymmetric levels of cooperation 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. A recursive formulation allows for a convenient characterization of the entire Pareto frontier of cooperation agreements sustainable under the lack of enforcement. The characterization of optimal agreements derived in this way captures the potential variation in bargaining outcomes that precede the beginning of actual cooperation.[12] The treatment of incentive problems associated with asymmetries of information builds on the static mechanism design literature, particularly Baron and Myerson (1982), 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 Masking (1994) and applied in Athey and Bagwell (2001).

I assume that the extent of asymmetries of information about the cost 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 a function of electoral shocks, coalition crises, or union strikes. All of these are public information in most democracies, but have only limited observability in authoritarian regimes. A growing literature in international politics emphasizes the informational role of domestic political institutions in international politics (see e.g. Fearon (1994), Schultz (1999), and Lipson (2003)). This paper contributes to this literature by studying a new mechanism that explains why democracies cooperate more that 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, I also demonstrate how cooperators can design simple cooperation rules that allow for truthful information sharing even when no information on domestic shocks is observable across the cooperating governments. The literature on international organization stresses the role of international institutions in facilitating coop-

---

[12] Although the bargaining stage precedes the actual cooperation stage, conceptually the optimal cooperation structure under *any* division of the cooperation surplus is key understanding what is being divided at the bargaining stage.

eration by monitoring and punishment of defectors (see e.g. Keohane (1984)). The argument in this paper contributes to this literature by emphasizing the design of institutions that cannot be exploited by lying.

3 A Model of International Cooperation under Changing Domestic Circumstances

Assume two governments indexed by i cooperate and each faces costs of cooperation that fluctuate over time. *Cost of cooperation* c_i can be high and low, denoted c^H and c^L respectively, and belong to the set $C = \{c^H, c^L\}$.[13] I index the cost of government one by j and the cost of government two by k. I denote the four possible states (j, k), with (H, L) denoting the state when government one faces high cost while government two faces low cost. The probability of a low cost realization in any period is $\Pr(c_i = c^L) = p$, and the probability of a high cost realization 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 $p < 1/2$ so that high cost realizations are relatively rare.

Cooperation choices are denoted by *actions* $a_i^{jk} \in A$, where A is a finite set on the interval $a_i^{jk} \in [0, 1]$. 0 denotes non-cooperation, 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, $b_i(a_1^{jk}, a_2^{jk}) - a_i c_i$ represents the difference between the *benefits from cooperation* $b_i(a_1^{jk}, a_2^{jk})$ and the *cost of cooperation* c_i weighted by the extent of cooperation a_i of government i in the state (j, k). I refer to $b_i(a_1^{jk}, a_2^{jk}) - a_i c_i$ as the *stage game cooperation surplus*. Benefits from cooperation depend on cooperation levels chosen by both governments in the *Prisoners' Dilemma* (PD) fashion, with

$$b_i(a_1^{jk}, a_2^{jk}) = -sa_i^{jk} + ra_{\sim i}^{jk} \quad \text{for all } r, s > 0 \text{ and } r > s$$

---

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

Note that government 1's benefits from cooperation, $b_1(a_1^{jk}, a_2^{jk})$, is increasing in a_2^{jk} and decreasing in a_1^{jk}, while $b_2(a_1^{jk}, a_2^{jk})$ is increasing in a_1^{jk} and decreasing in a_2^{jk} for government 2.[14] Also, $b_1(0,1) > b_1(1,1) > b_1(0,0) > b_1(1,0)$ for government 1, and $b_2(1,0) > b_2(1,1) > b_2(0,0) > b_2(0,1)$ for government 2, which is the PD payoff ordering. The stage game cooperation surplus then ranges from $b_1(1,0) - c^H$ to $b_1(0,1)$ for player 1, with appropriate substitution in cooperation levels for player 2. The game matrix in Figure 1 illustrates these assumptions.

Figure 1: Payoffs in a generalized Prisoners' Dilemma with variable cost of cooperation

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

Furthermore, I assume the stage game cooperation surplus is such that full cooperation is preferred to autarchy when the cost of cooperation in that period are low, $b_i(1,1) - c^L > b(0,0)$, while autarchy is preferred to full cooperation when the costs of cooperation are high, $b_i(1,1) - c^H < b(0,0)$. This assumption creates incentives for variation in cooperation levels across states and implies $0 < c^L < r - s$ while $c^H > r - s$. To simplify the exposition in some of the examples below, I will use the traditional PD payoffs with $b_i(a_1^{jk}, a_2^{jk}) = -a_i^{jk} + 2a_{\sim i}^{jk}$.[15] In such case, $0 < c^L < 1$ and $c^H > 1$.

In Section 6, 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 they can simultaneously communicate, perhaps untruthfully, the cost of fully cooperating in each period by sending a *message* $m_i^{jk} \in M$,

---

[14] Also note that the assumption $r > s$ implies that cooperation surplus cannot be transferred between governments without a loss, and alternation between $b_i(0,1)$ and $b_i(1,0)$ never yields a joint benefit of more than $2b_i(1,1)$.

[15] That is, $b_2(1,0) = 2, b_2(1,1) = 1, b_2(0,0) = 0, b_2(0,1) = -1$, with corresponding changes for government 1.

with $M = \{H, L\}$. H and L represent announcements of high and low levels of costs of full cooperation, respectively. In section 5, I introduce the possibility that an imperfect *cost signal* $\theta \in \Theta$, where $\Theta = \{H^*, L^*\}$, of each government's costs is observed after cooperation choices had been made. In order for such a signal to be informative, I assume that the high cost signal is more likely a result of high rather than low cost realization in a given country. Let $\pi_i^{c\theta}$ be the probability that a cost signal θ is publicly observed when the true cost of government i is c. Then for $i = 1, 2$ this assumption implies $1/2 < \pi_i^{LL^*} < 1$ and $1/2 < \pi_i^{HH^*} < 1$.

The timing of the stage game in each period captures a setting where governments (i) privately observe their costs of cooperation, (ii) announce their cost of cooperation in that period, (iii) decide on a level of cooperation, and (iv) 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, $\sigma_i^t(\alpha_i, \rho_i)$, chooses a cooperation level a_i^{jk} and a message m_i^{jk} about i's cost realization. The choice of cooperation level α_i is a function of government i's cost 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 cost c_i, $\rho_i : C \to M$.

Since the benefits from cooperation have the structure of Prisoners' Dilemma, the realized costs of cooperation are irrelevant for the perfect Bayesian equilibrium of the stage game, which yields $b_i(0, 0)$ to both governments.[16] I refer to $b_i(0, 0)$ as the *autarchic* stage game payoff. I therefore study the possibilities for cooperation under infinitely repeated interaction. I characterize the public perfect equilibria of this repeated game.[17] That is, players will condition their actions only on the publicly observed history of the game. A public history h^t in period $t \in \{1, 2, ...\infty\}$ of the repeated game is a sequence of actions and reports in periods $1, ..., t - 1$.

I focus on grim-trigger strategies under which the play starts by cooperation and reverts to the perfect Bayesian equilibrium of the stage game forever after a defection.

---

[16] Also note that no informative communication can be implemented in the single shot game as the players' interests are uncorrelated. Cf. Morrow's (1994) application of Crawford and Sobel (1982).

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

Since a multiplicity of equilibria can be supported by such strategies, I will focus on those that maximize the joint cooperation surplus. Such a focus is appealing, since 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 pure strategy equilibria in the repeated game.

Consider repeated interaction where governments maximize the expected discounted cooperation surplus,

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

where δ denotes a common discount factor $\delta \in [0, 1)$. I will refer to V_i as *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,

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

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*. Note that continuation payoffs are bounded from below by V_i^{Aut}, which is the lowest payoff enforceable under anarchy, and bounded from above by some maximum feasible continuation payoff V_i^{max}. Once I characterize the optimal cooperation agreement, I will need to verify that V_i^{jk} are indeed feasible. The highest feasible $V_i^{jk} = V_i^{max}$ will be the upper bound on continuation payoffs for government i. 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 the paper.

Recognizing the lack of enforcement under anarchy as a central feature of inter-

national 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 payoff V^{Aut} forever after. The autarchic payoff is

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

The lack of enforcement under anarchy is then captured by the following enforcement constraints for the two governments:

$$b_1(a_1^{jk}, a_2^{jk}) - a_1^{jk} c^j + \delta V_1^{jk} \geq b_1(0, a_2^{jk}) + \delta V^{Aut} \text{ for all } j, k \qquad (enf_1^{jk})$$
$$b_2(a_1^{jk}, a_2^{jk}) - a_2^{jk} c^k + \delta V_2^{jk} \geq b_2(a_1^{jk}, 0) + \delta V^{Aut} \text{ for all } j, k \qquad (enf_2^{jk})$$

I refer to a cooperation agreement as *enforceable* if it satisfies the above constraints. Note that the severity with which the enforcement constraints bind varies with cost realizations, cooperation levels a_i^{jk}, and continuation payoffs V_i^{jk}. Also note that autarchy is trivially enforceable. In the remainder of the paper, I consider only cases when δ is large enough so that at least one non-autarchic cooperation agreement is enforceable.

4   A Numerical Example

To highlight the intuition behind the formal arguments in the following sections, I present a numerical example. Consider a cooperation setting where the cooperation surplus of government i is $-a_i^{jk} + 2a_{\sim i}^{jk} - a_i^{jk} c_i$. Furthermore, low cost $c^L = 0.5$, high cost $c^H = 1.5$, and the probability of a low cost realization $p = 0.6$. The game matrix in Figure 2 summarizes this setting.

Consider implementing the best joint payoff in this game. Then in the state (L, L), we shall choose the action profile $(1, 1)$ which achieves the joint cooperation surplus of $0.5 + 0.5 = 1$. In the state (H, H), we shall choose the action profile $(0, 0)$ which achieves the joint surplus of 0. In the state (H, L), we shall choose the action profile $(0, 1)$ which achieves the joint surplus of 0.5. And finally, in the state (L, H), we shall

15

Figure 2: An example of Prisoners' Dilemma with variable cost of cooperation

<div align="center">

Government 2

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

</div>

choose the action profile $(1, 0)$ which also achieves the joint surplus of 0.5. Call this strategy *domestic conditionality*.

Under domestic conditionality, the joint expected cooperation surplus in one period will be

$$1p^2 + 0(1-p)^2 + 0.5(1-p)p + 0.5p(1-p) = 0.6$$

Set the common discount factor $\delta = 0.8$. The joint discounted expected cooperation surplus from the repeated game under domestic conditionality, V^{DC}, is

$$V^{DC} = \frac{0.6}{1 - \delta} = 3$$

Compare domestic conditionality to a rigid cooperation rule where governments cooperate each period irrespective of cost realizations. In that case, the joint expected cooperation surplus in one period will be

$$1p^2 - 1(1-p)^2 + 0(1-p)p + 0p(1-p) = 0.2$$

And the joint discounted expected cooperation surplus, V^R, is

$$V^R = \frac{0.2}{1 - \delta} = 1$$

If the cooperating governments divide the cooperation surplus evenly and implement domestic conditionality, the enforcement constraint of each government in the state (L, L) is

$$0.5 + \delta V^{DC} \geq 2 + \delta V^{Aut} \quad \text{where} \quad V^{Aut} = 0$$

Cooperation can then be sustained for $\delta \geq 0.5$. On the other hand when governments use the rigid rule, the enforcement constraint in the state (L, L) is

$$0.5 + \delta V^R \geq 2 + \delta V^{Aut} \quad \text{where} \quad V^{Aut} = 0$$

Cooperation then cannot be sustained for $\delta \leq 1$.[18] Thus domestic conditionality sustains cooperation at discount factors when the rigid rule would fail. A general argument is presented in Section 5.

Now consider what happens when governments have private information about their cost of cooperation and attempt to implement domestic conditionality. In the states (H, L) and (L, H), this rule instructs the government facing high cost to stay out while the low cost government fully participates. Then in the state (L, L), low cost governments may benefit from announcing high cost and avoid participating.

Anticipating this, governments may devise the following cooperation rule called *rotation*: Cooperation starts with both governments implementing domestic conditionality. If government 1 announces high cost in the state (H, L), it benefits from domestic conditionality in that period. However, afterward it participates fully in all states until government 2 announces high cost in the state (L, H). Then the same rule applies to government 2. Less formally, rotation says, "Do not ask for another favor until you get a chance to return the last one!"

At the beginning of the game, the expected discounted cooperation surplus of government 1 from rotation, V_1, is

$$V_1 = p^2(0.5 + \delta V_1) + (1-p)^2(0 + \delta V_1) + (1-p)p(2 + \delta V_1^{HL}) + p(1-p)(-1.5 + \delta V_1^{LH})$$

where V_1^{HL} is the continuation payoff of government 1 after it announced high cost

---

[18]It can be easily checked that the enforcement constraint in the state (L, L) binds most severely.

in the state (H, L). Rotation implies

$$V_1^{HL} = \underbrace{p^2(0.5 + \delta V_1^{HL}) + (1-p)^2(-2.5 + \delta V_1^{HL}) + (1-p)p(-0.5 + \delta V_1^{HL})}_{\text{"waiting to return a favor while in the states } (L,L),\ (H,L),\ \text{and } (H,H)\text{"}}$$
$$+ \underbrace{p(1-p)(-1.5 + \delta V_1^{LH})}_{\text{"favor returned in the state } (L,H)\text{"}}$$

On the other hand, after government 2 announced high cost in the state (L, H), government 1 receives the continuation payoff V_1^{LH},

$$V_1^{LH} = \underbrace{p^2(0.5 + \delta V_1^{LH}) + (1-p)^2(2 + \delta V_1^{LH}) + p(1-p)(0.5 + \delta V_1^{LH})}_{\text{"waiting to receive a favor while in the states } (L,L),\ (L,H),\ \text{and } (H,H)\text{"}}$$
$$+ \underbrace{(1-p)p(2 + \delta V_1^{HL})}_{\text{"favor received in the state } (H,L)\text{"}}$$

Clearly, $V_1^{LH} > V_1^{HL}$, and announcing high cost implies lower future benefits from cooperation. Solving for V_1, V_1^{LH}, and V_1^{HL} we see that $V_1 = 1.17$, $V_1^{LH} = 2.54$, and $V_1^{HL} = -0.54$.

Is rotation sufficient to discourage governments from misrepresenting low cost as high cost? Government 1 will not benefit from lying if in the states (L, L) and (L, H) if

$$0.5 + \delta V_1 \geq 2 + \delta V_1^{HL} \Rightarrow V_1 - V_1^{HL} \geq \frac{1.5}{\delta}$$
$$-1.5 + \delta V_1^{LH} \geq 0 + \delta V_1 \Rightarrow V_1^{LH} - V_1 \geq \frac{1.5}{\delta}$$

At $\delta = 0.8$, $1.5/\delta = 1.88$ and we can easily check that rotation does not satisfies these inequalities. However, at $\delta = 0.95$, $V_1 = 4.20$, $V_1^{LH} = 5.78$, $V_1^{HL} = 2.22$, $1.5/\delta = 1.58$, and rotation satisfies these inequalities. Thus when the governments implement rotation and are patient enough, government 1 will not find it profitable to lie about its cost realizations. Similar argument applies to government 2.

However, note that inducing truth-telling comes at a cost. First, greater patience

18

may be required than under complete information. Thus for some discount factors cooperation will be possible under complete information but not under asymmetries of information. Second, in the periods when government 1 is waiting to "return the favor", the cooperating governments are not implementing actions that would be most efficient under complete information. In turn, efficiency is wasted due to asymmetries of information. A more general argument about the implications of private information for cooperation is presented in sections 6 and 7.

5   Domestic Conditionality under Complete Information

As a benchmark, I first show that when governments can perfectly observe each other's costs of cooperation, the optimal cooperation rule does not require full co-operation in each period. Intuitively, governments would like to reduce cooperation levels in periods when costs of cooperation are high and cooperate more when costs of cooperation are low. That is, in the state (H, L), the government facing low cost is better off fully cooperating while allowing the government facing high cost participate less. However, the lack of enforcement implies that such a cooperation rule will be enforceable only if it can expect a similar favor in the state (L, H). In this way, the cooperation agreement reduces the cost of compliance for the government that faces the greatest pressures to defect. For some parameter values, this rule allows for cooperation among governments that would not be able to cooperate if the cooperation agreement required full cooperation in each period. I call a cooperation rule that implements this strategy *domestic conditionality*. The following formalizes this intuition.

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 non-autarchic payoff 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, 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[19]:

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

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

$$\text{and } (enf_1^{jk}) \text{ and } (enf_2^{jk})$$

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

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 enforceable cooperation surpluses that can be promised to government 2 and it will always contain the autarchic payoff 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 a bargaining that precedes the actual cooperation. Denote $\overline{V} \equiv V_1(V_2) + V_2$ 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 constraint (2), and substitute $b_i(a_1, a_2) = -sa_i + ra_{\sim i}$

---

[19]Such an agreement is *optimal* in the following sense: There exists no other enforceable agreement that would give both governments at least as much expected cooperation surplus at present and at least one government more in later periods.

20

and $V^{Aut} = 0$ in the above optimization problem to obtain

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

$$\text{subject to} \quad 0 \le -a_1^{jk}(s + c^j) + \delta V_1(V_2^{jk}) \quad \text{for all } j, k \qquad (enf_1^{jk})$$

$$0 \le -a_2^{jk}(s + c^k) + \delta V_2^{jk} \quad \text{for all } j, k \qquad (enf_2^{jk})$$

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

Note that λ will always be positive and $\lambda = 1$ when governments divide the joint cooperation surplus evenly. Suppose the enforcement constraints are not binding and $\lambda = 1$. Then it is clearly optimal to set $a_i^{jk} = 1$ when $r - s - c_i \ge 0$ and 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 set $a_i^{jk} = 0$ when the costs of cooperation are high for government i. As this is the unique maximum of the stage game, optimal continuation payoffs V_i^{jk} will be unique, too, 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, i.e. $V_1(V_2) \ne V_2$ and $\lambda \ne 1$. Then in some state, governments will have to depart from the rule outlined above to transfer a part of the joint cooperation surplus to the government that is favored by the division. A government that departs from the above optimum by Δ in a low cost state, i.e. decreases its participation to some $a_i < 1$, gains $\Delta(s + c^L)$, while the other government loses Δr. This entails a loss of some joint cooperation surplus as $c^L < r - s$ implies that $\Delta(s + c^L) - \Delta r < 0$. If a government departs from the above optimum in a high cost state, i.e. increases its participation to some $a_i > 0$, it loses $\Delta(s + c^H)$, while the other government gains Δr. But as $c^H > r - s$, $\Delta r - \Delta(s + c^H) < 0$.[20]

Therefore, an agreement that instructs governments to participate fully in the state (L, L), suspend cooperation in the state (H, H), instructs the high cost govern-

---

[20]In the present setting, the only way to implement an uneven division of cooperation surplus is through asymmetric action choices. If additional actions could be introduced, such as transfers of utility, uneven division of surplus would not have to entail a loss of joint cooperation surplus.

ment to withdraw from cooperation and the low cost government to keep cooperating in the asymmetric states (H, L) and (L, H), and divides the joint cooperation surplus evenly, achieves the highest joint cooperation surplus. I refer to an international agreement structure that has these properties as *unconstrained domestic conditionality* and denote a government's cooperation surplus under this rule V^*. Any departure from this rule entails inefficiency.

How does the lack of enforcement limit domestic conditionality? Note that given the assumption that at least one non-autarchic payoff is sustainable in the repeated game, only one government's enforcement constraints can bind at a time in optimum.[21] When governments divide the joint cooperation surplus evenly, defection brings no benefit in the high cost states as governments do not participate in these states. For some discount factors therefore, enforcement constraints may bind for low cost governments. To satisfy them, the low cost government will have to participate at $a_i < 1$, which limits domestic conditionality.[22] When the division of the joint cooperation surplus is uneven, enforcement constraints may bind in all states and bind more severely for the disadvantaged government. Intuitively, uneven division of the joint cooperation surplus places greater requirements on the enforcement of cooperation by the disadvantaged side. I summarize these results in the following proposition.

Proposition 1. *Domestic conditionality is the optimal cooperation rule between governments whose cooperation costs fluctuate over time. Governments facing high cost participate less then governments facing low costs. The lack of enforcement under anarchy limits the extent of domestic conditionality.*

Note that the argument in this section suggests that under complete information governments can "cooperate too much" if faced with an agreement that stipulates full cooperation in each period. The joint expected cooperation surplus under a "rigid" cooperation agreement that requires full cooperation in each period is $\overline{V}^R = 2[p(1 - c^L) + 2(1 - p)(1 - c^H)]/(1 - \delta)$, when $b_i(a_1^{jk}, a_2^{jk}) = -a_i^{jk} + 2a_{\sim i}^{jk}$ as in the

---

[21] See Lemma 1 in the Appendix.

[22] Note that increasing the high cost government's participation to $a_i > 0$ will not work as government i's enforcement constraint is independent of government $\sim i$'s level of cooperation.

traditional PD and surplus is divided evenly. On the other hand, the joint expected cooperation surplus under "flexible" cooperation rules that implement unconstrained domestic conditionality is $\overline{V}^{DC} = 2p(1 - c^L)/(1 - \delta)$. Since $1 - c^H < 0$, $\overline{V}^{DC} > \overline{V}^R$. Enforcement constraints therefore bind more severely under rigid cooperation rules. As a result, flexible cooperation rules that implement domestic conditionality 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.

5.1 Political Instability and the Structure of Cooperation Agreements

What happens when the cooperating countries differ in the frequency or magnitude of adverse shocks they face over time? Both factors capture some aspects political instability in the cooperating countries.[23] I now show that less stable governments prefer more flexible agreement structure than stable ones. As a result, they face a *trade-off between flexible agreement terms and a favorable division of cooperation gains.*

Both, the frequency of adverse shocks, $1 - p$, and their magnitude, c^H, make domestic conditionality more desirable. In terms of the comparison between rigid and flexible cooperation rules above, the difference between $\overline{V}^{DC}$ and $\overline{V}^R$ is increasing in the probability of high cost $1-p$ and the magnitude of c^H. *Rigid rules therefore become less efficient as the probability and magnitude of adverse shocks increases.* Empirically, this argument implies that cooperation agreements among unstable governments or in volatile issues areas incorporate extensive provisions for domestic conditionality.

When the levels of political stability in the interacting countries are uneven, the less stable government suffers adverse shocks more often, and wants to withdraw

---

[23]This formalization of political instability intends to capture domestic factors relevant to this model of international cooperation, such as changes in government or policy preferences. It does not map conveniently on some other measures of political instability, such as social unrest, constitutional changes, or political violence that have been used in comparative politics. See, e.g., Przeworski at al. (2000).

from cooperation more often. Such a cooperation regime entails lower cooperation surplus for the stable government than if both governments' frequency of adverse shocks was equal.[24] To implement a particular division cooperation surplus given by V_1 and V_2, the more stable government has to be compensated for the loss in cooperation surplus that results from more frequent participation withdrawals by the less stable government. Therefore, an optimal cooperation agreement between governments of unequal political stability provides the unstable government with more flexible agreement compliance criteria, while the stable government receives a more favorable stage game cooperation surplus over time.

5.2 Conflict of Interests and the Flexibility of Compliance Provisions

So far, the argument has not been specific about the relevance of the cooperation issue area for agreement structure. Recall that domestic conditionality entails nonparticipation by the government facing high cooperation costs in the asymmetric cost states. The enforceability of domestic conditionality in these states therefore depends on the cost of nonparticipation to the low cost government, as only this one participates in an asymmetric cost state.

Consider the state (L, H). The enforcement constraint of government 1 is

$$0 \leq -a_1^{LH}(s + c^L) + \delta V_1(V_2^{LH}) \qquad (enf_1^{LH})$$

Optimally, when enf_1^{LH} does not bind, $a_1^{LH} = 1$. The severity with which enf_1^{LH} binds depends on $-s$, the (negative) benefit from cooperation government 1 obtains when government 2 does not participate.[25] More substantively, s represents the cost of defection and captures a key element of the *conflict of interest* in cooperation. In the present setting, s also reflects the implications of the conflict of interest for enforceability of domestic conditionality. That is, *as the conflict of interest deepens,*

---

[24] This follows directly from the formulation in equations (1) and (2).

[25] Note that the enforcement constraint of government 2, enf_2^{LH}, never binds in the state (L, H) as it is $0 \leq \delta V_2^{LH}$. Analogous situation obtains in the state (H, L).

domestic conditionality is harder to achieve under the lack of enforcement.

Substantively, costs of defection are usually assumed to be greater in security than in economic cooperation.[26] Flexible treaty provisions should therefore be observed more often in economic than security agreements. This conclusion complements Lipson's (1984) argument about different institutional arrangements in economic and security cooperation, and is consistent with qualitative evidence on flexible treaty provisions across economic and security affairs.[27]

6 Domestic Conditionality under Asymmetries of Information

The previous discussion has demonstrated the optimality of domestic conditionality but proceeded under the strong assumption that governments could perfectly observe each other's costs of cooperation. This section will analyze domestic conditionality when governments' information about costs of cooperation is *private*. That is, neither government can observe the other's cost of cooperation. I impose this strong assumption in order to highlight the limits to domestic conditionality that result from incentives to misrepresent domestic circumstances. Then in Section 7, I consider a more realistic intermediate case, when a noisy signal of cooperation costs becomes available *after* cooperation choices have been made.

In the current setting, enforcing cooperation includes inducing governments *both* to choose the cooperation levels prescribed by the equilibrium and to report their cost levels truthfully. Therefore, it is useful to distinguish the following two types of defections. Defection by choosing a lower level of cooperation than prescribed by the equilibrium that is perfectly observable to both sides, I call it *non-compliance*. On the other hand, defection by overstating one's cost of cooperation that cannot be detected, and I refer to it as *misreporting*.

---

[26]However, I am not aware of any systematic empirical comparison between the monetary cost of defection in security versus economic affairs.

[27]See, for instance, the discussion of empirical evidence in Koremenos (2001), Koremenos, Lipson, and Snidal (2001), and Rosendorff and Milner (2001).

Since non-compliance is publicly detectable, the threat of reversion to autarchy guarantees that, in equilibrium, neither government wants defect by non-compliance if sufficiently patient. On the other hand, governments have incentives to misreport by announcing high cost as they expect to participate less after such an announcement. We should then expect governments to anticipate misreporting and design cooperation agreements to prevent such a problem. The Revelation Principle implies that any cooperation agreement that involves communication can be characterized, without any loss of generality, by strategies under which both governments report their costs truthfully.[28] In the present context, incentives against misreporting can be provided by conditioning future cooperation benefits on the announcement of present costs. In particular, greater future benefits from cooperation can be assigned to the government that reports low cost in order to induce it to report its cooperation costs truthfully. Or conversely, governments that claim high cost of cooperation participate less at present, but carry a larger participation burden in the future. Under this incentive structure, misreporting high cooperation cost will not be beneficial as present benefits from cooperation are tied to future ones in such a way as to make any misreporting disadvantageous.

The following upward (inc_2^{jL}) and downward (inc_2^{jL}) *incentive* constraints make the provision of incentives against misreporting more precise. For government 2, gains from truth-telling must be greater than gains from misreporting,

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

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

Incentive constraints for government 1 are constructed correspondingly.[29] I call international cooperation agreements that respect these constraints *incentive compatible*.

Since domestic conditionality implies that low cost governments participate more, governments will never want to claim low cost when they face high cost. Therefore,

---

[28] See e.g. Myerson (1986).

[29] There is also the possibility that a government would non-comply and misrepresent at the same time. However, this kind of defection is fully captured by the enforcement constraints as the stage game benefit from misreporting is never greater than the stage game benefit from non-compliance.

only upward incentive constraints will be relevant under the optimal cooperation rule.[30] Combining upward incentive constraints of both governments at equality we obtain

$$V_1^{HL} \leq V_1^{LL} \leq V_1^{LH}, \ V_1^{HL} \leq V_1^{HH} \leq V_1^{LH}$$
$$V_2^{LH} \leq V_2^{LL} \leq V_2^{HL}, \ V_2^{LH} \leq V_2^{HH} \leq V_2^{HL} \tag{3}$$

Inequalities (3) confirm the intuition about the role of continuation payoffs in incentive provision outlined in this section.[31] After announcing high cost in the state (L, H), government 2 faces lower continuation payoff than in the states (L, L) or (H, H) and is assigned the highest continuation payoff in the state (H, L).

Now, I turn to the equilibrium behavior that satisfies both the incentive *and* enforcement constraints. Two causes limit domestic conditionality under asymmetries of information. First, under the lack of enforcement, the range of self-enforcing continuation payoffs is bounded both from above and below. At the same time, provision of incentives against misreporting requires variation in continuation payoffs after different cost reports. The extent of domestic conditionality will be therefore constrained by the limits that the lack of enforcement imposes on the spread of continuation payoffs.

Second, any asymmetry in continuation payoffs can be achieved only at the cost of efficiency. Recall that the unique efficient expected discounted cooperation surplus V^* involves implementing optimal actions in each state. In order to achieve some $V < V^*$, cooperation surplus needs to be transferred between the two governments in some stage game. But this cannot be done without a loss of efficiency as shown in Section 5. For instance, in order to implement $V_2^{LH} < V^*$ in some stage game, this can be done by only by assigning $a_2 > 0$ in the states (L, H) and (H, H), or $a_1 < 1$ in the state (L, L). By the argument in Section 5, any of these results in inefficiency. Therefore, when inequalities (3) hold, $V_1^{LH} + V_2^{LH} < 2V^*$ and $V_1^{HL} + V_2^{HL} < 2V^*$, and only limited domestic conditionality is feasible in these states.

How do enforcement constraints interact with incentive constraints? Inequalities (3) imply that a spread in continuation payoffs is necessary to satisfy incentive

---

[30] See Lemma 3 in the Appendix.
[31] See Lemma 4 in the Appendix.

constraints. When compared to the complete information case, where continuation payoffs were constant on the equilibrium path, incentive constraints impose additional requirements on enforcement. Consider an equal division of the cooperation surplus. Under complete information, only enf_2^{LL} and enf_2^{HL} can be the binding constraints of government 2 as these are the only states when government 2 participates. Equations (3) however imply that enf_2^{HL} is relaxed, enf_2^{LH} is tightened, and enf_2^{LL} remains unchanged by the introduction of incentive constraints. In the Appendix, I show that, δ^I, the lowest discount factor under which a given cooperation surplus can be implemented under incomplete information, is strictly greater than δ^*, the corresponding discount factor under complete information. As a result, for some discount factors, domestic conditionality under asymmetries of information is more limited than under complete information.

These results imply that greater participation than optimal will be required from high cost governments when flexibility would be needed most. As a result of this inefficiency, joint gains from cooperation are smaller than under complete information. Thus for certain discount factors, cooperation would be feasible under complete information, but cannot be achieved under asymmetries of information. I summarize these results in the following proposition.

Proposition 2. *Asymmetries of information limit the extent of domestic conditionality. The lowest discount factor that achieves a given cooperation surplus under asymmetries of information is greater than the corresponding discount factor under complete information.*

To illustrate the rather abstract intuition about the role of continuation payoffs in the provision of incentives against misreporting, I will now describe two incentive compatible mechanisms for implementing domestic conditionality: *restraint* and *rotation*. I chose these because of their intuitive appeal and resemblance to some cooperation rules observed in international organization. Both restraint and rotation allow the cooperating governments to credibly communicate domestic circumstances despite the fact that domestic shocks are their private information. This however comes at a cost. After the asymmetric cost states, asymmetric continuation values

28

have to be implemented in order to provide incentives against misrepresentation. As I argued in this section, this can be achieved only at the cost of some inefficiency. 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 consider the implementation of domestic conditionality when the joint cooperation surplus is divided evenly, i.e. $V_1(V_2) = V_2$, stage game payoffs are $b_i(a_1^{jk}, a_2^{jk}) = -a_i^{jk} + 2a_{\sim i}^{jk}$, and δ is high enough for enforcement constraints not to bind.

6.1 Restraint

Restraint is a rule under which the government that was the last to withdraw from cooperation after facing high cost in an asymmetric state cooperates fully irrespective of its cost realization 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 misusing my good will!" Such a rule may characterize the application of the Luxembourg Compromise in the European Union, where by tacit agreement, the right to veto was invoked only under exceptional circumstances.

In our formal setting, after one of the governments takes advantage of domestic conditionality in an asymmetric state, the low continuation payoffs V_1^{HL} and V_2^{LH} will be implemented. These require full cooperation by the government last to use domestic conditionality in all states irrespective of cost realizations for a given number of periods unless the other government takes advantage of domestic conditionality in the meantime.

Restraint implies the following cooperation surplus for government 2

$$V_2 = p^2 V_2 + p(1-p)V_2^{HL}(k) + p(1-p)V_2^{LH}(k) + (1-p)^2 V_2$$

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

For government 2, once the low continuation payoff V_2^{LH} is implemented, the stage game payoff in the state (L, H) is $b_2(1, 1) - c^H$ instead of $b_2(1, 0)$, and the payoff in

29

the state (H, H) is $b_2(0, 1) - c^H$ instead of $b_2(0, 0)$. This implies

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

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

For government 1, the high continuation payoff V_1^{LH} is

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

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

Continuation payoffs in the state (H, L) are defined analogously.

It remains to characterize the number of periods restraint needs to be applied. Combining the incentive constraints of government 2 we obtain

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

For incentive constraints to hold, find minimum k for which V_2, V_2^{LH}, and V_2^{HL} satisfy the inequalities in (4). For example, for $p = 0.6$, $c^L = 0.5$, $c^H = 1.5$, and $\delta = 0.8$, minimum k for which (4) are satisfied is 3. Therefore, after the state (L, H), government 2 will exercise restraint for the next three periods unless the state (H, L) occurs in the meantime. In such case, government 1 will begin exercising restraint for the next three periods unless the state (L, H) occurs in the meantime, and so on.

30

6.2 Rotation

When implementing rotation, the government facing high cost in an asymmetric state withdraws participation only if it is its turn. 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", where 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.

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 the government 2 "owes a favor" while government 1 is "expecting to receive one". On the other hand, after the state (H, L), government 2 receives a higher continuation payoff V_2^{HL}, while government 1 receives a lower continuation payoff V_1^{HL}. Now, government 1 "owes a favor" while government 2 is "expecting to receive one". Rotation then implies that the expected cooperation surplus of government 2 is

$$V_2 = p^2[b_2(1,1) - c^L + V_2] + p(1-p)[b_2(0,1) - c^L + V_2^{HL}] + p(1-p)[b_2(1,0) + V_2^{LH}]$$
$$+ (1-p)^2[b_2(0,0) + V_2]$$

V_1 is defined analogously.

After the state (L, H) occurs, government 2 "owes a favor" and it receives

$$V_2^{LH} = \underbrace{p^2[b_2(1,1) - c^L + V_2^{LH}] + p(1-p)[b_2(1,1) - c^H + V_2^{LH}] + (1-p)^2[b_2(0,1) - c^H + V_2^{LH}]}_{\text{Waiting to return a favor while in the states } (L,L), (L,H), \text{ and } (H,H)}$$
$$+ \underbrace{p(1-p)[b_2(0,1) - c^L + V_2^{HL}]}_{\text{Favor returned in } (H,L)}$$

On the other hand, after the state (L, H) occurs, government 1 "expects a favor" and

31

it receives

$$V_1^{LH} = \underbrace{p^2[b_1(1,1) - c^L + V_1^{LH}] + p(1-p)[b_1(1,1) - c^L + V_1^{LH}] + (1-p)^2[b_1(0,1) + V_1^{LH}]}_{\text{Waiting for a favor while in the states } (L,L), (L,H), \text{ and } (H,H)}$$

$$+ \underbrace{p(1-p)[b_1(0,1) + V_1^{HL}]}_{\text{Favor received in } (H,L)}$$

Continuation payoffs V_2^{HL} and V_1^{HL} are constructed analogously.

Note that 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} to government 1, and V_2^{LH} and V_2^{HL} to 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 not be sufficient to prevent misreporting. A numerical example of this mechanism was presented in section 4.

7   The Potential for Cooperation and Political Transparency

Sections 5 and 6 analyzed two benchmark 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 paper by establishing continuity between these benchmark cases. I demonstrate that greater degree of domestic conditionality is sustainable as more information about domestic circumstances becomes available. That is, implementing international agreements where communication allows governments to condition cooperation on domestic circumstances becomes easier as the informativeness of the signal about domestic circumstances improves. In particular, domestic

conditionality becomes feasible for a larger set of discount factors, cooperation surpluses, and interactions with more pronounced conflict of interest or greater political instability.

I associate the informativeness of a signal about domestic circumstances with the transparency of the agreement issue area. When costs of cooperation can be plausibly captured as political cost, I suggest the informativeness of the signal reflects the openness of the political system. Autocracies without parliaments can be thought of as least informative, while established parliamentary democracies as the most informative political systems. Therefore, among governments of moderate patience, gains from cooperation will be lower for autocracies, and they will be able to sign fewer agreements that allow for conditioning of cooperation on domestic circumstances than democracies.

To isolate 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. Two forms of transparency can be considered in international cooperation scenarios. I refer to *ex ante transparency* as the ability of cooperation partners to verify domestic circumstances before the decision to cooperate is taken. *Ex post transparency* captures the extent to which an outside observer can infer, perhaps imperfectly, the true value of domestic circumstance once cooperation occurred. The two types may be present in different extent in different regime types. Transparency of policy making and freedom of press improve *ex ante* transparency. Elections and parliamentary debates, when they occur after cooperation choices have been made, are sources of *ex post* transparency. In this case, any claims about political pressures made prior to cooperation occurred can be checked against information that comes to light after cooperation occurred. From the point of incentive provision, *ex post* transparency presents a harder case as the informative signal becomes available only once cooperation choices have been made. To keep the formal exposition as simple as possible, I therefore focus on *ex post* transparency, assuming governments ignore any *ex ante* signals when making cooperation choices.[32]

---

[32] The claim in this section would be strengthened by considering *ex ante* transparency as well. This analysis should therefore be viewed as presenting a conservative conclusion about the impact of

I assume 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 true cost of government i is c. As it is government 2's *ex post* signal that is observed, only $\pi_2^{c\theta}$ is relevant, and 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, for a perfectly informative signal, and thus perfect transparency, $\pi^{HH*} = \pi^{LL*} = 1$. The variation of π^{HH*} and π^{LL*} on the open interval $(1/2, 1)$ ensures that government 1 is never able to perfectly infer the cost of cooperation of government 2 from *ex post* signal outcomes. By assumption, higher publicly observed cost signal is more likely a result of high rather than low cost realization, which implies $\frac{\pi^{HH*}}{\pi^{LH*}} \geq \frac{\pi^{HL*}}{\pi^{LL*}}$ and corresponds to the monotone likelihood property.[33] I will say that a signal is more *informative* when its realization is more sensitive to changes in true cost levels. I will therefore take the variation of $\frac{\pi^{HH*}}{\pi^{LH*}} - \frac{\pi^{HL*}}{\pi^{LL*}}$ on the interval $(0, \infty)$ as a measure of informativeness.

Now that continuation payoffs can be conditioned not only on the announced cost but also on *ex post* signal realization, the maximization problem needs to be rewritten in expectation over the realization of the signal θ for government 2. The Pareto frontier of self-enforcing cooperation agreements is now

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

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

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

transparency on the efficiency of cooperation agreements. See Boyer and Laffont (2003) for a static setting with *ex ante* informative signals.

[33] See Milgrom (1981) for more details on the monotone likelihood property.

and the following enforcement and incentive constraints:

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

$$(enf_1^{jkk^*})$$

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

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

$$\text{for all } j, k, k^* \text{ and } k \neq \hat{k} \qquad (inc_2^{jkk^*})$$

after it announces low cost and the publicly observed signal is H^*. Then $\sum_{k^*} \pi^{Lk^*} V_2^{jLk^*}$ denotes the expected continuation payoff assigned to government 2 after it announces low cost and the publicly observed signal is k^*.

Since continuation payoffs are conditioned on cost signal realizations that occur *after* cooperation choices have been made, any assigned continuation payoff needs to be enforceable *ex post*. I therefore consider the following *ex post enforcement* constraints for both governments

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

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

The intuition of the argument in this section is as follows. To prevent government 2 from misreporting, its cost announcement is compared to an *ex post* public signal correlated with the true cost level and continuation payoffs are awarded so as to make any misreporting unprofitable in expectation. From the point of incentive provision, continuation payoffs $V_2^{jLH^*}$ and $V_2^{jHL^*}$ are punishments for misreporting, while continuation payoffs $V_2^{jLL^*}$ and $V_2^{jHH^*}$ are rewards for truthfulness. Greater signal informativeness permits a schedule of punishments and rewards that will respect incentive and enforcement constraints for lower discount factors. Therefore, as signal informativeness improves, unconstrained domestic conditionality can be implemented

under conditions that impose greater requirements on enforcement.

To highlight the implications of political transparency, consider how the optimal level of domestic conditionality changes as signal informativeness improves. In the Appendix, I show that the problem of designing an incentive compatible agreement can be without a loss of generality simplified by *awarding governments whose signal realizations are least likely the lowest enforceable continuation payoffs*. That is, $V_2^{jLH^*}$ and $V_2^{jHL^*}$ are designed so that ex post-$enf_2^{jLH^*}$ and ex post-$enf_2^{jHL^*}$ hold with equality, while $V_2^{jLL^*}$ and $V_2^{jHH^*}$ are adjusted to keep the optimization problem unchanged. I show that the relevant incentive constraint is $inc_2^{jLk^*}$, and it binds less severely as $\frac{\pi^{LH^*}}{\pi^{HH^*}} - \frac{\pi^{LL^*}}{\pi^{HL^*}}$, which is negative, decreases. The limits that asymmetries of information present on optimal contracting can thus be expressed in terms of *ex post* signal informativeness. The following proposition summarizes this result.

Proposition 3. *The extent of domestic conditionality increases with transparency.*

A corollary of Proposition 3 is that transparent governments are more attractive cooperation partners. Since less transparent governments are more constrained by the lack of enforcement, their ability to sign agreements that take fluctuations in their costs of cooperation into account is limited as well. As a result, they gain less from cooperation. Moreover, they are unable to provide as much domestic conditionality to others as a more transparent government facing the same cooperation partner could. The lack of transparency therefore lowers benefits from cooperation to *both* the nontransparent government *and* its cooperation partners.

8   Conclusion

This paper provides a new explanation for why democracies cooperate more than dictatorships or mixed dyads. 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 in this political environment 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. But the argument in Sections 6 and 7 is more general than that. It implies that transparent countries face more contracting opportunities in general. While I stressed the transparency of the political process as the key property of democratic political systems, in some cooperation contexts, transparency of the political system may not be as important as that of certain bureaucracies or industries. Although the empirical findings that democracies trade more and sign more cooperation agreements than other regime types support the claims in this paper, it would be desirable to test if the argument in this paper applies to other indicators of transparency than regime type.

The argument in this paper leads to predictions that are consistent with a number of empirical observations in the international organization literature. Several have been discussed in the introduction. In addition, flexibility in international agreements has been documented in number of empirical studies (Koremenos 2001, Rosendorff and Milner 2001). A frequently studied case of a formal escape provision that allows for domestic conditionality is Article IX of GATT (Bagwell and Staiger 2002). But domestic conditionality does not have to be explicitly stated in agreement terms. Domestic agencies responsible for monitoring of compliance frequently enjoy enough discretion that substantial variation in compliance may not lead to litigation. Evidence in Reinhardt (2001) suggests that agencies responsible for compliance monitoring such the US International Trade Commission (USITC) enjoy considerable discretion in their choice of which cases to litigate. Furthermore, Hansen and Prusa (1996, 1997) present data showing that political factors such as interest group pressures on legislators play significant role in USITC's decisions. Tallberg and Johnsson (2001) document the substantial discretion that the European Commission enjoys in enforcing compliance with the EU legislation.

Finally, the present environment does not consider the possibility of a dispute settlement mechanism that would allow the cooperating governments contest claims about costs of cooperation at a court that would have the same *ex post* public information as the cooperating governments. Instead of the asymmetric assignment of continuation payoffs that results in this paper, a court would assign a penalty fol-

lowing a public outcome that is inconsistent with cost reports. The penalty would be optimally designed to make any misrepresentation unprofitable in a similar way that continuation payoffs are assigned in this paper. WTO panels and the European Court of Justice are prominent examples of mechanisms that may be performing precisely this role. An empirical implication of this argument is that more transparent countries should be more likely to agree to set up institutions for international adjudication of cooperation disputes as they are less likely to loose a trial as a result of an unfortunate signal realization.

Appendix A: Proofs

Domestic Conditionality under Complete Information

Lemma 1. *Under complete information, a cooperation agreement that delivers an expected discounted cooperation surplus of V_2 to government 2 can be without a loss of generality characterized by strategies under which $V_2^{jk} = V_2$ and $V_1^{jk} = V_1(V_2)$.*

Proof. This is a consequence of risk-neutrality. Any promised V_2 needs to be *feasible* through stage game actions such that $a_i^{jk} \in [0,1]$. For a given V_2, a risk-neutral government 2 is indifferent between obtaining V_2 through stage game payoffs or continuation payoffs. Then variation in continuation payoffs is not necessary to achieve any given V_2. The same holds for $V_1(V_2)$. I will use this fact simplify some of the proofs below. $\square$

Lemma 2. *In equilibrium, at most one government's enforcement constraint binds at a time.*

Proof. Note that $V_1(V_2)$ is decreasing in V_2. Then the assumption that at least one non-autarchic cooperation agreement is enforceable implies that actions a_1^{jk}, a_2^{jk} and a cooperation surpluses $V_1(V_2)$ and V_2 exist such that

$$
\begin{aligned}
V_2 &\geq a_1^{jk} r + \delta V^{Aut} \\
V_1(V_2) &\geq a_2^{jk} r + \delta V^{Aut}
\end{aligned}
\tag{A.1}
$$

and at least one of the inequalities is strict. Suppose, to the contrary, that both governments' enforcement constraints bind in some state (j,k). Substitute $b_i(a_1^{jk}, a_2^{jk}) = -sa_i^{jk} + ra_{\sim i}^{jk}$ to enf_1^{jk} and enf_2^{jk}. Then in the state (j,k),

$$V_2 = -a_2^{jk}(s + c^k) + a_1^{jk}r + \delta V_2^{jk} = a_1^{jk}r + \delta V^{Aut}$$

If government 1's enforcement constraint binds in the state (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 equalities in (A.1) is strict, which contradicts the assumption that at least one non-autarchic cooperation agreement is enforceable. □

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. By Lemma 1, we can restrict attention to the choice of a_i^{jk}. By inspection, the optimum is unique. The rest follows from the text. □

Domestic Conditionality under Asymmetries of Information

Lemma 3. *In optimum, downward incentive constraints never bind.*

Proof. Proof is presented for inc_2^{jH}, proof for inc_1^{Hk} is analogous. After substituting $b_i(a_1^{jk}, a_2^{jk}) = -sa_i^{jk} + ra_{\sim i}^{jk}$, inc_2^{jL} and inc_2^{jH} become

$$-a_2^{jL}(s + c^L) + a_1^{jL}r + \delta V_2^{jL} \geq -a_2^{jH}(s + c^L) + a_1^{jH}r + \delta V_2^{jH} \quad \text{for all } j \quad (inc_2^{jL})$$
$$-a_2^{jH}(s + c^H) + a_1^{jH}r + \delta V_2^{jH} \geq -a_2^{jL}(s + c^H) + a_1^{jL}r + \delta V_2^{jL} \quad \text{for all } j \quad (inc_2^{jH})$$

Add inc_2^{jL} and inc_2^{jH} to obtain,

$$a_2^{jL}(c^H - c^L) \geq a_2^{jH}(c^H - c^L) \tag{A.2}$$

Since $c^H > c^L$, (A.2) implies $a_2^{jL} \geq a_2^{jH}$. Recall that under unconstrained domestic conditionality $a_1^{LL} = a_1^{LH} = 1$ and $a_1^{HL} = a_1^{HH} = 0$. In that case, inc_2^{jL} implies

$V_2^{jL} \geq V_2^{jH}$. When constraints enf_1^{jk} bind, a_1^{jk} must be reduced. Suppose that $a_1^{jL} \leq a_1^{jH}$ when constraints enf_1^{jk} bind. Then if follows that

$$-a_2^{jL}(s + c^L) + a_1^{jL}r \leq -a_2^{jH}(s + c^L) + a_1^{jH}r$$

Then in order to satisfy inc_2^{jL}, it must be true that $V_2^{jL} \geq V_2^{jH}$.

Next, hold inc_2^{jL} at equality and substitute the expression for $V_2^{jL} - V_2^{jH}$ into inc_2^{jH}. inc_2^{jH} reduces to

$$a_2^{jL}(c^H - c^L) \geq a_2^{jH}(c^H - c^L)$$

which is always satisfied at optimum as incentive constraints require that $a_2^{jL} \geq a_2^{jH}$. inc_2^{jH} is therefore always satisfied in optimum.

It remains to be checked that $a_1^{jL} \leq a_1^{jH}$ when constraints enf_1^{jk} bind in optimum under complete information. In the states (H, L) and (H, H), enf_1^{Hk} never bind as $a_1^{Hk} = 0$ in unconstrained optimum. In the states (L, L) and (L, H), enf_1^{Lk} bind identically, therefore $a_1^{LL} = a_1^{LH}$. Finally, when cooperation surplus is divided unevenly, any division can be implemented by setting $a_1^{jL} \leq a_1^{jH}$.

Similar argument for government 1 implies $a_1^{Lk} \geq a_1^{Hk}$ and $V_1^{Hk} \leq V_1^{Lk}$. Then incentive constraint inc_1^{Hk} is always satisfied in optimum. $\qquad \square$

Lemma 4. *In optimum,* $V_1^{HL} \leq V_1^{LL} \leq V_1^{LH}$, $V_1^{HL} \leq V_1^{HH} \leq V_1^{LH}$, $V_2^{LH} \leq V_2^{LL} \leq V_2^{HL}$, $V_2^{LH} \leq V_2^{HH} \leq V_2^{HL}$.

Proof. Follows from the proof of Lemma 3. $V_2^{jH} \leq V_2^{jL}$ 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 $V_2^{Hk} \geq V_2^{Lk}$. $\qquad \square$

Proof of Proposition 2. First, consider an even division of cooperation surplus and consider implementing unconstrained domestic conditionality. Enforcement constraints of government 2 may bind only in the states (L, L) and (H, L) as government 2 participates only in these states. The lowest discount factor δ^* at which unconstrained domestic conditionality if enforceable obtains when enf_2^{LL} and enf_2^{HL} hold at equality.

Then,

$$\delta^* = \frac{s + c^L}{V^*} \tag{A.3}$$

Now consider implementing unconstrained domestic conditionality under asymmetries of information. Lowest spread in continuation values is achieved by setting

$$V_2 = V_2^{LL} = V_2^{HH}, \quad V_2^{HL} = V_2 + \frac{s + c^L}{\delta}, \quad V_2^{LH} = V_2 - \frac{s + c^L}{\delta} \tag{A.4}$$

Enforcement constraints of government 2 now bind most severely in the states (L, L) and (L, H). Consider implementing V_2^{LH}. As $V_2^{LL} < V_2^{LH}$, some of the stage games that follow the realization of the state (L, H) need to be adjusted so that government 2 receives smaller surplus. This cannot be done in the state (H, L) where $a_1 = 0$ and $a_2 = 1$. Therefore, either $a_1 < 1$ must be assigned in the state (L, L), $a_2 > 0$ in the state (H, H) or (L, H). As shown in the text, any such change involves a loss of the joint cooperation surplus. Therefore,

$$V_2^{HL} + V_1^{LH} < \overline{V}^* \tag{A.5}$$

where $\overline{V}^*$ is the joint cooperation surplus under unconstrained domestic conditionality. Recall that

$$V_2 = p^2 V_2^{LL} + p(1 - p)V_2^{HL} + p(1 - p)V_2^{LH} + (1 - p)^2 V_2^{HH}$$

Then (A.5) and (A.4) imply $V_2 < V^*$ and $V_2^{LL} < V^*$. Consequently, enf_2^{LL} binds more severely under asymmetries of information that under complete information. enf_2^{LL} implies

$$\delta^I = \frac{s + c^L}{V^{LL}} \tag{A.6}$$

Comparing (A.3) and (A.6) we see that $\delta^* > \delta^I$. Now consider an uneven division of cooperation surplus. Enforcement constraints of the government receiving smaller share of the cooperation surplus may now bind in any state. The argument above then applies to the enforcement constraint that binds most severely. $\square$

Gains from Cooperation and Political Transparency

Proof of Proposition 3. The proof uses the *ex post* signal formalization introduced in Riordan and Sappington (1988) and extended in Gary-Bobo and Spiegel (2003). 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, if government 1's ex post-$enf_2^{jkk^*}$ constraints are slack, domestic conditionality can be implemented. When government 1's ex post-$enf_2^{jkk^*}$ constraints bind, only limited domestic conditionality can be implemented. The extent to which domestic conditionality is limited depends on the informativeness of the 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

$$b_2(a_1^{jL}, a_2^{jL}) - a_2^{jL} c^L + \delta \sum_{k^*} \pi^{Lk^*} V_2^{jLk^*} \geq$$

$$b_2(a_1^{jH}, a_2^{jH}) - a_2^{jH} c^L + \delta \sum_{k^*} \pi^{Lk^*} V_2^{jHk^*} + \delta \pi^{HL^*} \triangle^{jHL^*} \left[\frac{\pi^{LH^*}}{\pi^{HH^*}} - \frac{\pi^{LL^*}}{\pi^{HL^*}} \right] \quad (A.7)$$

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

$$b_2(a_1^{jH}, a_2^{jH}) - a_2^{jH} c^H + \delta \sum_{k^*} \pi^{Hk^*} V_2^{jHk^*} \geq$$

$$b_2(a_1^{jL}, a_2^{jL}) - a_2^{jL} c^H + \delta \sum_{k^*} \pi^{Hk^*} V_2^{jLk^*} + \delta \pi^{LH^*} \triangle^{jLH^*} \left[\frac{\pi^{HL^*}}{\pi^{LL^*}} - \frac{\pi^{HH^*}}{\pi^{LH^*}} \right] \quad \text{(A.8)}$$

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.

I have shown that 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 $\overline{V}$. Then

$$\overline{V} = V_1(V_2^{jkk*}) + V_2^{jkk*} \quad \text{(A.9)}$$

Equation (A.9) implies that the constructed change in government 2's continuation payoffs results in an increase in $V_1(V_2^{jLH^*})$ and $V_1(V_2^{jHL^*})$. Note that

$$V_1(V_2^{jLH^*} - \triangle^{jLH^*}) = \overline{V} - V_2^{jLH^*} + \triangle^{jLH^*} = V_1(V_2^{jLH^*}) + \triangle^{jLH^*}$$

and

$$V_1(V_2^{jHL^*} - \triangle^{jHL^*}) = \overline{V} - V_2^{jHL^*} + \triangle^{jHL^*} = V_1(V_2^{jHL^*}) + \triangle^{jHL^*}$$

On the other hand, $V_1(V_2^{jLL^*})$ and $V_1(V_2^{jHH^*})$ decreased as

$$V_1(V_2^{jLL^*} + \triangle^{jLH^*} \frac{\pi^{LH^*}}{\pi^{LL^*}}) = \overline{V} - V_2^{jLL^*} - \triangle^{jLH^*} \frac{\pi^{LH^*}}{\pi^{LL^*}} = V_1(V_2^{jLL^*}) - \triangle^{jLH^*} \frac{\pi^{LH^*}}{\pi^{LL^*}}$$

and

$$V_1(V_2^{jHH^*} + \triangle^{jHL^*} \frac{\pi^{HL^*}}{\pi^{HH^*}}) = \overline{V} - V_2^{jHH^*} - \triangle^{jHL^*} \frac{\pi^{HL^*}}{\pi^{HH^*}} = V_1(V_2^{jHH^*}) - \triangle^{jHL^*} \frac{\pi^{HL^*}}{\pi^{HH^*}}$$

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 government 1's *ex post* enforcement constraints in the states (L, H) and (H, L), ex post-$enf_1^{jLH^*}$ and ex post-$enf_1^{jLH^*}$ are relaxed. However, constraints ex post-$enf_1^{jLL^*}$ and ex post-$enf_1^{jHH^*}$ bind more severely now. As long as these are satisfied, unconstrained domestic conditionality can be implemented. But when ex post-$enf_1^{jLL^*}$ and ex post-$enf_1^{jHH^*}$ bind, the extent of domestic conditionality must be reduced in order to satisfy $inc_2^{jLk^*}$ and $inc_2^{jHk^*}$.

To see how incentive constraints limit domestic conditionality note that $inc_2^{jHk^*}$ never binds as Lemma 3 implies

$$b_2(a_1^{jH^*}, a_2^{jH^*}) - a_2^{jH^*} c^H \geq b_2(a_1^{jL^*}, a_2^{jL^*}) - a_2^{jL^*} c^H$$

Therefore, the relevant incentive constraint is $inc_2^{jLk^*}$. To relax it, choose an appropriate $a_2^{jH} > 0$. The exact change will depend on $\delta \pi^{HL^*} \triangle^{jHL^*} \left[\frac{\pi^{LH^*}}{\pi^{HH^*}} - \frac{\pi^{LL^*}}{\pi^{HL^*}} \right]$, which follows from equation (A.7). Signal informativeness, captured through $\frac{\pi^{LH^*}}{\pi^{HH^*}} - \frac{\pi^{LL^*}}{\pi^{HL^*}}$ then directly impacts the severity with which incentive constraint $inc_2^{jLk^*}$ constrains domestic conditionality. $\square$

Appendix B: Empirical Support

Several recent empirical findings in the international organization literature indicate that democracies are better cooperators than authoritarian regimes (Bliss and Russett 1998, Morrow, Siverson and Tabares 1998, Mansfield, Milner, and Rosendorff 2000, 2002). Here, I re-evaluate the empirical findings reported in Mansfield, Milner, and Rosendorff (2002, MMR hereafter) as their results offer support for the theoretical arguments in this paper. I reproduce the analysis by MMR, test some alternative formulations, and improve their analysis in several ways.

Briefly, MMR show that an increase in democracy between two countries is associated with greater likelihood of concluding a Preferential Trading Agreement (PTA). This finding supports the argument in this paper which claims that democracies enjoy greater contracting opportunities than authoritarian regimes.

In addition to reproducing the results, I reformulate MMR's regression equation to be consistent with standard gravity models of international trade. I also show that PTA signing is dependent on the number of PTAs previously signed by a dyad. In other words, once a dyad concludes an international agreement, it is more likely to conclude another one. This effect suggest the presence of some unmeasured variables.

Finally, I present results that indicate that the democracy score of the more democratic country in a dyad is much more important for the conclusion of a PTA than the democracy of the less democratic country. This result suggests a modification of the theory presented in this paper that would account for this finding is needed.

Data

While research on international cooperation typically uses dyadic trade flows, MMR's paper provides a new variable, the signing of a PTA, that allows for empirical assessment of a wider number of theoretical arguments. PTAs include commercial agreements such as customs unions, common markets, and free trade areas. Cooperation in the form of reductions in trade barriers is key to all such agreements. MMR's data contains 230,393 country dyad-years, comprised of 8,758 country dyads observed annually from 1950 through 1991. Some dyads are observed for all 42 years, while others are observed for only a shorter period. The median observation length is 27 years. The dependent variable is the signing of a PTA within a country dyad in a year $t+1$, PTA_{ij}. The signing of a PTA is a "rare event" as only in 1,348 out of the total 230,393 dyad-years a PTA was signed. That is, only about 0.5% of observations are ones.

The key independent variable is the regime type of the cooperating countries, REG_i and REG_j. The democracy score of each member of the dyad comes from the Polity III data set (Jaggers and Gurr 1995). This is a widely used democracy index that measures democracy on a 21 point scale. In this data, 0 denotes a highly authoritarian state while 21 denotes a highly democratic country. Other independent variables are GDP (GDP_i, GDP_j), yearly change in GDP (ΔGDP_i, ΔGDP_j), the volume of dyadic trade ($TRADE_{ij}$), the occurrence of a militarized

dispute in a dyad-year ($DISPUTE_{ij}$), colonial relationship in a dyad-year (COL_{ij}), military alliance ($ALLY_{ij}$), distance ($DISTANCE_{ij}$), joint membership in GATT ($GATT_{ij}$), and a measure of hegemony, which is the percentage of global trade accounted for by the state that conducts the greatest amount of commerce in a given year ($HEGEMONY$).

MMR's Analysis

Before discussing MMR's regression specification in greater detail, I reproduce their results. To test this proposition, MMR estimate the following logistic regression of the pooled data:

$$PTA_{ij} = \beta_0 + \beta_1 REG_i + \beta_2 REG_j + \beta_3 GDP_i + \beta_4 GDP_j + \beta_5 \Delta GDP_i + \beta_6 \Delta GDP_j$$
$$+ \beta_7 TRADE_{ij} + \beta_8 DISPUTE_{ij} + \beta_9 COL_{ij} + \beta_{10} ALLY_{ij}$$
$$+ \beta_{11} DISTANCE_{ij} + \beta_{12} GATT_{ij} + \beta_{13} HEGEMONY + e_{ij}$$
$$(A.10)$$

In addition, MMR estimate a natural cubic with three knots and include it in the analysis to account for temporal dependence in PTA formation.[34] That is, they hypothesize that the likelihood of PTA formation may not be constant over time. The inclusion of a natural cubic spline is one of the solutions to temporal dependence that have been suggested for pooled time-series cross-sectional data.[35]

MMR however do not provide a test of whether accounting for temporal dependence is required. I therefore perform a likelihood ratio test of a specification with and without temporal dependence using cubic splines. The test yielded a χ^2 statistic of 115.42 with 4 degrees of freedom. The probability of obtaining this result by chance is zero to computer precision. Thus including cubic splines clearly improves the fit of the model.

---

[34]Spline coefficient are not included in the above regression equation. I report them in Table 1.

[35]I reproduce the estimation of the spline, but do not discuss the appropriateness of its inclusion versus other solutions to temporal dependence as this is beyond the scope of this paper.

My re-estimation is yields results almost identical to those reported by MMR and I present it in column 1 of Table 1. Standard errors reported in parentheses are Huber (robust) standard errors, which have been recommended for time-series cross-section models with a binary dependent variable (Beck, Katz, and Tucker 1998).

The results are consistent with this paper's proposition that democratic countries cooperate more. The estimated coefficients of REG_i and REG_j are both positive and statistically significant. To gauge the substantive importance of these results I also present the predicted probability that a dyad establishes a PTA, when both countries are highly democratic, when their democracy scores are at their median levels, and if both are highly autocratic. I report them in Table 2. A "mean dyad", one where all variables are held at their means (and modes where appropriate) creates a PTA with the probability of 0.36%, which corresponds to about 20 PTAs in a year.[36] As can be seen, all predicted values are statistically significant.

The coefficients of remaining independent variables are not all in the expected direction. The estimates of $DISTANCE_{ij}$,COL_{ij}, $ALLY_{ij}$, and $GATT_{ij}$ are positive and statistically significant, indicating that states that are closer, with a prior colonial relationship, allies, and members of GATT are more likely to conclude a PTA. A positive change in GDP increases the likelihood of signing a PTA, while a dispute lowers it. The coefficients on ΔGDP_i and ΔGDP_j are however not statistically significant, although they go in the predicted direction.

The results also show, rather counterintuitively, that states with lower GDP are more likely to conclude a PTA, and that states that trade more conclude fewer PTAs. One would intuitively expect that richer countries trade more and therefore sign more PTAs. Furthermore, we should expect greater volume in trade to be associated with greater likelihood of PTA signing. However, the coefficient on $TRADE_{ij}$ is negative and not statistically significant. Finally, the presence of a hegemon decreases the likelihood of forming a PTA, which runs against the intuition that the presence of an economic hegemon facilitates international cooperation.

---

[36]In addition, I report standard errors for these predicted values, which MMR do not present.

Table 1: Determinants of Preferential Trading Agreements

Variable	(1)	(2)	(3)	(4)
REG_i	0.038*** (0.004)	0.020*** (0.004)		0.024*** (0.005)
REG_j	0.035*** (0.004)	0.022*** (0.004)		0.024*** (0.005)
$minDEM_{ij}$			-0.002 (0.005)	
$maxDEM_{ij}$			0.054*** (0.006)	
GDP_i	-4.84×10^{-10}*** (1.48×10^{-10})			
GDP_j	-3.84×10^{-10}** (1.62×10^{-10})			
$log\,(GDP_i \times GDP_j)$		- 0.201*** (0.019)	- 0.202*** (0.019)	- 0.129*** (0.023)
ΔGDP_i	4.72×10^{-9} (3.71×10^{-9})			
ΔGDP_j	4.85×10^{-9} (2.95×10^{-9})			
$TRADE_{ij}$	-1.21×10^{-7} (7.86×10^{-8})			
$log\,TRADE_{ij}$		0.065*** (0.017)	0.065*** (0.018)	-0.009 (0.021)
$DISPUTE_{ij}$	-0.740** (0.349)			
COL_{ij}	1.338*** (0.241)	0.925*** (0.237)	0.870*** (0.238)	0.448* (0.246)
$ALLY_{ij}$	0.665*** (0.066)	0.345*** (0.084)	0.509*** (0.089)	-1.077*** (0.153)
$DISTANCE_{ij}$	-0.731*** (0.030)			
$log\,DISTANCE_{ij}$		-0.442*** (0.031)	-0.462*** (0.031)	-0.172*** (0.048)
$GATT_{ij}$	0.391*** (0.063)	0.519*** (0.072)	0.556*** (0.072)	-0.084 (0.084)
$HEGEMONY$	-53.754*** (3.882)			
$PTACount$				2.373*** (0.077)
Constant	7.315*** (0.599)	3.798*** (0.557)	3.544*** (0.567)	1.959*** (0.743)
Years since last PTA	-0.071*** (0.026)	0.029 (0.033)	0.025 (0.033)	0.112** (0.045)
Spline (1)*	-1.891×10^{-3}*** (0.467×10^{-3})	-1.325×10^{-3}*** (0.561×10^{-3})	-1.445×10^{-3}*** (0.562×10^{-3})	-1.134×10^{-3}*** (0.699×10^{-3})
Spline (2)*	2.036×10^{-3}*** (0.404×10^{-3})	1.682×10^{-3}*** (0.471×10^{-3})	1.811×10^{-3}*** (0.472×10^{-3})	1.431×10^{-3}*** (0.549×10^{-3})
Spline (3)*	0.934×10^{-3} *** (0.161×10^{-3})	0.815×10^{-3} *** (0.185×10^{-3})	0.877×10^{-3} *** (0.185×10^{-3})	0.624×10^{-3} *** (0.195×10^{-3})
Log Likelihood	-7146.541	-5279.952	-5263.234	-4332.002

Logistic regression. Robust (Huber/White/sandwich) standard errors in parentheses.

Significance levels: $*$ (10%) $**$ (5%) $***$ (1%).

*Coefficients of natural cubic spline segments.

48

Table 2: The impact of regime type on the predicted probability of PTA formation

Regime types of i and j	Predicted probability of a dyad forming a PTA[a]	Predicted annual number of dyads forming a PTA[b]
Mean dyad	3.568×10^{-3}*** (0.115×10^{-3})	19.572***
Democratic dyad	7.089×10^{-3}*** (0.430×10^{-3})	38.947***
Mixed dyad	3.519×10^{-3}*** (0.244×10^{-3})	19.199***
Autocratic dyad	1.642×10^{-3}*** (0.124×10^{-3})	8.777***

Logistic regression. Robust (Huber/White/sandwich) predicted standard errors in parentheses.

Significance levels: $*$ (10%) $**$ (5%) $***$ (1%).

[a]Predicted probabilities computed using coefficients estimated in column 1 of Table 1 and hold all other variables at their means (and modes, where appropriate).

[b]Predicted probabilities computed by multiplying the predicted probability of a dyad forming a PTA by the total number of observations in the sample and then dividing that product by the number of years in the sample.

A Gravity Model of PTA Formation

MMR's empirical model includes several control variables that are unrelated to the underlying theoretical model. While these are useful when testing against alternative explanations, they do not contribute to the test of the effect of the key explanatory variables on PTA formation. I therefore drop $HEGEMONY$, $DISPUTE_{ij}$, and ΔGDP_i, ΔGDP_j from further estimation.

Moreover, MMR's formulation is not consistent with standard estimation of international trade which usually employs the gravity model. While the dependent variable is different in this case, the role of the underlying determinants of trade should be similar to those of PTAs. Typical components of the gravity model are the log of the product of GDPs, the log of population, and the log of distance. MMR include the log of distance, the GDPs however are not logged, and data on population is not provided. While the extent of this paper does not allow me to add population data to the dataset, I re-estimate the model with the log of the product of GDPs as an independent variable and the log of trade instead of trade. I report the results in

column 2 of Table 1.

The results differ from MMR's specification in several respects. First, the impact of democracy on the likelihood of PTA formation has diminished. Importantly, it still remains highly significant. Second, *trade is now positively associated with PTA formation.* This confirms a clear intuition about the demand for trade agreements: As the trade increases so do the benefits of legalizing such transactions. However, GDP is still negatively associated with PTA formation which remains a puzzling finding.

Democracy and PTA Formation

The theory in this paper does not predict what the relative impact of democracy scores on PTA formation should be when democracy scores are uneven within a dyad. To explore this issue, I create variables $minDEM_{ij}$ and $maxDEM_{ij}$ that contain the lower and the higher of each dyad's democracy scores, respectively. I re-estimate the empirical model using these new variables. The results are presented in column 3 of Table 1.

A regression on $minDEM_{ij}$ and $maxDEM_{ij}$ indicates that *the democracy score of the more democratic country in a dyad is much more important for the conclusion of a PTA than the democracy score of the less democratic country.* The coefficient on $maxDEM_{ij}$ is almost twice the coefficient of individual democracy scores in column 1. On the other hand, the coefficient of the lower democracy score is close to zero, negative, and not statistically significant. A change of the higher democracy score within an average dyad from its mean to its maximum value while holding the lower democracy score at its mean predicts an increase in the probability of PTA formation by 24% from 0.68% to 0.84% (and is significant at the 99% confidence level). One the other hand, a change in the lower democracy score within a dyad from its mean to its maximum while holding the higher democracy score at its mean does not change the likelihood of PTA formation at all (and is not statistically significant).

This finding suggests that an extension of the theory proposed in this paper that would account for the asymmetric relevance of democracy scores within a dyad should be valuable.

PTA Count and the Likelihood of PTA signing

MMR account for temporal dependence in PTA formation by including the number
of years since the last PTA was signed by a dyad in the regression (together with a
cubic spline with three knots). This technique controls for the possibility that the
probability of PTA formation depends on the time that elapsed since it last signed a
PTA. In the case of militarized disputes, for instance, Beck, Katz, and Tucker (1998)
have shown that the likelihood of a conflict in a dyad is negatively associated with
the amount of time since the last militarized dispute of that dyad.

   This method, however, does not account for the potential impact of the number
of PTAs that have been previously signed by a dyad on the likelihood of subsequent
PTA formation by that dyad. I hypothesize that a dyad that has signed a number
of PTAs in the past is more likely to form another one again than a dyad that has
signed none. I therefore generate a variable $PTACount_{ij}$ that counts the number of
PTAs that a dyad ij has formed prior to year $t+1$. $PTACount_{ij}$ is summarized in
Table 3.

Table 3: The number of PTAs formed prior to year $t+1$ by a dyad

Number of PTAs	Frequency	Percent
0	357,525	92.49
1	26,431	6.84
2	2,227	0.58
3	313	0.08
4	60	0.02
Total	386,556	100.00

   I now re-estimate the empirical model and include $PTACount_{ij}$ as an independent
variable. The results in column 4 indicate that $PTACount_{ij}$ is strongly positively
and significantly associated with PTA formation. That is, a pair of countries that
has signed a PTA in the past is more likely to do so in the future. This effect may
point to the fact that benefits from PTA signing accrue over time and positively
influence the likelihood signing a PTA in the future. This effect, however, is not
captured by the independent variables used in this estimation which results in the

high and significant coefficient on $PTACount_{ij}$. This results implies the presence of unmeasured variables that impact PTA formation. Importantly, the positive and significant impact of democracy on PTA formation is preserved.

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.

Acemoglu, Daron, and James A. Robinson. 2001. A Theory of Political Transitions. *American Economic Review* 91: 938-963.

Athey, Susan, and Kyle Bagwell. 2001. Optimal collusion with private information. *RAND Journal of Economics* 32, 3: 428-65.

Bagwell, Kyle, and Robert W. Staiger. 2002. *The Economics of the World Trading System.* Cambridge: MIT Press.

Baron, David P. 1994. Electoral competition with informed and uniformed voters. *American Political Science Review* 88, 1: 33-47.

Baron, David P., and Roger B. Myerson. 1982. Regulating a monopolist with unknown cost. *Econometrica* 50, 4: 911-930.

Bayard, Thomas O., and Kimberly L. Elliot. 1994. *Reciprocity and retaliation in U.S. trade policy.* Washington, D.C: Institute for International Economics.

Beck, Nathaniel, Jonathan Katz, and Richard Tucker. 1998. "Taking time seriously: Time-series cross-section analysis with a binary dependent variable. *American Journal of Political Science* 42:12601288.

Bliss, Harry, and Bruce Russett. 1998. Democratic trading partners: The liberal connection, 1962-1989. *Journal of Politics* 60: 1126-1148.

Boyer, Marcel, and Jean-Jacques Laffont. 2003. Competition and the reform of incentive schemes in the regulated sector. *Journal of Public Economics* 87: 2369-2396.

Bueno De Mesquita, Bruce, Alastair Smith, Randolph M. Siverson, and James D. Morrow. 2003. *The Logic of Political Survival.* Cambridge: MIT Press.

Crawford, Vincent P., and Joel Sobel. 1982. Strategic information transmission. *Econometrica* 50, 6: 1431-1451.

Dinan, Desmond. 1999. *Ever Closer Union.* Boulder: Rienner Publishers.

Dixit, Avinash, and John Londregan. 1995. Redistributive politics and economic efficiency. *American Political Science Review* 89, 4: 856-866.

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: 5-25.

Downs, George W., and David M. Rocke. 1995. *Optimal imperfection?* Princeton: Princeton University Press.

Fearon, James D. 1997. Signaling foreign policy interests: Tying hands versus sinking costs. *Journal of Conflict Resolution* 41, 1: 68-90.

Frieden, Jeffrey A. 2002. Real sources of European currency policy: Sectoral interests and European monetary integration. *International Organization* 56: 831-860.

Fudenberg, Drew, David Levine, and Eric Maskin. 1994. The folk theorem with imperfect public information. *Econometrica* 62, 5: 997-1039.

Gary-Bobo, Robert, and Yossi Spiegel. 2003. Optimal state-contingent regulation under limited liability. CEPR Discussion Paper No. 3920.

Gaubatz, Kurt Taylor. 1996. Democratic states and commitment in international relations. *International Organization* 50, 1: 109-39.

Green, Edward J., and Robert H. Porter. 1984. Noncooperative collusion under imperfect price information. *Econometrica* 52: 87-100.

Grossman, Gene M., and Elhanan Helpman. 1994. Protection for sale. *American Economic Review* 84, 4: 833-50.

Grossman, Gene M., and Elhanan Helpman. 1996. Electoral competition and special interest politics. *Review of Economic Studies* 63, 2: 265-286.

Haggard, Stephan, and Robert R. Kaufmann. 1995. *The Political Economy of Democratic Transitions.* Princeton: Princeton University Press.

Jaggers, Keith, and Ted Robert Gurr. 1995. "Tracking Democracy's Third Wave with the Polity III Data" *Journal of Peace Research* 32:469482.

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: 761-799.

Leeds, Brett Ashley. 1999. Domestic political institutions, credible commitments, and international cooperation. *American Journal of Political Science* 43, 4: 979-1002.

Lipson, Charles. 1984. International cooperation in economic and security affairs. *World Politics* 37: 1-23.

Lipson, Charles. 2003. *Reliable partners: How democracies have made a separate peace*. Princeton: Princeton University Press.

Mansfield, Edward D., Helen V. Milner, and B. Peterf1 Rosendorff. 2002. Why democracies cooperate more? Electoral control and international trade agreements. *International Organization* 56, 3: 477-513.

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: 809-824.

Milgrom, Paul R. 1981. Good news and bad news: representation theorems and applications. *Bell Journal of Economics* 12: 380-391.

Milner, Helen V., and B. Peter Rosendorff. 1997. Democratic politics and international trade negotiations: Elections and divided governments as constraints on trade liberalization. *Journal of Conflict Resolution* 41: 117-46.

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: 649-661.

Myerson, Roger B. 1986. Multistage games with communication. *Econometrica* 54,

2: 323-358.

Przeworski, Adam, Michael E. Alvarez, Chose Antonio Cheibub, and Fernando Limongi. 2000. Political Instability and Economic Growth. Chapter 4 in *Democracy and development political institutions and material well-being in the world, 1950-1990.* 187-215. Cambridge: Cambridge University Press.

Putnam, Robert. 1988. Diplomacy and domestic politics: The logic of two level games. *International Organization* 43, 3: 427-60.

Reinhardt, Eric. To GATT or not to GATT: Which trade disputes does the US litigate, 1975-1999? Working Paper.

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: 189-199.

Rosendorff, B. Peter, and Helen V. Milner. 2001. The optimal design of international trade institutions: Uncertainty and escape. *International Organization* 55, 4: 829-857.

Sappington, David E. M. 1983. Limited-liability contracts between principal and agent. *Journal of Economic Theory* 29: 1-21.

Schultz, Kenneth A. 1998. Domestic opposition and signaling in international crises. *American Political Science Review* 92, 4: 829-844.

Verdier, Daniel. 1998. *Democratic convergence and free trade. International Studies Quarterly* 42, 1: 1-24.