

**ALL OR NOTHING:  
AVOIDING INEFFICIENT COMPROMISE IN  
INTERNATIONAL COOPERATION**

by

Johannes Urpelainen

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Doctoral Committee:

Professor James D. Morrow, Co-Chair  
Associate Professor Barbara Koremenos, Co-Chair  
Professor Tilman M. Borgers  
Professor Arthur Lupia  
Associate Professor William Robert Clark  
Assistant Professor Jana von Stein

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# Chapter 1

## Introduction

International cooperation is notoriously prone to bargaining failure. States cooperate “under anarchy,” so they cannot rely on external enforcement by a benevolent third party as a commitment mechanism or to deter such costly bargaining as economic sanctions or warfare.<sup>1</sup> Scholars of international cooperation contend that in such a precarious environment, an international agreement must be self-enforcing.<sup>2</sup> Specifically, the division of gains must reflect the parties’ relative bargaining power and remove any incentives to defect in the future. When either one of these conditions fail, a state deems it profitable not to comply with the international agreement. Consequently, international cooperation should be most successful when an efficient compromise is readily available.

In this dissertation, I conduct a theoretical investigation of those unfortunate international cooperation problems that preclude efficient compromise by their very nature. Consider, for instance, the politics of international standard setting. Virtually all states agree that international standardization and harmonization is highly desirable, given the magnitude of the gains that international economic exchange produces. But each state prefers to impose its pre-existing domestic standard to minimize adjustment costs and to gain a competitive advantage over foreign producers in the international market.<sup>3</sup> Domestic standards often involve systematic differences in design that preclude the use of a simple “blended” standard as a compromise. Two forms of bargaining failure are thus likely. First, states can engage in costly bargaining to impose their domestic standard on others through threats. Second, they can “water down” the international agreement by designing a mutually acceptable compromise standard that fails to maximize technical effectiveness and minimize adjustment costs.

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<sup>1</sup>Oye 1986.

<sup>2</sup>Axelrod and Keohane 1985; Barrett 1999; Fearon 1998, 1995; Koremenos, Lipson and Snidal 2001.

<sup>3</sup>Abbott and Snidal 2001; Mattli and Büthe 2003; Schmidt and Verle 1998.

These two forms of bargaining failure prompt two questions that have received limited attention in the extant literature. First, which issues in the domain of international cooperation preclude efficient compromise? While previous research has acknowledged the existence of such problems and studied various solutions, such as issue linkage and side payments, the literature has not examined the reasons behind inefficient compromise in any detail.<sup>4</sup> I show that *increasing returns*, or the increasing marginal value of a more favorable allocation of the gains from cooperation, provide a deep and broadly applicable explanation for inefficient compromise.<sup>5</sup>

Second, how are states to cooperate when efficient compromise is impossible? Building on international cooperation theory, I consider the problem of institutional design when the risk of inefficient compromise looms large. The theoretical results qualify, extend, and sharpen previous theories of international cooperation while generating detailed and empirically testable predictions.<sup>6</sup>

## Bargaining and Increasing Returns

In international politics, negotiations fail for various reasons. Among the plethora of potential causes, incomplete information and commitment problems figure most prominently in the literature on bargaining failure.<sup>7</sup> Under incomplete information, a state misrepresents its resolve to obtain a better agreement on the division of gains. Sometimes the other state offers an unacceptable agreement, so a risk of bargaining failure is present.<sup>8</sup> When a commitment problem is present, a mutually acceptable agreement exists but it will not stand the test of time as one of the parties will ultimately renege.<sup>9</sup> Notably, neither cause is intrinsically related to the nature of the issue. Incomplete information often pertains to the strength of an outside option, such as trade sanctions or warfare. A commitment problem could result from changes in relative bargaining power over time. Finally, domestic political constraints that prevent leaders from conceding can prompt bargaining failure even when the protagonists themselves agree on the existence of an appropriate solution to the cooperation

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<sup>4</sup>Sebenius 1983; Stein 1980; Tollison and Willett 1979.

<sup>5</sup>For the concept of increasing returns, see Arthur 1989; David 1994; Pierson 2000*a*; Romer 1986.

<sup>6</sup>Fearon 1998; Keohane 1984; Koremenos, Lipson and Snidal 2001; Morrow 1994.

<sup>7</sup>Fearon 1995; Powell 2006.

<sup>8</sup>Gartzke 1999.

<sup>9</sup>Powell 2004.



problem.<sup>10</sup>

In this dissertation, I investigate those international cooperation problems in which the issue itself precludes inefficient compromise. The following definition captures the essence of the problem:

**Definition 1.** A problem of **inefficient compromise** exists when a division of gains that reflects the parties' relative bargaining power is impossible or dissipates surplus from cooperation.

In other words, a problem of inefficient compromise implies that the parties must sacrifice efficacy to strike a mutually acceptable bargain.

Which issues involve a problem of inefficient compromise? The concept of increasing returns, which refers to the increasing marginal value of a more favorable allocation of the gains from cooperation, provides a general explanation:

**Definition 2.** Let  $\pi_i \in [0, 1]$  measure the share of gains that state  $i$  obtains from cooperation and  $u_i(\pi_i)$  the corresponding payoff. **Increasing returns** are present when  $\lambda \cdot u_i(\pi_i) > u_i(\lambda \cdot \pi_i)$  for all  $\pi_i \in [0, 1]$  and  $\lambda \in (0, 1)$ .

This definition suggests that, in the presence of increasing returns, state  $i$  prefers obtaining all of the gains from cooperation with probability  $\lambda$  to obtaining a share  $\lambda$  of the gains.

Figure 1.1 illustrates. The payoff to state  $i = 1, 2$  is given on the vertical axis as a function of its share on the horizontal axis. In this game, either player gains a payoff 1 if it obtains the asset as a whole. The decision to divide the asset equally, which is the most natural compromise in a symmetric game, yields payoffs  $(\frac{1}{4}, \frac{1}{4})$ . Both players prefer a random allocation of the entire asset to either player with equal probability, to “splitting the difference.”

[FIGURE 1.1 ABOUT HERE]

Two theoretical remarks on the problem of inefficient compromise are in order. First, in a highly abstract sense, “indivisible” assets are a special case of increasing returns.<sup>11</sup>

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<sup>10</sup>Allee and Huth 2006; Milner 1997; Schelling 1960.

<sup>11</sup>See Fearon 1995; Hassner 2003; Powell 2006 for the role of indivisibilities in international bargaining.

To see why, observe that indivisibilities are theoretically equivalent to increasing returns when division is possible but it dissipates all surplus from cooperation. Thus, it is not necessary to differentiate between indivisibilities and increasing returns in empirical applications. Second, increasing returns are accompanied by a commitment problem. When states prefer obtaining the entire asset with some probability, they can allocate the asset randomly provided that they can credibly commit to accepting an unfavorable outcome. Much of the theoretical analysis in this dissertation pertains to institutional designs that help states avoid or solve this problem.

Consider some empirical examples. First, a territorial conflict over an island is likely to involve increasing returns. The island could be too small to be split into multiple viable economic and political units; it is certainly easier to defend without division. In Chapter 2, I analyze international legal settlements concerning competing sovereignty claims over islands from this perspective. Second, some territorial conflicts involve “intangible assets” such as ethnic or historical possession and homeland ties.<sup>12</sup> If both parties view minor concessions as unacceptable, it could be difficult to divide the territory without sowing the seeds of future conflict.

Third, the returns to reputation are often increasing. In international finance, for example, creditors cannot verify the conditions underpinning each default. In such circumstances, the only way to maintain a good reputation is to diligently pay back debts even under severe hardship. This could explain why some poor countries have insisted on paying back their debts in full despite extreme domestic difficulties. Indeed, Tomz shows that creditors have often rewarded such countries with drastically lower interest rates.<sup>13</sup> A good example is the newly independent Republic of Finland in the 1930’s, a poor and unstable democracy in economic recession that promptly paid its debts and gained a reputation as a reliable debtor for decades to come.

Fourth, the problem of international standard setting already addressed above is a good example of increasing returns in political economy. Fifth, trade and other economic disputes over the legality of a product ban or any other form of direct regulation complicate division.<sup>14</sup> The advantage of direct regulation is its simplicity, so a muddled compromise removes most of the desired effect.

Sixth, legal precedents involve increasing returns.<sup>15</sup> In the transatlantic dispute over growth hormone in beef production, both parties were aware of the far-reaching

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<sup>12</sup>Hensel and Mitchell 2005.

<sup>13</sup>Tomz 2007.

<sup>14</sup>Guzman and Simmons 2002.

<sup>15</sup>See Busch 2007 for a theoretical analysis of legal precedents in international trade law.

consequences of concessions. The European Union would have compromised its sovereign right to environmental and health regulation, while the United States would have shown green light to possibly protectionist regulation in more important export markets, such as Japan.<sup>16</sup> Yet both parties understood that a clear rule is necessary to facilitate international economic exchange and reduce uncertainty surrounding the multilateral trade regime.<sup>17</sup> Finally, institutional design is most efficient when the underpinning principles are clear and unambiguous.<sup>18</sup> If states disagree on these principles, as was the case when the developed and developing countries bargained over an international commodity fund to stabilize world prices,<sup>19</sup> a compromise requires a complex agreement that does not provide clear and robust rules for behavior now and in the future.

## Avoiding Inefficient Compromise

To avoid inefficient compromise, states engage in institutional design.<sup>20</sup> They write international agreements to regulate collective behavior, which is useful when unconstrained pursuit of individual goals results in a collective-action failure. To model the design of these international agreements, I use game theory and institutionalist methodology.<sup>21</sup> I model the international cooperation as a “game” with collectively undesirable equilibria and consider changes in behavior that would bring about an improved outcome.

The analysis that I conduct draws heavily on the extant literature. The problem of inefficient compromise was analyzed by scholars of international cooperation theory in the study of “issue linkage” as a means to expand the bargaining space and permit compromise when one is not readily available.<sup>22</sup> By linking two or more issues, the bargaining parties can achieve a *de facto* compromise across issue areas. Although each party must yield in one or more issue areas, it receives compensation in others. A particularly straightforward issue linkage is a direct side payment, such as a financial

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<sup>16</sup>Vogel 1995.

<sup>17</sup>Kerr and Hobbs 2002.

<sup>18</sup>Morrow 2002.

<sup>19</sup>Finlayson and Zacher 1988; Krasner 1985.

<sup>20</sup>Keohane 1984; Koremenos, Lipson and Snidal 2001.

<sup>21</sup>Diermeier and Krehbiel 2003.

<sup>22</sup>Sebenius 1983; Stein 1980; Tollison and Willett 1979.

reward to clinch a deal.<sup>23</sup> Indeed, Koremenos, Lipson, and Snidal conjecture that the “issue scope” of international agreements expands a distribution conflict surrounding the issue grows more intense.<sup>24</sup> Fearon argues that the possibility of issue linkage is a good reason to rule out indivisibilities as an explanation for interstate war, because the costs of militarized conflict must exceed the costs of issue linkage.<sup>25</sup>

Although this literature provides a foundation for theoretical analysis, it suffers from three shortcomings. First, scholars have yet to systematically analyze the reasons behind inefficient compromise. This poses a problem for empirical analysis because the conditions under which there is demand for issue linkage remain unclear. My analysis of increasing returns is relevant here.

Second, the literature does not investigate plausible alternatives to issue linkage. Empirically, this shortcoming prevents testing of international cooperation theory because the full “choice set” is not considered. Theoretically, this limited focus leaves circumstances in which issue linkage is not feasible uncovered. Linkage bargaining is costly, so it is useful to consider alternatives that sometimes carry lower transaction costs. I consider various commitment mechanisms that permit *ex ante* mutually desirable lotteries and agreements. I also consider ways to prevent the emergence of international cooperation problems that give rise to inefficient compromise.

Finally, previous research does not shed light on the differences between bilateral and multilateral cooperation. Although such scholars as Martin and Ruggie investigate multilateralism as an alternative to bilateralism in general, they do not analyze cooperation problems that are multilateral by their very nature.<sup>26</sup> Others contend that multilateral negotiations carry *ceteris paribus* higher transaction costs, without studying these costs in any detail.<sup>27</sup> My analysis shows that the differences between bilateral and multilateral cooperation are significant and reach well beyond transaction costs.

## Summary of Results

This dissertation has four substantive chapters. Each chapter addresses the problem of inefficient compromise from a different perspective. Two of them focus on

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<sup>23</sup>Kuziemko and Werker 2006.

<sup>24</sup>Koremenos, Lipson and Snidal 2001.

<sup>25</sup>Fearon 1995.

<sup>26</sup>Martin 1992; Ruggie 1992.

<sup>27</sup>Keohane 1984; Koremenos, Lipson and Snidal 2001.

multilateral cooperation in particular. I present the results by chapter.

## Chapter 2: A Theory of Interstate Arbitration

In Chapter 2, I analyze interstate arbitration. This focus is motivated by three startling features of interstate arbitration. First, it requires mutual consent and is thus strictly voluntary. However, if the parties can agree on arbitration, why cannot they simply strike a bargain instead? Second, interstate arbitration typically produces starkly asymmetric awards that clearly indicate who won the dispute. Why do the parties specifically request that the arbitration tribunal specifically declare a winner, instead of forging a mutually acceptable compromise? Third, interstate arbitration is almost exclusively public – in contrast to commercial arbitration, which is predominantly confidential. Why do states willingly surrender authority over the publication of the proceedings?

Existing explanations for international dispute resolution that draw on bargaining theory cannot account for interstate arbitration. It does not involve costly signals to reveal information, and it does not facilitate communication between the disputants, so it is poor means to solve a problem of incomplete information. Its public nature does create some commitment capacity through a reputational mechanism, but the asymmetric nature of arbitration awards gives the loser an additional incentive to defect. Finally, the asymmetric awards are particularly harmful if states use international dispute resolution as a “smokescreen” to legitimize domestic unacceptable concessions.<sup>28</sup>

I develop a simple explanation for interstate arbitration based on an institutional analysis of inefficient compromise. With increasing returns, two parties can strike an efficient *ex ante* compromise through a lottery. Interstate arbitration as a lottery is less costly than pathological forms of bargaining, which explains why the awards must be asymmetric. Interstate arbitration is public to build the commitment capacity necessary to enforce this lottery. The theory generates a variety of empirically testable hypotheses on the relationship between the cost of bargaining, power asymmetries, and the nature of the arbitration award.

To illustrate the theory, I consider empirical examples. First, I analyze the Hanish Islands Crisis and the resulting *Eritrea/Yemen* (1998/1999) arbitration at the Permanent Court of Arbitration. Second, I consider recent “special agreements” in the

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<sup>28</sup>Allee and Huth 2006.

International Court of Justice.

### **Chapter 3: Preventive Care: Increasing Returns, Domestic Institutions, and International Regulation**

The importance of international regulation and standard setting has greatly increased with the integration of national economies.<sup>29</sup> In an integrated world economy, states must find ways to standardize and harmonize domestic regulatory policies to avoid raising non-tariff barriers to trade.<sup>30</sup>

In Chapter 3, I study the relationship between domestic regulatory institutions and international regulation. I claim that domestic regulatory institutions are subject to increasing returns over time, which causes a regulatory “lock-in” that complicates harmonization and standardization due to high adjustments costs.<sup>31</sup> Thus, if states have previously adopted incompatible domestic regulatory institutions, the cost of mutual adjustment increases over time. However, if states anticipate a future lock-in, they can intervene to prevent it. Specifically, states can coordinate the development of nascent domestic regulatory institutions. I label this practice “preventive care.”

I deduce the conditions under which preventive care is feasible and desirable. Most importantly, it is likely to succeed in new regulatory issues not burdened by domestic institutional deadweight. Its most important advantage is a reduction in adjustment costs that mitigate the problem of inefficient compromise. Another important advantage is the self-enforcing nature of preventive care: if compatibility locks in, defection becomes increasingly difficult over time.

To assess the empirical plausibility of the theory, I conduct a comprehensive case study of transatlantic cooperation on the harmonization of chemical testing requirements in the Organisation for Economic Co-operation and Development (OECD). Seemingly technical, this issue exhibits remarkable variation in success and failure. Using extensive analysis of primary sources and dozens of elite interviews with regulators and industry representatives in the United States, the European Union, and the OECD, I show that variation in incompatibilities pertaining to domestic regulatory institutions explains variation in success and failure. When such incompatibilities undergo lock-in, harmonization is difficult and cooperation proceeds slowly over time.

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<sup>29</sup>Alesina and Dollar 2000; Abbott and Snidal 2001; Mattli and Bütte 2003; Spruyt 2001.

<sup>30</sup>Bradford 2003; Sykes 1995.

<sup>31</sup>Arthur 1989; Pierson 2000*b*; Unruh 2000.

When such incompatibilities are absent or easy to remove, success in cooperation follows. Most importantly, the analysis explains the diverging trajectories of success on mutual acceptance of testing data and failure on mutual acceptance of manufacturing and marketing notification by companies.

## **Chapter 4: A Cure Worse Than the Disease? Issue Linkage and Delegation in Multilateral Negotiations**

In Chapter 4, I turn to multilateral cooperation. I study the role of issue linkage and delegation to an international committee in preventing costly bargaining and inefficient compromise in multilateral negotiations over policy coordination. Specifically, are these bargaining techniques unproblematic, or can the opportunity to link issues or delegate decision-making power cause rather than solve international cooperation problems?

I begin by showing that the multilateral policy coordination problem is qualitatively similar to the corresponding bilateral problem. Unless states have an overriding incentive to coordinate policies or a hegemonic coalition can impose its preference on others, there is a risk of inefficient compromise or failure to coordinate policies.

The analysis of institutional design reveals a striking gap between bilateral and multilateral cooperation. I show that neither issue linkage nor delegation can reduce the payoff to any state in bilateral cooperation. In multilateral cooperation, this conclusion only holds with certainty if unanimity rule is used or there is exactly one group of states that can link issues or delegate to an international committee. If there is potential for competition, however, opportunistic issue linkage and delegation can reduce the payoff to all states.

The analysis provides insight into the higher-order negotiations over institutional design. First, I show that in pure coordination problems, states have a collective incentive to proscribe issue linkage and delegation. Second, I show that a hegemonic coalition always resists issue linkage and delegation because it can secure full coordination to its preference in isolated negotiations. Other states, however, could benefit from these bargaining techniques to form a counterhegemonic coalition. Finally, I show that when the risk of inefficient compromise or coordination failure looms large, states benefit from issue linkage or delegation that requires collective approval.

## Chapter 5: The Over- and Undersupply of Enforcement Power in International Public Good Provision

In Chapter 5, I consider the problem of international public good provision. The empirical record is puzzling, as states have almost exclusively chosen issue-specific reciprocity over explicit sanctions, such as trade restrictions, to enforce cooperation.<sup>32</sup> This seems counterproductive because the enforceability of reciprocal agreements is limited in multilateral cooperation: states cannot threaten severe punishments through reduced public good provision because of the high collective cost. Why cannot they use sanctions through issue linkage instead?

The model that I construct has two core elements. First, I model international public good provision as a repeated game with multiple players. Second, I include a bargaining stage at which a “winning coalition” of powerful states determine the content of the international agreement. Bargaining is costly, which is particularly appropriate for multilateral agreements that often require participation by developing countries with severe capacity constraints.

Comparing reciprocity and sanctions through issue linkage, I find a remarkable strategic rationale for reciprocity. While sanctions do create more collective enforcement power than reciprocity, they also increase the returns to relative bargaining power. When enforcement power is in abundant supply, powerful states can enforce exploitative agreements. Thus, weak states refuse to participate in the negotiations. Consequently, powerful states stand to gain from reciprocity as a credible commitment to a mutually acceptable division of gains.

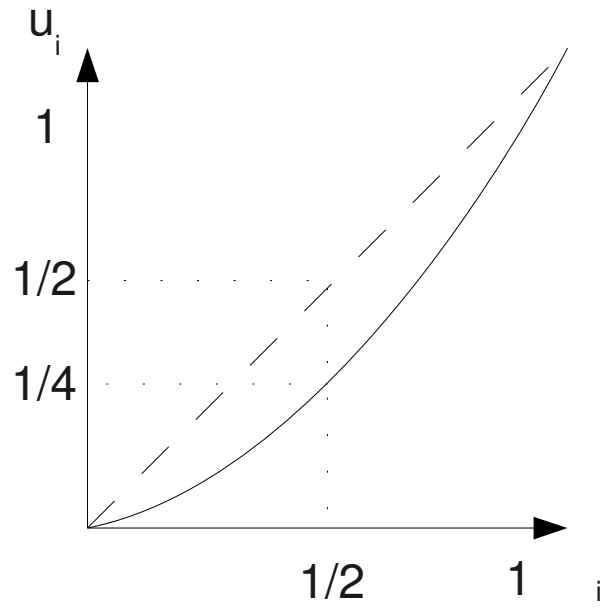
The analysis has important implications for international public good provision in the contemporary world economy. First, the model suggests that the growing bargaining power of rapidly industrializing countries such as China and India could increase international public good provision. As their influence in negotiations increases, they are willing to consider sanctions through issue linkage to enforce cooperation. Second, the analysis implies that states can limit the supply of enforcement power when the returns to trade protectionism decrease. If world market integration renders liberalization more attractive, it can help states achieve a higher level of international public good provision. Contrary to the infamous “race to the bottom” hypothesis, economic globalization could mitigate collective-action problems in international cooperation.

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<sup>32</sup>Keohane 1986.



## Figures



**Figure 1.1.** A game with increasing returns.

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# Chapter 2

## A Theory of Interstate Arbitration

### 1 Introduction

Arbitration is a legal technique of dispute resolution, wherein the parties to a dispute mutually commit to a judgment by an external tribunal. Its *ad hoc* voluntary nature differentiates it from adjudication and its external nature differentiates it from mediation. Although usually associated with domestic and international commerce, arbitration is also used by states to resolve political disputes. The uses of arbitration in international politics include, *inter alia*, territorial conflicts and the interpretation of international agreements. For example, the Permanent Court of Arbitration (PCA) has an explicit arbitration function and the International Court of Justice (ICJ) issues judgments based on *ad hoc* “special agreements” between states.<sup>1</sup>

However, interstate arbitration presents a genuine theoretical puzzle: if the parties to a dispute voluntarily commit to arbitration, why cannot they simply strike a bargain to resolve the conflict instead? This is particularly puzzling in political disputes because lack of technical knowledge, which is a central reason for commercial arbitration, is rarely important. Indeed, interstate arbitration seems a particularly unappealing technique of international dispute resolution for two reasons. First, it typically produces a starkly asymmetric “award.”<sup>2</sup> Why do states resort to a technique that creates winners and losers, instead of pursuing a compromise? Second, interstate arbitration is usually public – in stark contrast to commercial arbitration,

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<sup>1</sup>Boockmann and Thurner 2006, 120 and Sohn 1982-1983. Many international agreements, and bilateral investment treaties in particular, contain provisions for compulsory arbitration (Koremenos 2007). This paper focuses on voluntary arbitration only, because compulsory arbitration is essentially a form of adjudication.

<sup>2</sup>Baratta 1989, 28.

which is almost always confidential. Why do states accept public proceedings despite the associated “sovereignty costs?”<sup>3</sup>

The contribution of this paper is a functionalist explanation for interstate arbitration. The analysis draws on bargaining theory, which provides three reasons for bargaining failure: incomplete information, commitment problems, and indivisibilities or increasing returns.<sup>4</sup> I claim that interstate arbitration is a rational response to the particular type of bargaining failure that stems from indivisibilities or increasing returns, which are for instance common in disputes that involve sovereignty over an island or the legality of a product ban. These factors prompt bargaining failure because compromise is impossible (indivisibilities) or inefficient (increasing returns). Thus, both parties have a strong incentive to engage in costly bargaining to win the dispute, perhaps through warfare or economic sanctions. The prospect of victory through bargaining results in protracted conflict, which is costly for both parties.

As Powell observes, indivisibilities – and by direct extension increasing returns – create a commitment problem.<sup>5</sup> Costly bargaining is essentially a wasteful “lottery” through which the disputants randomly allocate the asset according to a probability distribution that reflects their relative bargaining power. If the parties could somehow substitute a less costly lottery for zero-sum bargaining, they would increase their expected payoffs. However, a credible commitment is necessary because the loser has an incentive to renege *ex post* by engaging in costly bargaining.

I argue that interstate arbitration is a low-cost lottery through which the arbitration tribunal issues a probabilistic award. A sovereign state can credibly commit to it because reneging on a public award carries reputational consequences. States view the process as probabilistic because the tribunal can interpret the relevant rules and principles in multiple ways. However, the odds are common knowledge: states appoint the members of the tribunal, choose the relevant rules, and consult their national experts. Indivisibilities and increasing returns explain the striking asymmetry of arbitration awards. When division of the asset is impossible or inefficient, states should only compromise *ex ante* to maximize their expected payoff.

The institutional features of interstate arbitration are remarkably functional for solving the problem. First, the public character of interstate arbitration provides a commitment mechanism. In international politics, adequate commitment capacity is

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<sup>3</sup>Abbott and Snidal 2000, 436-440.

<sup>4</sup>Fearon 1995 does not discuss increasing returns. For present purposes, an asset is subject to increasing returns if division dissipates some surplus. Below, I show that indivisibilities are but a special case of increasing returns.

<sup>5</sup>Powell 2006, 177-180.

not guaranteed.<sup>6</sup> States cannot request a central authority to enforce the arbitration award, but they can condition their reputation on complying with it.<sup>7</sup> If the payoff from future cooperation is high, the commitment is credible. Moreover, the arbitration proceedings are impartial and external, so the award is more legitimate and acceptable to domestic interest groups.<sup>8</sup>

Second, the institutional design of interstate arbitration promotes neutrality and independence. The parties usually appoint the members of the tribunal, which reduces the risk of bias, and mutual consent prevents the use of arbitration against the interests of a state. The strictly external nature of the proceedings, on the other hand, increases the cost of manipulating the arbitration tribunal. Consequently, the institutional design of interstate arbitration forms an effective impediment to costly manipulation. States can coerce, blackmail, or bribe the tribunal, but the cost of such activities is high. The decision to arbitrate is in the parties' hands, but the incentive to engage in zero-sum bargaining during the proceedings is low, which reduces the cost of interstate arbitration.

To formalize the theory, I construct a simple bargaining model over an asset that is subject to increasing returns. States can request arbitration, but their only source of commitment capacity is reputation. I show that states benefit from arbitration without any commitment capacity when bargaining is very costly, and that states can successfully resolve a dispute through arbitration even when bargaining is a lucrative outside option if reneging carries negative reputational consequences. Specifically, states enforce the commitment to arbitration by refusing to arbitrate with a deviator in the future.

## 2 Understanding Interstate Arbitration

Interstate arbitration is a legal technique of international dispute resolution, wherein states submit a dispute to a neutral third party for settlement. This third party is usually a self-identified arbitration tribunal, which deliberates according to rules chosen and is composed of members appointed by the parties. During the proceedings, however, the parties' role is limited to submitting their claims and evidence, and the arbitration tribunal independently issues an arbitration "award." Consequently, in-

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<sup>6</sup>Oye 1986.

<sup>7</sup>Chayes and Chayes 1993, 177.

<sup>8</sup>Allee and Huth 2006.

terstate arbitration is not equivalent to mediation or adjudication. Unlike mediation, interstate arbitration is not a process in which the parties seek compromise with negotiation support. Unlike adjudication, it is not compulsory and thus cannot be used to enforce compliance with international law.

Interstate arbitration achieved a prominent role as a method of legal dispute resolution at the Hague Peace Conference of 1899, where the great powers of the time agreed on establishing the PCA for peaceful dispute resolution.<sup>9</sup> The method was in active use during the first two decades of the 20th century, but its popularity declined with the possibility of adjudication at the Permanent Court of International Justice since 1922 and the general demise of internal law since the 1930's. Recently, interest in interstate arbitration has renewed. For example, in 1998 and 1999 the PCA gave two celebrated awards that peacefully resolved the protracted and violent conflict between Eritrea and Yemen on sovereignty over the Hanish Islands in the Red Sea.<sup>10</sup> However, the number of cases at the PCA and the ICJ continues to be smaller than the number of cases with compulsory or adjudicative elements.<sup>11</sup> The purpose of this paper is to provide a detailed explanation for the former subset of cases only, not international dispute resolution in general.

Currently, the PCA stands out as the prominent forum for interstate arbitration. In addition to voluntary arbitration, it has recently served as the dispute resolution body for important multilateral agreements such as the United Nations Convention on the Law of the Sea (UNCLOS).<sup>12</sup> It now also resolves commercial disputes in which one of the parties is not a state. Another important forum for interstate arbitration is the ICJ, which allows states to sign a voluntary "special agreement" instead of the conventional adjudicative procedure.<sup>13</sup> Finally, many international organizations perform a *de facto* arbitration function. An example is the Codex Alimentarius Commission, which can recommend international food and veterinary standards when states seek harmonization but fail to agree on a specific standard.

Although the practice of interstate arbitration varies, it is characterized by four general features worth discussing in some detail. First, interstate arbitration requires mutual consent.<sup>14</sup> Although some international agreements, such as most bilateral in-

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<sup>9</sup>Baratta 1989.

<sup>10</sup>Permanent Court of Arbitration 2005.

<sup>11</sup>Fischer 1982. In some of these cases the states agreed on the need for a legal resolution.

<sup>12</sup>Sohn 1982-1983; Shadish, Cook and Campbell 2002.

<sup>13</sup>Mitchell and Hensel 2007.

<sup>14</sup>Baratta 1989.



vestment treaties, refer to “compulsory” arbitration with strong adjudicative elements, conventional interstate arbitration is founded on a mutual decision. Unless dictated by a separate international agreement, the PCA only considers cases in which both parties agree on arbitration. Similarly, an ICJ special agreement must be mutually submitted.

Second, interstate arbitration is external to the parties. Unlike mediation, interstate arbitration does not purport to facilitate dialogue between the disputants. When two states submit a dispute, they commit to honoring the award. They do not bargain with the arbitration tribunal, and the arbitration proceedings do not provide a mechanism for direct communication between the parties.

Third, interstate arbitration usually results in an asymmetric award that clearly indicates which party “won” the dispute.<sup>15</sup> While this practice is unremarkable in adjudication, the explicit purpose of which is to discipline violators, it is striking in voluntary dispute resolution: arbitration tribunals do not pursue compromise. For example, Stuyt documents 451 individual cases of interstate arbitration between 1789 and 1990 and finds that in 225 of these cases, a clear winner could be identified.<sup>16</sup> Only 30 cases can be characterized as compromise with reasonable certainty. In the remaining cases, either the award was unavailable, no award was given, or the result was unclear. Even if one half of these cases were actually compromises, the vast majority of all arbitration awards would follow the winner-loser logic.

Finally, interstate arbitration is typically public. States rarely choose to conduct the arbitration proceedings in secrecy, while arbitration proceedings involving private parties are almost exclusively confidential. All cases of interstate arbitration at the PCA and the ICJ, for example, are fully public. To the contrary, the PCA has 22 pending cases involving a private party, and only three of these cases are public.<sup>17</sup> Moreover, the role of the PCA is limited to “administrative support” in two of these three cases.

A functionalist explanation for interstate arbitration should include a rationale for the counterintuitive combination of these features. At first glance, the necessity of mutual consent seems to fit poorly with the external nature of the proceedings and the asymmetric nature of the modal arbitration award. If the purpose of interstate arbitration is dispute resolution, why should the parties be isolated from the process instead of pursuing a negotiated compromise? Similarly, the choice of public proceed-

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<sup>15</sup>Baratta 1989.

<sup>16</sup>Stuyt 1990.

<sup>17</sup>As of May 2, 2008.

ings is counterintuitive given the “sovereignty costs” that surrendering the authority to conceal or release information carries.<sup>18</sup>

## 2.1 The Usual Suspects: Incomplete Information and Commitment Problems

Bargaining theory offers three potential explanations for failure: incomplete information, commitment problems, and indivisibilities or increasing returns.<sup>19</sup> Of these, incomplete information and commitment problems with a fully divisible asset have received most attention.<sup>20</sup>

To begin with, consider incomplete information. As game theorists have shown, uncertainty over the opponent’s resolve sometimes prompts an unacceptable offer on the division of the disputed asset.<sup>21</sup> Had the bargaining parties known exactly which offers the other party prefers to a costly outside option, they would have found a mutually preferable agreement and avoided costly alternatives such as warfare or trade sanctions. However, based on the four features outlined above, interstate arbitration is not useful in solving the problem of incomplete information. Bargaining theory predicts that the parties should send “costly signals” that reveal information on the parties’ resolve.<sup>22</sup> Yet interstate arbitration is voluntary, not particularly costly, and does not involve visible strategic “moves.” If the parties were to reveal information through costly signaling, they should simply create scope for it. Similarly, interstate arbitration does not facilitate communication. Instead, states should choose mediation for negotiation support. Externalizing the process to an independent arbitration tribunal is not a good substitute for mediation.

If incomplete information is not a problem, bargaining failure is nevertheless possible when the bargaining parties cannot credibly commit to an agreement.<sup>23</sup> For example, states sometimes choose warfare to prevent the opponent from growing stronger in the future. More generally, bargaining failure is possible whenever a potential agreement involves incentives to defect as in a Prisoners’ Dilemma.<sup>24</sup> If credible commitment is not readily available, the parties must find an enforcement

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<sup>18</sup>Abbott and Snidal 2000; Moravcsik 2000.

<sup>19</sup>Fearon 1995.

<sup>20</sup>Powell 2006.

<sup>21</sup>Gartzke 1999.

<sup>22</sup>Fearon 1997; Spence 1973.

<sup>23</sup>Powell 2004, 2006.

<sup>24</sup>Axelrod and Keohane 1985.

mechanism.

The public nature of arbitration permits reputational consequences for non-compliance,<sup>25</sup> but interstate arbitration turns out to be a poor solution to commitment problems in general. Most importantly, the external nature of the proceedings and the asymmetric awards are not functional for preventing defection in the future. To solve a commitment problem, states should negotiate a compromise that reflects their relative bargaining power and announce a public commitment to it. If they need international law to bolster the commitment, they can sign and ratify a formal international agreement with specific enforcement provisions.<sup>26</sup> Interstate arbitration creates no added value, and a starkly asymmetric award actually gives the loser an additional incentive to defect, so interstate arbitration could even aggravate the commitment problem.

These limitations suggest that neither incomplete information nor commitment problems provide an adequate explanation for international arbitration. In contrast, they offer plausible explanation for adjudication or compulsory arbitration because states can use a legal challenge as a costly signal and/or to punish defectors.<sup>27</sup>

## 2.2 Bargaining and Increasing Returns

In addition to incomplete information and commitment problems, bargaining failure is possible if the disputed asset is subject to *increasing returns*. Increasing returns imply that compromise is not efficient, as some surplus is dissipated upon division:

**Definition 1.** Suppose states  $A$  and  $B$  bargain over an asset of size 1 and let  $u_i(\pi_i)$ , where  $\pi_i$  is the share that state  $i$  obtains, be the non-negative payoff to state  $i$ . The asset is subject to *increasing returns* if and only if both states  $i = A, B$  prefer obtaining any share  $\pi_i \in [0, 1]$  with probability  $\lambda_i$  to obtaining a smaller share  $\pi_i \cdot \lambda_i$  with certainty, for all  $\lambda_i \in [0, 1]$ , and this preference is strict for some  $\lambda_i$ .

This definition implies that in the presence of increasing returns, a state would rather obtain the entire asset with probability  $\lambda_i$  than a share of  $\lambda_i$  with certainty. When the marginal value of each additional unit of the asset is increasing, it is optimal to “gamble” on obtaining the entire asset.

A special case of increasing returns is *indivisibility*, which implies that the asset

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<sup>25</sup>See Chayes and Chayes 1993; Paulson 2004; Tomz 2007.

<sup>26</sup>Koremenos, Lipson and Snidal 2001.

<sup>27</sup>Reinhardt 2001; Rosendorff 2005.

disappears upon division:

**Claim 1.** If an asset is *indivisible*, so that  $u_i(\pi_i) = 0$  for all  $\pi_i \neq 1$ , it is subject to increasing returns.

To understand this claim, note that an indivisible asset is worthless if it is divided. Thus, a state would rather obtain the entire asset with any probability rather than a share of it.

The problems that increasing returns create can be illustrated by using three simple two-player games sketched in Figure 2.1. The game on the left is a classic Battle of the Sexes. Failure to cooperate creates no surplus, but any cooperative arrangement results in unequal distribution of gains with payoffs  $(2, 1)$  or  $(1, 2)$ . The mixed strategy equilibrium, in which both players choose their strategy randomly, is inefficient. The expected payoffs are only  $(\frac{2}{3}, \frac{2}{3})$  because coordination failure sometimes occurs. Choosing between  $(U, L)$  and  $(D, R)$  randomly would yield payoffs  $(1 + \lambda, 2 - \lambda)$ , where  $\lambda$  is the probability of choosing  $(U, L)$ . This solution is efficient and mutually profitable for any  $\lambda \in [0, 1]$ . The game in the middle is a Deadlock, and it seems as if neither player had an incentive to cooperate. However, the pure-strategy equilibrium gives payoffs  $(3, 3)$  while randomly choosing between  $(U, L)$  and  $(D, R)$  would yield  $(2 + 3\lambda, 5 - 3\lambda)$ , which both players prefer when  $\frac{2}{3} > \lambda > \frac{1}{3}$ . The game on the right reflects increasing returns without indivisibilities. Unlike Battle of the Sexes and Deadlock, this game does not have a discrete strategy space. The pie is physically divisible, but equal division dissipates surplus. Randomly choosing between 0 and 1 would yield  $(2\lambda, 2 - 2\lambda)$  in expectation, while the symmetric solution  $\frac{1}{2}$  would yield  $(\frac{1}{2}, \frac{1}{2})$ . Both players prefer randomization when  $\frac{3}{4} > \lambda > \frac{1}{4}$ .

[FIGURE 2.1 ABOUT HERE]

In each case, the problem of inefficient compromise reduces to creating a lottery that is less costly to implement than bargaining. Even if the asset is subject to increasing returns, the expected payoff can be divided without loss of surplus through probabilistic allocation. Consequently, a mutually profitable agreement is always possible. A low-cost lottery prevents distributional conflict from dissipating surplus, but credible commitment by both players is necessary because the loser has an incentive to renege. This is why Powell argues that the broader class of commitment problems

subsumes indivisibilities:<sup>28</sup>

**Claim 2.** If states bargain over an asset that is indivisible or subject to increasing returns, the allocation is efficient if and only if state  $A$  obtains the asset with probability  $\lambda$  and state  $B$  obtains the asset with probability  $1 - \lambda$ .

Remarkably, no matter how asymmetric the states are, the *ex post* allocation must never involve any division.

To be sure, a lottery is not the only means of preventing bargaining failure in the presence of increasing returns. For example, Fearon dismisses indivisibilities as an explanation for interstate war on the grounds that although many issues are indeed indivisible, “the real question in such cases is what prevents leaders from creating intermediate settlements.”<sup>29</sup> States could use issue linkages or side payments to prevent costly bargaining.<sup>30</sup> However, the method states choose depends on costs and benefits. While any lottery requires some commitment capacity, issue linkages and side payments require negotiations across issue areas and carry transaction costs.<sup>31</sup> Thus, states have an incentive to implement the lottery described in **Claim 2** when the cost of issue linkage or side payments is higher than the cost of that lottery.

Are increasing returns empirically relevant? To begin with, the most straightforward example of a physical indivisibility is an island with strategic value. Unlike in most territorial disputes, states cannot simply “split the difference.” Another example is an international product or process standard.<sup>32</sup> Industries and companies desire harmonization to reduce transaction costs, but each party prefers retaining its domestic standard to avoid adjustment costs. Often the most efficient solution is to choose among pre-existing, proven national standards, which implies that division through a compromise standard dissipates some of the surplus. Similarly, a simple product ban is sometimes the most efficient means of controlling a negative externality.<sup>33</sup>

Increasing returns also affect bargaining over norms and legal principles. For example, as Vogel argues, transatlantic bargaining over the European ban in 1985 on beef hormone, used extensively by American beef exporters, was complicated by the fear that a precedent would set the guidelines for future regulations elsewhere in the

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<sup>28</sup>Powell 2006, 177-180.

<sup>29</sup>Fearon 1995, 390.

<sup>30</sup>Sebenius 1983.

<sup>31</sup>Koremenos, Lipson and Snidal 2001.

<sup>32</sup>Mattli and Büthe 2003.

<sup>33</sup>Guzman and Simmons 2002.

world.<sup>34</sup> The European Community could not yield because it would signal willingness to negotiate its sovereign right to protect consumer health, while the American exporters were loath to see similar regulations emerge in more important markets, such as Japan. Yet a clear rule would reduce uncertainty and increase confidence in a rule-based international trading system. Similarly, many international disputes involve contradictory sovereignty claims based on ethnicity or historical possession. In such situations, division could fuel hostilities and pave way for future conflict, which suggests the presence of increasing returns even though the territory is physically divisible.<sup>35</sup>

Importantly, increasing returns are conceptually distinct from domestic political constraints. If the asset is not subject to increasing returns but leaders cannot compromise due to domestic political constraints, the only problem is a bargaining failure at the domestic level. International dispute resolution could add legitimacy to the process and thus provide a “smokescreen” for concessions.<sup>36</sup> This explanation is useful in understanding international dispute resolution in general, but it cannot account for the asymmetric nature of arbitration awards.

### **2.3 A Functionalist Explanation**

The above discussion suggests that increasing returns are empirically relevant. Moreover, it implies that states need a low-cost lottery to which they can credibly commit. If interstate arbitration is such a lottery with a credible commitment mechanism, and its institutional features match the associated problems, increasing returns provide a logically coherent explanation for interstate arbitration.

Let us first verify that interstate arbitration is indeed strategically equivalent to a lottery. On the one hand, the arbitration award must be subject to uncertainty. This condition is easily fulfilled in any dispute requiring arbitration. Even if the parties choose a clear set of rules according to which the arbitration tribunal is to deliberate, it is impossible to anticipate the outcome with certainty. Any moderately complex framework of rules allows multiple interpretations, and international law is highly complex.<sup>37</sup> On the other hand, the bargaining parties must agree on the odds. Given the well-defined mandate and composition of the arbitration tribunal, the parties

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<sup>34</sup>Vogel 1995.

<sup>35</sup>Hensel and Mitchell 2005.

<sup>36</sup>Allee and Huth 2006.

<sup>37</sup>Franck 1995.

can form “common conjectures.”<sup>38</sup> Additionally, the set of expected probabilities is limited to those that both parties prefer to costly bargaining.<sup>39</sup> Finally, states can also consult national specialists such as international lawyers to obtain an estimate of the likelihood of a favorable award.

Consider next the four institutional features. First, the presence of increasing returns offers a rationale for mutual consent and asymmetric awards. When a compromise dissipates surplus so that both states obtain a higher expected payoff through a lottery, a mutual commitment to an asymmetric award is rational. When compromise is impossible or inefficient, it is better to choose a winner. Thus, increasing returns explain the puzzling tendency of arbitration tribunals to neglect compromise.

Second, the external nature of interstate arbitration provides two important benefits. On the one hand, insulating the arbitration tribunal from state influence is useful because it dampens the incentive to engage in costly bribery, blackmail, or coercion.<sup>40</sup> Although it is impossible to fully isolate the arbitration tribunal from major powers’ influence, the institutional design increases the cost of such activities. This increases states’ willingness to engage in interstate arbitration, because they can expect a fair hearing and a favorable award with sufficiently high probability.<sup>41</sup> On the other hand, the external nature of interstate arbitration also confers legitimacy on the proceedings.<sup>42</sup> With increasing returns, it is difficult for the loser to explain its domestic audiences why the opponent “took it all,” so domestic legitimacy is particularly important.

Finally, the public nature of the proceedings offers a commitment mechanism. If states announce a public commitment to the award and condition their reputation for bargaining in good faith on compliance, they increase the cost of renegeing.<sup>43</sup> Even if states possess “multiple reputations” in different issue areas, as Downs and Jones argue, they can create a system of reputational consequences upon violation.<sup>44</sup> If third parties could not compare the award with the loser’s *ex post* behavior, a reputational mechanism would not function. If a purely domestic commitment mechanism, such as an independent judiciary or a democratic legislature,<sup>45</sup> is not sufficient to create

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<sup>38</sup>Morrow 2002.

<sup>39</sup>Aumann 1974.

<sup>40</sup>Haftel and Thompson 2006.

<sup>41</sup>Some bias towards major powers is useful for incentive compatibility (Posner and de Figueiredo 2005).

<sup>42</sup>Allee and Huth 2006.

<sup>43</sup>Tomz 2007.

<sup>44</sup>Downs and Jones 2002.

<sup>45</sup>Martin 2000; Powell and Mitchell 2007.

adequate commitment capacity, such a reputational mechanism is useful.

### 3 The Model

To formalize the theory, I construct a simple bargaining model in which the disputed asset is subject to increasing returns. I then embed this bargaining model in a simple repeated game to examine the role of public commitment and reputation.

#### 3.1 The Dispute Game

Suppose states  $A$  and  $B$  are in a dispute over an asset of size 1 that is subject to increasing returns. Both states choose simultaneously whether to unilaterally initiate a costly bargaining process  $\Gamma$ . If neither state initiates, they settle on an exogenous allocation  $(\pi_A, \pi_B) = (\pi, 1 - \pi)$ . If at least one state initiates, each state  $i = A, B$  obtains a bargaining payoff  $\gamma_i$  less the cost of bargaining  $c_i$ .

If states reach the settlement, the value of share  $\pi_i$  to state  $i$  is  $u_i(\pi_i)$ . To simplify exposition, let  $u_i$  be twice differentiable and normalize  $u_i(0) = 0$ . By increasing returns,  $u_i(\pi_i)$  and  $u'_i(\pi_i)$  are strictly increasing in  $\pi_i$ , as illustrated in Figure 2.2. The settlement  $(\pi, 1 - \pi)$  is exogenous for simplicity and could *inter alia* reflect relative bargaining power. Throughout, I assume that if there is at least one settlement  $(\pi, 1 - \pi)$  that both states prefer to costly bargaining, such a preferred settlement is chosen.

[FIGURE 2.2 ABOUT HERE]

Either player can unilaterally initiate costly bargaining, which could be a war of attrition or any other costly bargaining procedure.<sup>46</sup> I do not model this outside option explicitly, because it only shapes behavior through expected payoffs: a war of attrition in the future is equivalent to an inefficient compromise if the expected payoffs are equal. If either state  $i$  initiates costly bargaining, both pay a strictly positive cost  $c_i$  and obtain an expected payoff  $\gamma_i$ , which is strictly lower than the payoff from obtaining the entire asset without bargaining,  $u_i(1)$ . This is a generalization of the conventional model in which  $\gamma_i = p_i \cdot u_i(1)$ , where  $p_i$  is the probability that state

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<sup>46</sup>Sutton 1986.



$i$  obtains the asset in its entirety through conflict. I omit the pathological possibility that both states choose to initiate costly bargaining even though they prefer the settlement.

Both bargaining and settlements can be inefficient, or Pareto-dominated by some lottery on the ownership of the entire asset:

**Definition 2.** An allocation  $(\pi, 1 - \pi)$  is *inefficient* if and only if  $u_A(\pi) < \lambda \cdot u_A(1)$  and  $u_B(1 - \pi) < (1 - \lambda) \cdot u_B(1)$  for some  $\lambda \in [0, 1]$ . Bargaining is *inefficient* if and only if  $\gamma_A - c_A < \lambda \cdot u_A(1)$  and  $\gamma_B - c_B < (1 - \lambda) \cdot u_B(1)$  for some  $\lambda \in [0, 1]$ .

Below, I omit the trivial case in which bargaining is efficient.

In the absence of interstate arbitration, the dispute game prompts the following outcomes:

**Claim 3.** The equilibria of the dispute game are as follows:

1. If there does not exist an allocation  $(\pi, 1 - \pi)$  such that  $\gamma_i - c_i \leq u_i(\pi_i)$  for  $i = A, B$ , at least one state  $j \in \{A, B\}$  such that  $\gamma_j - c_j > u_j(\pi_j)$  initiates the costly bargaining process.
2. Otherwise states settle on an allocation  $(\pi, 1 - \pi)$  such that  $\gamma_i - c_i \leq \pi_i$  for  $i = A, B$ .

The first part is standard.<sup>47</sup> If there is no “zone of agreement,” at least one state has an incentive to initiate a costly bargaining process. The second part shows that if bargaining is too costly, a settlement is possible. However, almost all settlements are inefficient:

**Claim 4.** The outcome of the dispute game is inefficient unless the equilibrium allocation is  $(1, 0)$  or  $(0, 1)$ .

This claim implies that increasing returns could create a commitment problem. If only the states could somehow commit to a lottery over the ownership of the entire asset, they could increase their expected payoff. Unfortunately, such a lottery is useless without commitment capacity because either player can initiate costly bargaining should it lose. Figure 2.3 illustrates.

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<sup>47</sup>Fearon 1995; Powell 2006.

[FIGURE 2.3 ABOUT HERE]

The only situation in which states can avoid inefficiency is one in which bargaining is so costly that at least one state prefers yielding to bargaining. The potential outcomes of the game can therefore be classified:

**Proposition 1.** The dispute game has four forms that give rise to different equilibria:

1. **Excessive bargaining costs.** If  $c_i \geq \gamma_i$  for  $i = A, B$ , in equilibrium neither state initiates costly bargaining and any allocation  $(\pi, 1 - \pi)$  is possible.
2. **Asymmetric bargaining costs.** If  $c_A < \gamma_A$  but  $c_B \geq \gamma_B$ , in equilibrium neither state initiates costly bargaining and any allocation  $(\pi, 1 - \pi)$  such that  $u_A(\pi) \geq \gamma_A - c_A$  is possible.
3. **Inefficient compromise.** If  $c_i < \gamma_i$  for  $i = A, B$  and there exists an allocation  $(\pi^*, 1 - \pi^*)$  such that  $u_i(\pi_i^*) \geq \gamma_i - c_i$  for  $i = A, B$ , in equilibrium neither state initiates costly bargaining and any allocation  $(\pi, 1 - \pi)$  such that  $u_i(\pi_i) \geq \gamma_i - c_i$  for  $i = A, B$  is possible.
4. **Costly bargaining.** If  $c_i < \gamma_i$  for  $i = A, B$  and there is no allocation  $(\pi^*, 1 - \pi^*)$  such that  $u_i(\pi_i^*) \geq \gamma_i - c_i$  for  $i = A, B$ , at least one state  $j \in \{A, B\}$  such that  $\gamma_j - c_j > u_j(\pi_j^*)$  initiates the costly bargaining process.

Consider the equilibria in turn. In **excessive bargaining costs**, the cost of bargaining  $c_i$  is so high relative to the value of the asset that both states would rather give up the asset than undergo the bargaining process  $\Gamma$ . Consequently, the bargaining situation requires coordination in the presence of distributional conflict. Paradoxically, however, by **Claim 4** any allocation other than  $(1, 0)$  or  $(0, 1)$  is inefficient. Below, I analyze the role of interstate arbitration in solving such coordination problems.

In **asymmetric bargaining costs**, only one of the states is willing to accept any allocation of the asset. The other state has an advantage in bargaining because it can credibly threaten not to accept an unfavorable allocation. The range of allocations that are feasible in equilibrium now depends on the expected payoff  $\gamma_A$  to the advantaged state  $A$  and its bargaining cost  $c_A$ . This does not imply, however, that the settlement would necessarily favor the advantaged state: it only sets a lower bound for the payoff that this state obtains.

In **inefficient compromise**, both states can credibly threaten to refuse an offer that is unfavorable. However, if there are allocations that both prefer to costly bargaining, they will choose one of them. This is the canonical situation, in which both parties have an “outside option” and the problem is to choose an allocation among those that both prefer to their respective outside options.

In **costly bargaining**, there is *no* allocation that both states prefer to bargaining. Substantively, this scenario is only possible because of increasing returns. With indivisibilities, it must occur unless at least one state prefers losing the entire asset to costly bargaining. Even though costly bargaining is never the best possible outcome, as the lottery described in **Definition 2** shows, it can dominate an inefficient compromise. For example, suppose  $\gamma_i = \frac{1}{2} \cdot u_i(1)$  so that the costly bargaining process allocates the entire asset to state  $i = A, B$  with probability  $\frac{1}{2}$ . Then if  $\frac{1}{2} \cdot u_i(1) - u_i(\frac{1}{2}) > c_i$  for at least one state  $i$ , it strictly prefers paying the bargaining cost to an egalitarian compromise. If this is so for both states, they engage in costly bargaining through mutual agreement. This outcome is nevertheless inefficient, as a credible commitment to a lottery that allocates the asset to state  $i = A, B$  with probability  $\frac{1}{2}$  would remove the bargaining cost  $c_i$ .

### 3.2 Interstate Arbitration

Arbitration can be incorporated in the model as a lottery in which a tribunal chooses an award  $(\pi, 1 - \pi)$  probabilistically. Before observing the arbitration award, each state  $i = A, B$  must “recognize” the arbitration tribunal as legitimate. Since mutual consent is required, the arbitration tribunal does not issue an award unless both states recognize it. However, the announcement is only legally binding if the states have the necessary commitment capacity to enforce it. Otherwise, arbitration can only help the states by establishing a “focal point.”<sup>48</sup>

Formally, consider the following game:

1. Both states  $i = A, B$  choose simultaneously whether to recognize the arbitration tribunal. If at least one of them does not recognize the arbitration tribunal, they play the equilibrium of the dispute game, as specified in **Proposition 1**, and the game ends.
2. If both players recognize the arbitration tribunal, it issues an exogenous arbitration award  $(\pi^A, 1 - \pi^A)$  favorable to state  $A$  with probability  $\lambda$  and another

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<sup>48</sup>Garrett and Weingast 1993; Schelling 1960.

exogenous arbitration award  $(\pi^B, 1 - \pi^B)$  favorable to state  $B$  with probability  $1 - \lambda$ .

3. Both states  $i = A, B$  observe the exogenous arbitration award  $(\pi^*, 1 - \pi^*)$  and choose simultaneously whether to unilaterally initiate costly bargaining. If neither state initiates, they obtain the payoffs from the arbitration award  $(\pi^*, 1 - \pi^*)$ . If at least one state  $i = A, B$  initiates, they play the costly bargaining process  $\Gamma$ , but each initiator must also pay an additional, strictly positive cost  $z_i$ .

Throughout, I assume that the probabilities and the exogenous awards are common knowledge. Exogeneity is without loss of generality, as the awards could be *inter alia* determined by the relative bargaining power of the states, the strength of their legal case, or the composition of the arbitration tribunal.<sup>49</sup> I endogenize the cost  $z_i$  of renegeing, which I refer to as *commitment capacity*, below by constructing a repeated game in which renegeing on an arbitration results in refusal by other states to engage in arbitration, which is costly. In this section, however, I let the cost remain exogenous.

Without imposing any further assumptions on the probabilities and the awards, the range of potential equilibria is wide. I restrict attention to *optimal* probability distributions  $(\lambda, 1 - \lambda)$  and awards  $(\pi^A, 1 - \pi^A), (\pi^B, 1 - \pi^B)$  upon which the states cannot Pareto-improve by choosing another arbitration tribunal instead. Throughout, I let  $\pi_i^0$  denote the equilibrium share of state  $i$  if a settlement is reached without arbitration. Substantively, this share is most likely increasing in the bargaining power of state  $i$ .

Consider now equilibria when arbitration is possible:

**Proposition 2.** In **excessive bargaining costs**, both states recognize the arbitration tribunal. It recommends  $(1, 0)$  with probability  $\lambda$  and  $(0, 1)$  with probability  $1 - \lambda$ , where  $\lambda$  is such that  $u_A(\pi^0) \leq \lambda \cdot u_A(1)$  and  $u_B(1 - \pi^0) \leq (1 - \lambda) \cdot u_B(1)$ . Neither state reneges.

When bargaining is so costly that both states prefer yielding to bargaining, they can choose from a range of random allocations that Pareto-dominate the expected settlement  $(\pi^0, 1 - \pi^0)$ . Consequently, the expected settlement sets a lower bound for the expected payoff from arbitration to both states. With increasing returns, it is always optimal to allocate the asset in its entirety. The situation can therefore

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<sup>49</sup>Johns 2007; Posner and de Figueiredo 2005.

be thought of as a coordination problem in which starkly asymmetric allocations are necessary to achieve an efficient *ex ante* compromise. Somewhat paradoxically, the absence of credible outside options results in starkly asymmetric arbitration awards, the risk of which they are willing to accept *ex ante*.

**Proposition 3.** In **asymmetric bargaining costs**, both states recognize the arbitration tribunal. It recommends  $(\pi^A, 1 - \pi^A) = (1, 0)$  with probability  $\lambda$  and  $(\pi^B, 1 - \pi^B)$  with probability  $1 - \lambda$ , where  $\lambda$  is such that  $\lambda \cdot u_i(\pi_i^A) + (1 - \lambda) \cdot u_i(\pi_i^B) \geq \pi_i^0$  for  $i = A, B$  and  $\pi^B$  is minimized subject to  $u_A(\pi^B) \geq \gamma_A - c_A - z_A$ . Neither state reneges.

When the cost of bargaining is asymmetric, one of the states has a credible outside option. *Ex post*, this state must obtain an arbitration award that it prefers to renegeing, which sets a lower bound for the share that it obtains upon an unfavorable award. Its ability to threaten costly bargaining also sets a lower bound on the probability  $\lambda$  that it obtains a favorable award. This judicial bias is necessary to render arbitration incentive-compatible.<sup>50</sup> With increasing returns, it is always optimal for both states to either allocate the entire asset to the advantaged state or choose the allocation that is barely acceptable for it.

**Proposition 4.** In **inefficient compromise**, both states recognize the arbitration tribunal. It recommends  $(\pi^A, 1 - \pi^A)$  with probability  $\lambda$  and  $(\pi^B, 1 - \pi^B)$  with probability  $1 - \lambda$ , where  $\lambda$  is such that  $\lambda \cdot u_i(\pi_i^A) + (1 - \lambda) \cdot u_i(\pi_i^B) \geq u_i(\pi_i^0)$  for  $i = A, B$  and  $\pi_i^j$  is minimized subject to  $u_i(\pi_i^j) \geq \gamma_i - c_i - z_i$  for  $i \neq j$ . Neither state reneges.

If the equilibrium outcome is an inefficient compromise without interstate arbitration, both states have a credible outside option. With increasing returns, the optimal arbitration tribunal chooses between the two allocations that are most asymmetric. The expected settlement  $(\pi^0, 1 - \pi^0)$  in the absence of arbitration determines the lowest and highest possible probability that state  $A$  obtains a favorable award.

**Proposition 5.** In **costly bargaining**,

1. If commitment capacity  $z_i$  is high enough for  $i = A, B$ , both states recognize the arbitration tribunal. It recommends  $(\pi^A, 1 - \pi^A)$  with probability  $\lambda$  and  $(\pi^B, 1 - \pi^B)$  with probability  $1 - \lambda$ , where  $\lambda$  is such that  $\lambda \cdot u_i(\pi_i^A) + (1 - \lambda) \cdot$

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<sup>50</sup>Posner and de Figueiredo 2005.

$u_i(\pi_i^B) \geq \gamma_i - c_i$  for  $i = A, B$  and  $\pi_i^j$  is minimized subject to  $u_i(\pi_i^j) \geq \gamma_i - c_i - z_i$  for  $i \neq j$ . Neither state reneges.

2. If commitment capacity  $z_i$  is low enough for some  $i \in \{A, B\}$ , at least one state fails to recognize the arbitration tribunal. At least one state  $j \in \{A, B\}$  such that  $\gamma_j - c_j > u_j(\pi_j^0)$  initiates costly bargaining.

It is only in the case of **costly bargaining** that arbitration could completely fail. Without commitment capacity, there is no allocation that both states would accept instead of engaging unilaterally in costly bargaining. If both states have adequate commitment capacity, however, they can choose asymmetric allocations randomly. With increasing returns, both states obtain a higher *ex ante* payoff. Importantly, they must choose the probabilities of obtaining a favorable arbitration so that both states are willing to recognize the arbitration tribunal, despite the fact that they also commit to accepting an unfavorable award with positive probability.

Notably, the model leaves the exact choice of probabilities open. On the one hand, one could invoke standard bargaining solutions such as the Nash Bargaining Solution to obtain a precise prediction.<sup>51</sup> Since the rules of the arbitration proceedings are determined by the parties, they could, for example, choose the arbitrators so as to build in some judicial bias. On the other hand, in reality it is well possible that the states do not know the exact probabilities. Since the range of acceptable probabilities is quite wide, this flexibility implies that the model is robust to small changes in expectations.

### 3.3 Comparative Statics

To apply the model empirically, it is useful to consider the effect of changes in the parameters on the feasibility of arbitration and the nature of the resulting award. I focus on the expected payoff from bargaining ( $\gamma_i - c_i$ ), the rate at which returns increase ( $u'_i$ ), and commitment capacity ( $z_i$ ).

**Proposition 6.** Consider an increase in the net expected payoff from bargaining,  $\gamma_i - c_i$ , for one state  $i$ , while holding the expected settlement  $\pi_i^0$  constant.

1. In **excessive bargaining costs**, a large enough increase transforms the game into **asymmetric bargaining costs**.

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<sup>51</sup>Nash 1950.

2. In **asymmetric bargaining costs**, when  $i = A$ , the share  $\pi^A$  of the advantaged state  $A$  increases upon an unfavorable award; when  $i = B$ , a large enough increase transforms the game into **inefficient compromise**.
3. In **inefficient compromise**, the share  $\pi_i^j$  of state  $i$  upon an unfavorable award increases. A large enough increase transforms the game into **costly bargaining**.
4. In **costly bargaining**, if arbitration is possible, the minimal expected payoff from arbitration and share  $\pi_i^j$  of state  $i$  upon an unfavorable award increases; if arbitration is not possible, the outcome remains unchanged.

As the expected payoff from bargaining increases, states are less willing to engage in arbitration. If arbitration is possible, however, the value of the outside option increases and the value of the unfavorable award to state  $i$  must increase. The value of the favorable award is not affected because the “winner” in the arbitration proceedings never has an incentive to renege. Finally, if the outcome in the absence of arbitration is costly bargaining, an increase in the value of this bargaining process must increase the expected payoff to a state.

A striking implication of the analysis is that when the net expected payoff from bargaining is low for both states, the likelihood of a “compromise” arbitration award increases *ex post* with the net expected payoff from bargaining for either state  $i$ . For example, when the relative bargaining power of state  $i$  increases, one expects to see an equal distribution of gains more frequently. This is so simply because the state whose expected payoff from bargaining increases cannot credibly commit to losing the entire asset, so the arbitration tribunal must increase the value of the unfavorable award to it. While the empirical implications are counterintuitive, this is not a theoretical paradox: the expected payoff from arbitration to the increasingly powerful state can certainly increase. Figure 2.4 illustrates.

[FIGURE 2.4 ABOUT HERE]

**Proposition 7.** Consider utility functions  $u_i, \tilde{u}_i$  and payoffs from bargaining  $\gamma_i, \tilde{\gamma}_i$  such that  $\tilde{u}'_i > u'_i$  and  $\frac{u_i}{\gamma_i} = \frac{\tilde{u}_i}{\tilde{\gamma}_i}$  everywhere.

1. The pair of bargaining costs  $(\tilde{c}_A, \tilde{c}_B)$  under  $\tilde{u}_i, \tilde{\gamma}_i$  is larger than the pair of bargaining costs  $(c_A, c_B)$  under  $u_i, \gamma_i$  above which **excessive bargaining costs** occurs.

2. The pair of bargaining costs  $(\tilde{c}_A, \tilde{c}_B)$  under  $\tilde{u}_i, \tilde{\gamma}_i$  is larger than the pair of bargaining costs  $(c_A, c_B)$  under  $u_i, \gamma_i$  below which **costly bargaining** occurs.
3. For any pair of bargaining costs  $(c_A, c_B) = (\tilde{c}_A, \tilde{c}_B)$ , the smallest acceptable share  $\pi_i^*$  for state  $i = A, B$  under  $u_i, \gamma_i$  is larger than the smallest acceptable share  $\tilde{\pi}_i^*$  under  $\tilde{u}_i, \tilde{\gamma}_i$ .

This proposition holds constant the expected benefit from bargaining relative to obtaining the entire asset, and examines the effect of “increasingly increasing returns.” This corresponds to an increase in the severity of the distributional consequences of asymmetric allocations, and the consequences are predictable: states are more willing to engage in costly bargaining, which shrinks the set of parameters for which arbitration is feasible and the extent to which the arbitration award can be asymmetric. As increasing returns become more important, the value of arbitration increases but, by **Proposition 7**, it is increasingly difficult for states to credibly commit to an unfavorable award.

**Proposition 8.** Consider an increase in commitment capacity  $z_i$  for one state  $i$ .

1. In **excessive bargaining costs**, the outcome is unaffected.
2. In **asymmetric bargaining costs**, the share  $\pi^B$  of the advantaged state  $A$  decreases upon an unfavorable award.
3. In **inefficient compromise**, the share  $\pi_i^j$  of state  $i$  decreases upon an unfavorable award.
4. In **costly bargaining**, interstate arbitration first becomes feasible for some allocations  $(\pi^A, 1 - \pi^A)$  and  $(\pi^B, 1 - \pi^B)$ , and the share  $\pi_i^j$  of state  $i$  then decreases upon an unfavorable award.

As commitment capacity increases, it is easier for states to commit to an unfavorable award. They can implement more asymmetric *ex post* allocations as the cost of renegeing increases.

**Proposition 9.** Consider an increase in commitment capacity  $z_i$  or a small enough decrease in the net expected payoff from bargaining,  $\gamma_i - c_i$ , for one state  $i$  such that the game is not transformed.

1. In **excessive bargaining costs**, the expected payoff cannot be increased for both states.



2. Otherwise, it is possible to increase the payoff to both states by choosing more asymmetric *ex post* allocations  $(\pi^A, 1 - \pi^A)$  and  $(\pi^B, 1 - \pi^B)$  and manipulating the probabilities  $(\lambda, 1 - \lambda)$ .

On the one hand, the minimal payoff that state  $i$  must expect from interstate arbitration decreases. This is so because the value of the outside option decreases, so the threat to engage in costly bargaining is less potent. On the other hand, the effect of a decrease in the net expected payoff from bargaining has another, counterintuitive implication. As the value of the outside option decreases for one of the states, it is possible to implement arbitration proceedings that increase the expected payoff to *both* states. In the presence of increasing returns, states can expect more asymmetric allocations, which reduces deadweight loss. The ability to commit to legal settlements allows more effective use of international law in dispute resolution.

Ideally, states could “collude” to increase the common cost of bargaining. A problem with this approach is, however, the possibility that the state whose net expected payoff from bargaining decreases, is exploited by the other state: implementing arbitration proceedings that benefit both states is possible, but it is also possible to implement arbitration proceedings that only benefits one of the states.

Consider finally changes in the expected settlement  $(\pi^0, 1 - \pi^0)$ , perhaps because the relative bargaining power of the two states changes and it affects the expected settlement:

**Proposition 10.** If the share  $\pi_i^0$  of state  $i$  in the expected settlement increases, its minimal expected payoff from arbitration increases in **excessive bargaining costs**, **asymmetric bargaining costs**, and **inefficient compromise**.

Predictably, an increase in the value of the expected settlement increases the minimal payoff that a state must obtain from interstate arbitration.

### 3.4 Reputation and Enforcement

The proposed commitment mechanism is reputational, which would explain the public nature of interstate arbitration. I consider briefly a dynamic game in which long-term relationships emerge to examine the conditions under which the reputational mechanism generates commitment capacity.

There are  $n$  states, where  $n \geq 2$  and each state  $i$  is randomly assigned to play the

dispute game characterized above with another state  $j$ . For simplicity, the probability  $\rho$  of being paired with another state is constant across all states. However, the nature of the dispute is determined probabilistically. Formally, for each period  $t$  and state  $i$ , conditional on being assigned to bargain, the payoff-relevant parameters  $\theta_i = (u_i, \gamma_i, c_i)$  are drawn from some state-specific and time-invariant multivariate distribution  $\Theta_i$ . A special case of interest is  $n = 2$  and  $\rho = 1$ , which corresponds to an “enduring rivalry” between two states.

For analytical tractability, each player has a common discount factor  $\delta \in (0, 1)$ . If the expected payoff from period  $t$  for player  $i$  is denoted by  $u_i^t$ , the discounted payoff from the game is determined by the following equation:

$$U_i = \sum_{t=0}^{\infty} \delta^t \cdot u_i^t. \quad (1)$$

The equilibria in focus are as follows. First, in the *one-stage Nash equilibrium*, each player always behaves optimally as if no future play was forthcoming. Formally, this corresponds to optimal equilibrium play when commitment capacity is zero. If mutually beneficial arbitration is possible without commitment capacity, it is thus implemented. Let  $U_i^N$  denote the discounted payoff for state  $i$  in this equilibrium.

Second, in a *commitment equilibrium* each player is tagged a “friend” if it has never deviated from the equilibrium path and an “enemy” otherwise. These tags are common knowledge, and when an “enemy” is present in a dispute game, neither bargaining state  $i = A, B$  ever recognizes the arbitration tribunal. Otherwise mutually beneficial interstate arbitration is implemented whenever possible.

The function of a commitment equilibrium is to enable arbitration proceedings when commitment capacity is necessary. This is sometimes possible because a state that reneges loses the benefits from interstate arbitration in the future. Let  $U_i^C$  denote the discounted payoff for a “friend” in the commitment equilibrium and  $U_i^D$  the discounted payoff for an “enemy.”

As shown above, interstate arbitration is sometimes possible in a Nash equilibrium. It is reasonable to focus on the case in which the Nash equilibrium is preferred to being an “enemy”, so set  $U_i^D \leq U_i^N \leq U_i^C$ .

In a commitment equilibrium, it is enough to ensure that no state has an incentive to renege upon an unfavorable award, for I have shown in the previous section that optimal interstate arbitration can always be arranged so that both states  $i = A, B$  stand to gain *ex ante*. While it is not possible to characterize all commitment equilibria explicitly, this constraint turns out to have considerable explanatory and predictive

power.

To begin with, the maximal benefit from renegeing is

$$\max \{ \gamma_i - c_i - u_i(\pi_i^{min}) \},$$

where  $u_i(\pi_i^{min})$  denotes the value of the unfavorable award when the incentive to renege is largest. On the other hand, the cost of renegeing determines commitment capacity,

$$z_i = \delta \cdot (U_i^C - U_i^D).$$

In a commitment equilibrium, one must therefore have:

**Proposition 11.** In any commitment equilibrium and at any time  $t$ , any two bargaining states  $i = A, B$  recognize an optimal arbitration tribunal if and only if the dispute game is such that, for  $i \neq j$ , there exist possible unfavorable awards  $\pi_i^j$  such that  $\gamma_i - c_i - u_i(\pi_i^j) \leq \delta \cdot (U_i^C - U_i^D)$ .

Consider the empirical implications of this constraint. First, as the expected payoff from bargaining ( $\gamma_i - c_i$ ) grows, it is increasingly difficult to enforce interstate arbitration. As I have shown in the section on comparative statics, powerful states that assign high value to winning the dispute and expect low-cost bargaining cannot be induced to engage in interstate arbitration unless they find the unfavorable award acceptable. This finding suggests that when a reputational commitment mechanism is necessary, states are most likely to arbitrate disputes in which the value of winning is low relative to the cost of bargaining. Even great powers engage in interstate arbitration under certain circumstances, but the most important disputes are resolved in other fora.

Second, the reputational commitment mechanism depends on the value of interstate arbitration in the future. This value is in turn determined by the frequency of bargaining ( $\rho$ ), the likelihood of encountering a dispute in which arbitration is beneficial, and the expected payoff from arbitration. This finding provides a potential explanation for the frequent use of arbitration in “enduring rivalries,” in which the frequency of bargaining is very high.<sup>52</sup> It also suggests that arbitration is most useful when the frequency of disputes that require arbitration is high. Finally, it shows that the expected payoff from arbitration in the future is at least partially determined by the need to ensure that states have incentives to comply. If a state cannot commit

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<sup>52</sup>Allee and Huth 2006.

to interstate arbitration in important disputes, its commitment capacity can be enhanced by increasing the likelihood that it obtains a favorable award in the future. Since the need for commitment capacity is determined by the value of the outside option, interstate arbitration should exhibit a bias that favors powerful states.

## 4 Examples

In this section, I apply the theoretical model to disputes that states have submitted to interstate arbitration. I consider the “Hanish Islands Crisis” between Eritrea and Yemen in some detail and offer a cursory examination of recent special agreements submitted for resolution in the ICJ.<sup>53</sup>

### 4.1 The Hanish Islands Crisis

The Hanish Islands Crisis was a violent conflict between Eritrea and Yemen over the three Hanish Islands in the Red Sea.<sup>54</sup> The dispute escalated into violence in 1995 when the Eritrean military invaded the island amidst the construction of a hotel and a scuba diving center by a German company and the Yemeni government. According to contemporary sources, the Eritrean military interpreted the Yemeni troops brought to the Hanish Islands to protect the construction workers as an attempt to establish Yemeni sovereignty over the islands.<sup>55</sup> After negotiations collapsed and the cost of bargaining increased on both sides, the parties submitted the dispute for arbitration at the PCA on October 3, 1996.<sup>56</sup> The *Eritrea/Yemen* (1998/1999) arbitration, which resulted in a total victory for Yemen, resolved the dispute peacefully and was celebrated among international lawyers as a landmark event in the history of interstate

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<sup>53</sup>Another recent case of importance at the PCA is *Belgium/Netherlands* (2005) or the “Iron Rhine Arbitration.” The dispute involved contradictory legal claims, which are generally subject to increasing returns. However, another dimension of the dispute was financial burden sharing, which is not subject to increasing returns. If the theory proposed in this paper applies, the primary obstacle to compromise were the contradictory legal claims.

<sup>54</sup>For an excellent account of the crisis, see Lefebvre 1998.

<sup>55</sup>“Eritrea: Battle for a Sandpit.” *Indian Ocean Newsletter* December 23, 1995. The onset of the dispute can therefore be attributed to incomplete information and misperception (Fearon 1995; Jervis 1976).

<sup>56</sup>Kwiatkowska 2001.

arbitration.<sup>57</sup>

To apply the model, I divide the dispute into two periods. The first period encompasses the months before, during, and after the violent conflict in 1995. It exemplifies a dispute in which interstate arbitration is not feasible because the cost of bargaining  $c_i$  is low for at least one of the states  $i \in \{A, B\}$ . The second period, which encompasses the time between initial submission in 1996 and the arbitration award in 1998, exemplifies a dispute in which the cost of bargaining  $c_i$  is high for both states  $i = A, B$ . Together, these two periods correspond to times  $t$  and  $t + 1$  of the dynamic model with  $n = 2$  and a high probability  $\rho$  of bargaining in each period.

The disputed asset was the archipelago, which comprises three islands of some significance. By far the most important of these islands is the Greater Hanish Island, which is valuable for navigational purposes, tourist revenue, fishing rights, monitoring the Red Sea, and oil exploration.<sup>58</sup> That the Hanish Islands are subject to increasing returns is likely for three reasons. First, division of the islands, all of which are relatively small, reduces their economic value. Second, upon division the islands contain the seeds of future conflict because a potential aggressor can easily inflict significant damage on the other side. If the islands are controlled by a single state, however, a surprise invasion from the sea is difficult to implement. Finally, the United Nations Law of the Sea assigns 12-mile “territorial sea” rights to the owner of the islands, which corresponds to a significant share of the narrow Red Sea.<sup>59</sup> For these reasons, both states likely prefer controlling the entire archipelago with some probability  $\lambda$  to controlling  $\lambda$  per cent of the archipelago.

In the first period, the cost of bargaining  $c_i$  was low for both parties and Eritrea in particular. Until 1995, the islands were occupied by a handful of Yemeni fishermen only. Upon the construction works, Yemen established a military presence of approximately 200 lightly-armed soldiers, which Eritrea interpreted as a sign of aggression. Given that the islands are distanced from the mainland on both sides, it was easy for the Eritrean military to conquer the islands with minor losses; both sides lost less than two dozen lives in a conflict that lasted three days.<sup>60</sup> The payoff from bargaining  $\gamma_i$  was also relatively high for Eritrea, the government of which expected to permanently lose the islands if the Yemeni military presence was to be sustained.

As **Proposition 1** predicts, this situation of **costly bargaining** resulted in a

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<sup>57</sup>Permanent Court of Arbitration 2005.

<sup>58</sup>Lefebvre 1998, 372-376.

<sup>59</sup>Schofield and Pratt 1996.

<sup>60</sup>“Eritrea: Battle for a Sandpit.” *Indian Ocean Newsletter* December 23, 1995.

conflict. The Eritrean military conquered the islands, and bilateral negotiations began immediately. The parties failed to make any progress towards a settlement despite mediation by the United Nations General Secretary Boutros Boutros Ghali by October 1996, when the parties agreed to submit the dispute for arbitration at the PCA.<sup>61</sup>

Two factors are particularly important in explaining why the parties ultimately engaged in arbitration. First, the dispute was at risk of escalating into a broader regional conflict between the Arab League, which supported Yemen, and Israel, which was accused of assisting the Eritrean military in the invasion.<sup>62</sup> This clearly increased the cost of bargaining  $c_i$  for both parties, for the regional security situation was already fragile before the dispute.

Second, the cost of the dispute increased for both countries due to “more pressing foreign policy problems.”<sup>63</sup> Yemen was simultaneously involved in an intense border dispute with Saudi Arabia. Negotiations following a memorandum of understanding signed in February 1995 failed to resolve the dispute by 1997. In Eritrea, the Eritrean Islamic Jihad Movement joined forces with the Eritrean Liberation Front to overthrow the government, thus posing an immediate threat of political survival to the latter.<sup>64</sup> Later, the relationship between Eritrea and the wealthier and more powerful Ethiopia also deteriorated into a full-blown war. As predicted by model, in the resulting situation of **excessive bargaining costs** on both sides, Eritrea and Yemen had an incentive to submit the dispute for interstate arbitration. They agreed that each state can choose two judges for a five-member tribunal, and the fifth judge is chosen together.

The outcome of the arbitration was strikingly asymmetric: Yemen gained control of all three Hanish Islands and Eritrea, the sovereignty of which was established over minor islands characterized as “navigational hazards” by the arbitration tribunal, was forced to withdraw its troops immediately.<sup>65</sup> This result is counterintuitive, as conventional bargaining models predict some kind of division, perhaps so that Yemen gains the largest islands and Eritrea the others. In the presence of increasing returns, however, this outcome is perfectly understandable. The model predicts that when the cost of bargaining is high on both sides, the arbitration tribunal chooses the most

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<sup>61</sup>Antunes 2001.

<sup>62</sup>“Arab League Backs Yemen in Dispute with Eritrea.” *United Press International Cairo* December 3, 1995; “Eritrea Wants Change in Monitoring of Yemen Row.” *Reuters World Service* September 3, 1996.

<sup>63</sup>Lefebvre 1998, 379.

<sup>64</sup>“Horn of Africa: Alliances.” *Africa Confidential* February 14, 1998.

<sup>65</sup>Kwiatkowska 2001; Permanent Court of Arbitration 2005.

asymmetric award available.

It is not possible to directly verify the *ex ante* probability  $\lambda$  that Yemen win the dispute, but the claims made by the two states support the interpretation that they specifically requested that the arbitration tribunal issue a starkly asymmetric award.<sup>66</sup> Both states claimed full sovereignty over the islands on historical grounds and submitted historical and cartographic evidence in support, but contemporary observers could not assess the relative strength of the competing claims.<sup>67</sup> Since the arbitration proceedings were initiated on mutual consent, they could have equally well designed the terms of the proceedings so as to achieve a division of the islands. That they mutually consented on arbitration on these terms provides strong evidence in support of the theory proposed above.

Additional evidence can be obtained by comparing the claims that the two states made with the second part of the arbitration proceedings, which concerned maritime claims related to the the Greater Hanish Islands. Strikingly, the claims submitted by the states were almost identical and, unsurprisingly, the arbitration award was a compromise that recognized the validity of both the Eritrean and Yemeni claims. Antunes writes that “where no mid-sea islands were involved, claim-lines of the two States did not differ significantly.”<sup>68</sup> A natural interpretation of the maritime claims is that they were submitted on the side as a minor addition to the territorial claims, which were the major point of contention.

Finally, as the theory predicts, both states have complied with the arbitration award.<sup>69</sup> In **excessive bargaining costs**, neither state has an incentive to renege upon the unfavorable award. Despite losing control of the Hanish Islands, Eritrea promptly withdrew its military from the islands.

Alternative explanations have severe limitations. First, the peaceful resolution was unlikely to reflect mere changes in relative bargaining power. If the decrease in the relative bargaining power of Eritrea was the only reason for a peaceful resolution, Eritrea could have simply withdrawn from the islands without need to engage in interstate arbitration at the PCA. Instead, the states agreed to initiate the arbitration proceedings. Second, the domestic political explanation that Allee and Huth offer, which emphasizes the legitimacy of legal international settlements, is incompatible with the asymmetric award.<sup>70</sup> If the purpose of arbitration was to simply provide a

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<sup>66</sup>Kwiatkowska 2001; Permanent Court of Arbitration 2005.

<sup>67</sup>Westing 1996.

<sup>68</sup>Antunes 2001, 318.

<sup>69</sup>“Eritrea: Hanish Islands Ruling.” *Reuters* October 13, 1998.

<sup>70</sup>Allee and Huth 2006.

smokescreen for a compromise, the states would not have publicly claimed sovereignty over the entire archipelago. The arbitration tribunal would have divided the asset to “save face.” It is unlikely that the putative Eritrean domestic opposition, embedded in a society “infused with nationalism,” would have accepted a crushing defeat without any resistance simply because the decision was made in The Hague.<sup>71</sup>

## 4.2 Special Agreements in the International Court of Justice

Interestingly, the four most recent special agreements submitted to the ICJ involve contradicting sovereignty claims over islands.<sup>72</sup> In *Botswana/Namibia*, the court found that the contested Kasikili/Sedudu island belongs to Botswana.<sup>73</sup> In *Indonesia/Malaysia*, the court ruled that Malaysia has sovereignty over the disputed Litigan and Sipadan islands. In *Benin/Niger*, the court endorsed Niger’s sovereignty over the Lété Goungou island in the River Niger, which is by far the most valuable of the contested islands. In *Malaysia/Singapore*, the most important island of contention, Pedra Banca/Pulau Batu Puteh was awarded to Singapore while Malaysia gained the Middle Rocks as a minor concession. The decision was by majority not unanimity in each case.

The parties have complied with the rulings.<sup>74</sup> In *Indonesia/Malaysia*, the Indonesian foreign minister expressed disappointment but observed that Indonesia is “obliged to respect” the judgment.<sup>75</sup> In *Benin/Niger*, both parties immediately “vowed to abide by the decision.”<sup>76</sup> Commenting on the *Botswana/Namibia* award, a spokesperson for the Center for Conflict Resolution in Cape Town, South Africa, said that “The dog that didn’t bite is massively significant here ... [t]he underlying premise is that there will always be conflict between states, including states that have friendly relations ... [w]hat matters is how the conflict is addressed.”<sup>77</sup> In September 2008, Singapore and Malaysia “reiterated their commitment to honour and abide by the International

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<sup>71</sup>The quote is from “Three Tiny Islands in the Red Sea May Cause Arab-African Feud.” *Deutsche Presse-Agentur* December 19, 1995.

<sup>72</sup>*Botswana/Namibia* (1996), *Indonesia/Malaysia* (1998), *Benin/Niger* (2002), *Malaysia/Singapore* (2003).

<sup>73</sup>The island is known as Sedudu in Botswana and Kasikili in Namibia.

<sup>74</sup>Mitchell and Hensel 2007.

<sup>75</sup>“Malaysia Gets Disputed Islands.” *BBC* December 17, 2002.

<sup>76</sup>“Benin-Niger: International Court Rules That Main Disputed Island Belongs to Niger Not Benin.” *IRIN Africa* December 7, 2005.

<sup>77</sup>“Peaceful End to Island Rift Builds Hope.” *Los Angeles Times* December 25, 1999.



Court of Justice’s judgment.”<sup>78</sup>

These special agreements provide suggestive evidence in support of the theory. Dividing islands is difficult and could involve loss of strategic and economic value. Instead of pursuing compromise, the parties explicitly requested a resolution on the validity of contradictory claims of sovereignty. The awards were asymmetric, but both parties have welcomed the resolution and complied with the rules set by the ICJ.

## 5 Conclusion

States use voluntary interstate arbitration to resolve disputes over assets that are subject to increasing returns. If compromise is inefficient or impossible, the disputants stand to gain from a low-cost lottery over the ownership of the asset, but such a lottery requires commitment capacity. Interstate arbitration is strategically equivalent to this lottery due to its voluntary nature and the starkly asymmetric awards that it produces. Moreover, its public nature enables a credible commitment through reputational consequences upon deviation. Thus, indivisibilities and increasing returns provide a functionalist explanation for interstate arbitration. The formal analysis confirms this intuition and the comparative statics provide a basis for a systematic empirical analysis.

These results situate interstate arbitration in the broader domain of international law and suggest that it is remarkably functional for preventing a specific yet important type of bargaining failure. If international law is indeed functional more generally, states should have the ability to adapt it according to their specific needs in different contexts. Consequently, it is unlikely that any single theory could explain international dispute resolution in general. Instead, scholars should explore in great detail the relationship between the nature of the dispute, which varies highly across cases, and the specific form of dispute resolution that states use.

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<sup>78</sup>“Singapore, Malaysia Will Honour ICJ’s Ruling on Pulau Batu Puteh.” *Bernama* September 1, 2008.

## Appendix

### Equilibria of the Static Game

The equilibrium concept used is subgame-perfect Nash equilibrium. In the dispute game without interstate arbitration, neither state initiates bargaining if and only if  $u_i(\pi_i) \geq \gamma_i - c_i$  for  $i = A, B$ . Otherwise, at least one state  $j \in \{A, B\}$  such that  $\gamma_j - c_j > u_j(\pi_j)$  initiates the costly bargaining process  $\Gamma$  and the other state is indifferent between initiating and not initiating. I omit inefficient equilibria in which both states initiate the costly bargaining process  $\Gamma$  even though  $u_i(\pi_i) \geq \gamma_i - c_i$  for  $i = A, B$ .

For interstate arbitration, proceed by backwards induction. Upon receiving the arbitration award  $(\pi, 1 - \pi)$ , state  $i = A, B$  has an incentive to initiate the bargaining process  $\Gamma$  if and only if  $\gamma_i - c_i - z_i > u_i(\pi_i)$ . Otherwise the payoff to both states  $i = A, B$  are determined by the arbitration award  $(\pi, 1 - \pi)$ . In the other proper subgame, in which at least one state  $i = A, B$  has not recognized the arbitration tribunal, they obtain the payoffs from the dispute game analyzed above.

Consider thus the decision to recognize the arbitration tribunal. Let  $\pi^i$  denote the share of state  $A$  when the award was favorable to state  $i \in \{A, B\}$ . If both states recognize it and neither state reneges, the expected utilities are

$$\begin{aligned} & \lambda \cdot u_A(\pi^A) + (1 - \lambda) \cdot u_A(\pi^B); \\ & \lambda \cdot u_B(1 - \pi^A) + (1 - \lambda) \cdot u_B(1 - \pi^B). \end{aligned}$$

For both states to recognize the arbitration tribunal, it must therefore be the case that these expected payoffs exceed the payoff without arbitration, which is either  $u_i(\pi_i^0)$  or  $\gamma_i - c_i$ , depending on whether the expected settlement  $(\pi^0, 1 - \pi^0)$  is such that both states  $i = A, B$  prefer to the bargaining process  $\Gamma$ .

Finally, consider the possibility that states recognize the arbitration tribunal even if one of the potential arbitration awards is such that the loser reneges. Without loss of generality, let this state be  $B$ . Then the expected utilities are

$$\begin{aligned} & \lambda \cdot (\gamma_A - c_A) + (1 - \lambda) \cdot u_A(\pi^B); \\ & \lambda \cdot (\gamma_B - c_B - z_B) + (1 - \lambda) \cdot u_B(1 - \pi^B). \end{aligned}$$

State  $A$  is now willing to engage in arbitration if and only if  $u_A(\pi^B) \geq \gamma_A - c_A$ .

But then both states prefer the allocation  $(\pi^B, 1 - \pi^B)$  to arbitration, so the proposed lottery cannot be Pareto-efficient, which contradicts the notion of optimal arbitration.

Throughout the analysis, I assume that both states recognize the arbitration tribunal if it yields a weakly higher expected payoff than the outcome without arbitration. There are also pathological equilibria in which they do not recognize the arbitration tribunal because they expect both states to initiate the bargaining process  $\Gamma$  under any conditions. I omit these equilibria because they are substantively implausible and inefficient.

### Equilibria of the Dynamic Game

In each period  $t$ , state  $i$  bargains with state  $j \neq i$  with probability  $\rho$ . It is thus bargaining with someone with probability  $\rho \cdot (n - 1)$ , so one obtains  $0 \leq \rho \leq \frac{1}{n-1}$ . If state  $i$  bargains, the parameter  $\theta_i$  is drawn from the time-invariant multivariate probability distribution  $\Theta_i$ , where the support of  $\Theta_i$  is such that the resulting game is a valid dispute game described in the main text.

In the uniquely chosen one-stage Nash equilibrium, states play each period  $t$  optimally, implementing some optimal arbitration tribunal whenever possible without commitment capacity. Optimal arbitration is described in the main text. In a commitment equilibrium, states play exactly as in the one-stage Nash equilibrium, with the exception that if commitment capacities  $(z_A, z_B)$  enable mutually profitable arbitration proceedings in a dispute game at time  $t$ , both states recognize the arbitration tribunal and abide by the arbitration award.

Commitment capacities  $\{z_i\}_i$  for the  $n$  states are generated as follows:

1. Each state  $i$  is tagged “friend” as long as it does not deviate from the equilibrium path and “enemy” otherwise.
2. If there is no “enemy” present in any dispute game, both bargaining states  $i = A, B$  recognize the arbitration tribunal if and only if  $\gamma_i - c_i - u_i(\pi_i^j) \leq \delta \cdot U_i^C - U_i^D$ . The arbitration proceedings are taken to be mutually profitable and optimal.
3. If an “enemy” is present in any dispute game, neither state ever recognizes the arbitration tribunal. This is clearly a Nash equilibrium, for no state can unilaterally initiate arbitration.

It follows immediately that  $U_i^D \leq U_i^N \leq U_i^C$ , where the inequalities are generically strict.

### Proof of Claim 1

With  $u_i(\pi_i) = 0$  for all  $\pi_i \in [0, 1)$ , we have  $\pi_i \cdot u_i(1) > u_i(\pi_i)$  for all  $\pi_i \in (0, 1)$  and  $\pi_i \cdot u_i(1) = u_i(1)$  for  $\pi_i \in \{0, 1\}$ . ■

### Proof of Claim 2

The lottery described in the claim gives the following expected utilities:

$$EU_A = \lambda \cdot u_A(1) + (1 - \lambda) \cdot u_A(0) = \lambda \cdot u_A(1);$$

$$EU_B = \lambda \cdot u_B(0) + (1 - \lambda) \cdot u_B(1) = (1 - \lambda) \cdot u_B(1).$$

Differentiating with respect to  $\lambda$ , any change in the probabilities leaves one state worse off. If there is a Pareto-dominant lottery, it must therefore involve a division of the asset for at least one outcome. The expected utilities are

$$EU_A^* = \lambda^* \cdot u_A(\pi^A) + (1 - \lambda^*) \cdot u_A(\pi^B);$$

$$EU_B^* = \lambda^* \cdot u_B(1 - \pi^A) + (1 - \lambda^*) \cdot u_B(1 - \pi^B).$$

Set  $\lambda = \lambda^* \cdot \pi^A + (1 - \lambda^*) \cdot \pi^B$  and note that by increasing returns,

$$(\lambda^* \cdot \pi^A + (1 - \lambda^*) \cdot \pi^B) \cdot u_A(1) \geq \lambda^* \cdot u_A(\pi^A) + (1 - \lambda^*) \cdot u_A(\pi^B);$$

$$(1 - \pi^B - \lambda^* \cdot \pi^A + \lambda^* \cdot \pi^B) \cdot u_B(1) \geq \lambda^* \cdot u_B(1 - \pi^A) + (1 - \lambda^*) \cdot u_B(1 - \pi^B).$$

Thus, the second lottery cannot be Pareto-dominant. ■

### Proof of Claim 3

See the equilibrium analysis of the static game above. ■

### Proof of Claim 4

Examine the proof of Claim 2 and set  $\pi^A = \pi^B \in (0, 1)$  for  $i = A, B$ . The inequalities are strict. ■

### Proof of Proposition 1

Refer to the equilibrium analysis of the static game and consider the four parts in turn. First, suppose  $c_i \geq \gamma_i$  for  $i = A, B$ . Recall that  $u_i(0) = 0$  so that any allocation  $(\pi, 1 - \pi)$  produces a higher payoff than the costly bargaining process  $\Gamma$ . Second, suppose  $c_A < \gamma_A$  but  $c_B \geq \gamma_B$ . State  $A$  does not initiate the bargaining process  $\Gamma$  when  $u_A(\pi) \geq \gamma_A - c_A$ . State  $B$  never initiates the bargaining process  $\Gamma$ . Third, suppose  $c_i < \gamma_i$  for  $i = A, B$ . If both conditions in the third part of **Proposition 1** hold, neither state  $i = A, B$  initiates the bargaining process  $\Gamma$ . Finally, suppose  $c_i < \gamma_i$  for  $i = A, B$  and there does not exist an allocation  $(\pi, 1 - \pi)$  such that both conditions hold. Then at least one state  $i \in \{A, B\}$  initiates the bargaining process  $\Gamma$ . ■

### Proof of Proposition 2

Suppose  $(\pi^*, 1 - \pi^*) \notin \{(1, 0), (0, 1)\}$ . By **Claim 3**, the outcome is inefficient in the set of feasible outcomes. Thus,  $(\pi, 1 - \pi)$  contradicts the optimality of the arbitration proceedings. The bounds on probability  $\lambda$  are a necessary and sufficient condition for both states to recognize the arbitration tribunal instead of obtaining the expected settlement  $(\pi^0, 1 - \pi^0)$ . ■

### Proof of Proposition 3

Refer to the equilibrium analysis of the static game and consider possible arbitration awards. For any lottery such that  $\pi_i^0 > \lambda \cdot u_i(\pi_i^A) + (1 - \lambda) \cdot u_i(\pi_i^B)$ , state  $i$  does not recognize the arbitration tribunal. For any lottery such that  $\gamma_A - c_A - z_A > u_A(\pi^B)$ , state  $A$  reneges.

It remains to consider all other allocations  $(\pi, 1 - \pi)$ . By increasing returns,  $u'_i(\cdot) > 0$  and  $u''_i(\cdot) > 0$ . The lottery described in the proposition gives the following expected utilities:

$$EU_A = \lambda \cdot u_A(1) + (1 - \lambda) \cdot u_A(\pi^B).$$

$$EU_B = \lambda \cdot u_B(0) + (1 - \lambda) \cdot u_B(1 - \pi^B).$$

Follow the procedure in the proof of **Claim 2** to see that some lottery on  $(1, 0)$  and  $(\pi^B, 1 - \pi^B) : u_A(\pi^B) = \max\{\gamma_A - c_A - z_A, 0\}$  Pareto-dominates all other lotteries

that meet the constraints outlined in the first part of this proof. ■

#### Proof of Proposition 4

Proceed as in the proof of **Proposition 3** for both states. ■

#### Proof of Proposition 5

To prove the first part, proceed as in the proof of **Proposition 4** but substitute the payoffs from bargaining  $\gamma_i - c_i$  for the payoffs from the expected settlement  $\pi_i^0$  in determining the probabilities  $(\lambda, 1 - \lambda)$ .

To prove the second part, note that if there are no allocations  $(\pi^A, 1 - \pi^A)$  and  $(\pi^B, 1 - \pi^B)$  such that  $u_i(\pi_i^j) \geq \gamma_i - c_i - z_i$  for  $i \neq j$ , which is the case for small enough  $z_i$  in **costly bargaining**, at least one state  $i \in \{A, B\}$  reneges upon an unfavorable award. Since there is no allocation  $(\pi, 1 - \pi)$  that both states  $i = A, B$  prefer to the bargaining process  $\Gamma$ , and at least one state  $i \in A, B$  initiates the bargaining process  $\Gamma$  upon an unfavorable award, both states cannot recognize the arbitration tribunal. ■

#### Proof of Proposition 6

To prove the first part, examine the first part of **Proposition 1**. To prove the second part, begin with  $i = A$ . It must be that  $u_A(\pi^B) \geq \gamma_A - c_A - z_A$ . As  $\gamma_A - c_A$  increases,  $u_A(\pi^B)$  must increase as well. Now consider  $i = B$ . As  $\gamma_B - c_B$  increases, at some point  $\gamma_B \geq c_B$ , so **inefficient compromise** occurs. To prove the third part, let  $i = A, B$  and use the previous part of this proof. To prove the fourth part, note that when arbitration is possible,  $\lambda \cdot u_i(\pi_i^A) + (1 - \lambda) \cdot u_i(\pi_i^B) \geq \gamma_A - c_A$ . As the right side increases, the left side must increase as well. Now note that  $\pi_i^j$  must fulfill  $u_i(\pi_i^j) \geq \gamma_i - c_i - z_i$ . Thus  $\pi_i^j$  is increasing in  $\gamma_i - c_i$ . When arbitration is not possible, an increase in the expected payoff from bargaining increases  $\gamma_i - c_i - z_i$ , so arbitration remains impossible. ■

#### Proposition 7

Consider the first part. Under  $u_i, \gamma_i$ , **excessive bargaining costs** occurs when  $(c_A, c_B)$  exceeds a certain threshold. Under  $\tilde{u}_i, \tilde{\gamma}_i$ , we have  $\tilde{\gamma}_i > \gamma_i$  so that this

threshold is larger for both elements of  $(\tilde{c}_A, \tilde{c}_B)$ .

Consider the second part. Under  $u_i, \gamma_i$ , **costly bargaining** occurs when  $(c_A, c_B)$  is below a certain threshold. Under  $\tilde{u}_i, \tilde{\gamma}_i$ , we have  $\tilde{\gamma}_i > \gamma_i$  so that this threshold is larger for both elements of  $(\tilde{c}_A, \tilde{c}_B)$ .

Consider the third part. Under  $u_i, \gamma_i$ , the smallest share  $\pi_i^j$  acceptable to state  $i$  is given by  $u_i(\pi_i^j) = \gamma_i - c_i - z_i$ . Under  $\tilde{u}_i, \tilde{\gamma}_i$ , it must be that  $\tilde{u}_i(\tilde{\pi}_i^j) = \tilde{\gamma}_i - c_i - z_i$ . If  $\pi_i^j = 0$ , the claim is trivially true. Suppose not. Then

$$\frac{u_i(\tilde{\pi}_i^j)}{\tilde{u}_i(\tilde{\pi}_i^j)} = \frac{\gamma_i}{\tilde{\gamma}_i} \Rightarrow \frac{u_i(\tilde{\pi}_i^j)}{\tilde{u}_i(\tilde{\pi}_i^j)} > \frac{\gamma_i - c_i - z_i}{\tilde{\gamma}_i - c_i - z_i} \Rightarrow u_i(\tilde{\pi}_i^j) > \gamma_i - c_i - z_i,$$

so  $\pi_i^j < \tilde{\pi}_i^j$ . ■

### Proof of Proposition 8

To prove the first part, note that commitment capacity  $z_i$  is not necessary to implement a lottery on allocations  $(1, 0)$  and  $(0, 1)$ . To prove the second part, note that an increase in commitment capacity  $z_A$  reduces the minimal acceptable share  $\pi^B$  to state  $A$  upon an unfavorable award. By **Proposition 3**, this must be part of optimal arbitration. To prove the third part, proceed as in the previous part. To prove the fourth part, note first that for sufficiently low  $z_i$ , interstate arbitration is not possible. As  $z_i$  increases, by the first part of **Proposition 5**, more asymmetric allocations are possible. By **Proposition 5**, this also enables a Pareto-improvement in payoffs, which occurs in optimal arbitration. ■

### Proof of Proposition 9

To prove the first part, note that if interstate arbitration occurs, it must be that the resulting allocation is either  $(1, 0)$  or  $(0, 1)$ . Thus, the expected payoff from bargaining is already negative. To prove the second part, adapt the proof of **Proposition 3** to see that the expected payoff to both states can be increased by choosing more asymmetric *ex post* allocations.

### Proof of Proposition 10

For state  $i$  to recognize the arbitration tribunal, it must obtain a higher expected payoff from arbitration than playing the equilibrium of the dispute game. If the

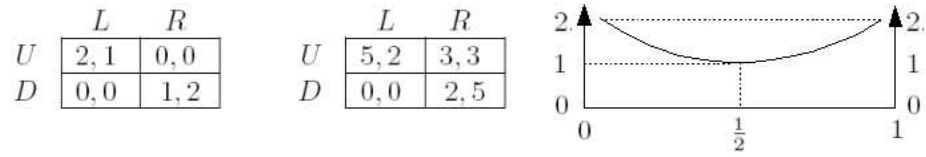
equilibrium outcome is a settlement, this value determines the minimal payoff that state  $i$  must expect. ■

### **Proof of Proposition 11**

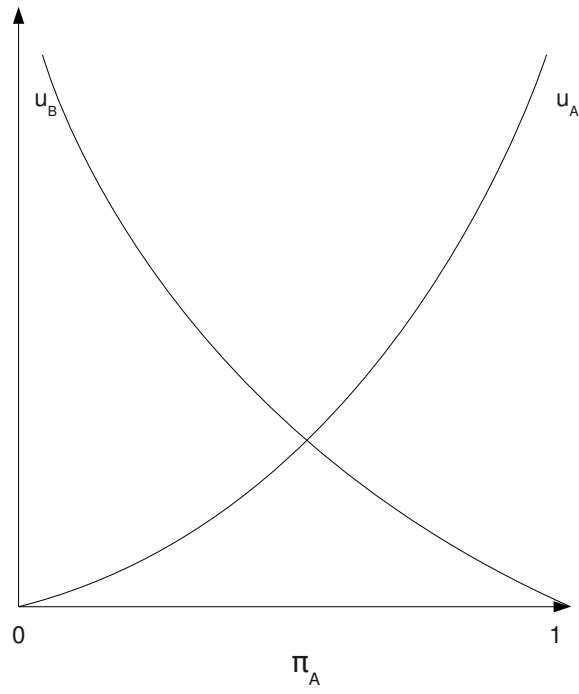
First note that since the focus is on optimal arbitration, the *ex ante* constraints outlined in **Proposition 5** always hold. Consider sufficiency. Since arbitration is optimal, it increases the payoff to both states when the condition holds. Thus, they recognize the arbitration tribunal. Since the cost of renegeing exceeds the benefit of renegeing, neither state reneges in equilibrium. Consider necessity. If states recognize the arbitration tribunal but the conditions do not hold, **Proposition 5** does not hold in **costly bargaining**, a contradiction. ■



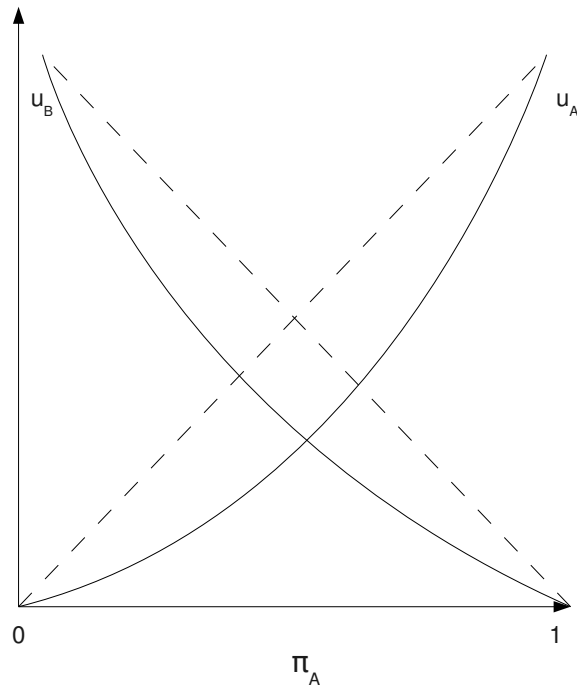
## Figures



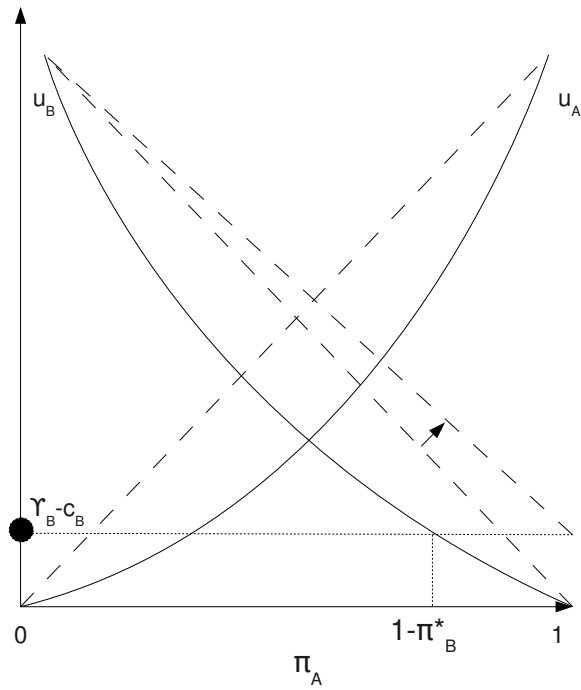
**Figure 2.1.** Three games with increasing returns.



**Figure 2.2.** Payoffs in the presence of increasing returns as a function of the share  $\pi_A$  of state  $A$ .



**Figure 2.3.** A mutually profitable lottery in the presence of increasing returns. For any share  $\pi_i$  of state  $i = A, B$ , the payoff from a lottery  $\pi_i \cdot u_i(1) + (1 - \pi_i) \cdot u_i(0)$ , represented by a point on the dashed line, is strictly higher than the payoff  $u_i(\pi_i)$  from obtaining share  $\pi_i$ .



**Figure 2.4.** The effect of a credible threat to bargain by state  $B$  on the likelihood of a compromise award. If neither state  $i = A, B$  is willing to initiate the bargaining process  $\Gamma$ , the arbitration award is either  $(1, 0)$  or  $(0, 1)$ . If state  $B$  obtains payoff  $\gamma_B - c_B$  from bargaining, it must obtain at least a share  $\pi_B^*$  *ex post*.

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# Chapter 3

## Preventive Care: Increasing Returns, Domestic Institutions, and International Regulation

### 1 Introduction

As national economies have become increasingly integrated to the world market, the importance of international regulatory cooperation has increased dramatically.<sup>1</sup> Policymakers in such major economies as the European Union and the United States work vigorously to ensure that international regulation serves the interests of domestic producers and consumers, but cooperation to reduce non-tariff barriers to trade and investment without compromising the quality of regulation has proven difficult. Recent theoretical and empirical research correctly underscores the intensely political nature of international regulation, as even the most technical regulatory issues often have far-reaching distributional consequences.<sup>2</sup>

Given the salience of international regulation, the determinants of success and failure in regulatory cooperation are of paramount importance. Why does regulatory cooperation prompt ambitious and enduring harmonization to the benefit of all parties in some circumstances, while giving rise to nothing but bargaining failure in others? Although it is now well known that canonical cooperation problems such as distributional conflict and incentives to free ride complicate international regulation,<sup>3</sup> the conditions under which such problems occur and present an insurmountable obstacle to international regulation remain elusive.

The record of transatlantic cooperation on chemical testing requirements in the Organisation for Economic Co-operation and Development (OECD) is illustrative. Worth two trillion dollars in annual production and with potentially detrimental con-

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<sup>1</sup>Sykes 1995; Vogel 1995.

<sup>2</sup>Abbott and Snidal 2001; Mattli and Bütte 2003; Vogel 1995, 1997.

<sup>3</sup>Koremenos, Lipson and Snidal 2001.

sequences for human health and the environment, the chemical industry is subject to regulation on both sides of the Atlantic.<sup>4</sup> Since the Carter administration first took chemical testing to the OECD in 1977, the parties have made substantial progress on some issues, such as the mutual acceptance of data, while achieving few results in others, such as notification procedures to avoid duplicative testing.

In this paper, I develop an institutional model to explain success and failure in international regulation. Holding domestic policy preferences constant, I argue, the likelihood of success decreases when the parties have previously adopted mutually incompatible domestic regulatory institutions. Incompatibility implies that at least one of the parties must adjust domestically for regulatory cooperation to succeed, which is costly because domestic regulatory institutions are “sticky” due to sunk costs and increasing returns.<sup>5</sup> Consequently, the incentive to retain one’s current institutions presents an obstacle to concessions in negotiations. The most important empirical implication of the model is that international regulation is mostly likely to succeed when the parties bargain over new issues in which domestic regulatory institutions are nascent.

I find that states can prevent the development of future incompatibilities through regulatory cooperation. If states intervene early to harmonize regulations and coordinate the development of domestic regulatory institutions, they benefit in two ways. First, low adjustment costs facilitate bargaining. Second, the coordinated development of domestic regulatory institutions creates a beneficial lock-in that reduces the incentive to deviate in the future. The very reason for bargaining failure in less conducive circumstances, high adjustment costs, entrenches the achievements of early regulatory cooperation. For example, if both foreign and domestic producers adjust their production processes in accordance with an international standard, the government cannot opportunistically protect the domestic producers from import competition by imposing another standard *cum* non-tariff barrier to trade, because the change also hurts domestic producers. Consequently, I label such intervention by the governments “preventive care.”

The analysis has important broader implications. Theoretically, it contributes to international cooperation theory by providing a general causal mechanism through which domestic institutions shape outcomes. The model has a dynamic aspect, as the central theoretical prediction relates the timing of harmonization to the likelihood of long-term success. The findings qualify the notion that “path dependencies” pose

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<sup>4</sup>“The Right Chemistry.” *OECD Observer* 266, March 2008.

<sup>5</sup>Arthur 1989; David 1994; Pierson 2000*a*.

a challenge to institutional design.<sup>6</sup> In the model, preventive care is a strategic decision by states to use institutional “stickiness” as a means to achieve self-enforcing international regulation.

Empirically, the model has an important and counterintuitive implication: states can sometimes sidestep enforcement problems without dispute resolution or monitoring mechanisms. Preventive care removes the incentive to defect, so states need not prepare for opportunism in the future. This finding could explain, for instance, why epistemic communities of scientists and experts are sometimes essential to international cooperation and irrelevant in other times.<sup>7</sup> The theory predicts that epistemic communities are central when a lock-in of domestic institutional incompatibilities has not occurred, so that technical collaboration is enough to entrench initial harmonization.

To assess the plausibility of the theory, I conduct a comprehensive case study of international chemical regulation in the OECD. Based on an extensive survey of primary and secondary sources together with 25 of elite interviews, I show that variation in the cost of adjusting incompatible domestic regulatory institutions had a strong effect on success and failure. I also find that success creates a virtuous circle of deeper cooperation, which corroborates the self-enforcing nature of the preventive care.

## 2 The Politics of International Regulation

Regulation is an essential mechanism of international governance. If states and other international actors are to achieve collectively desirable outcomes under interdependence, they must set and enforce rules and guidelines for acceptable behavior.<sup>8</sup> The concept of regulation subsumes a variety of important rules ranging from purely technical compatibility standards to health, environmental, and labor standards.<sup>9</sup> According to the OECD, for example, “[r]egulation is broadly defined as imposition of rules by government, backed by the use of penalties that are intended specifically to modify the economic behaviour of individuals and firms in the private sector.”<sup>10</sup> International

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<sup>6</sup>Koremenos, Lipson and Snidal 2001; Pierson 2000*b*.

<sup>7</sup>Downs 2000; Haas 1990, 1992; Hasenclever, Mayer and Rittberger 1997.

<sup>8</sup>Keohane 1984.

<sup>9</sup>Abbott and Snidal 2001; Braithwaite and Drahos 2000; Drezner 2001; Schmidt and Verle 1998.

<sup>10</sup>“Glossary of Statistical Terms.” *OECD* March 17, 2002.

regulation is potentially useful when these rules have international repercussions.

Empirically, the importance of international regulation is apparent. All modern societies engage in extensive regulation of virtually all areas of economic and social activity.<sup>11</sup> Contrary to the expectations that economic globalization prompts pervasive deregulation, states have responded to external economic pressures through changes in domestic standards and ambitious regulatory cooperation.<sup>12</sup> As Braithwaite and Drahos show, influential business interests invest heavily in shaping the regulatory environment, which underscores the centrality of regulation in trade and investment.<sup>13</sup> Similarly, other non-governmental organizations and the public are increasingly participating in the formulation of international regulations and standards.<sup>14</sup>

Recent empirical research highlights the pervasive political conflict that surrounds international regulation. In multilateral trade negotiations, for example, states have failed to significantly reduce non-tariff barriers to trade despite immense mutual gains.<sup>15</sup> Similarly, financial standards in the banking sector have provoked a bitter conflict among states with different financial institutions and banking systems.<sup>16</sup> Perhaps most surprisingly, even purely technical standards set by the International Organization for Standardization often prompt political conflict among the participants.<sup>17</sup> These and other disputes have *inter alia* led the European Commission to adopt an aggressive strategy for promoting European regulations and standards elsewhere in the world.<sup>18</sup>

The tangible consequences of domestic and international regulation are of staggering magnitude. In an analysis of price data from OECD countries, Bradford identifies price distortions due to non-tariff barriers to trade in the magnitude of 50% in Germany and Japan.<sup>19</sup> He also shows that removing these distortions in Japan alone would produce more global economic growth than the entire Uruguay Round of multilateral trade negotiations. To be sure, only some of these distortions arise from domestic regulations, but the magnitude of the problem suggests that much can be gained through harmonization. Equally significant is the high cost of regulatory

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<sup>11</sup>Moran 2002.

<sup>12</sup>Drezner 2007; Vogel 1995.

<sup>13</sup>Braithwaite and Drahos 2000.

<sup>14</sup>Raustiala 1997; Tarrow 2001.

<sup>15</sup>Henson and Loader 2001; Sykes 1995.

<sup>16</sup>Oatley and Nabors 1998.

<sup>17</sup>Mattli and Büthe 2003.

<sup>18</sup>De Bièvre 2006; Vogel 2003.

<sup>19</sup>Bradford 2003.

failure in issues such as fisheries conservation and global warming.<sup>20</sup>

In light of its political importance, international regulation can be fruitfully viewed through the lens of international cooperation theory.<sup>21</sup> From this perspective, the central analytical question concerns the optimal design of formal international institutions in response to an international cooperation problem. If states understand that unilateral policy formation is collectively undesirable and recognize specific obstacles to improved efficiency, they can engineer the appropriate “rules of the game” by designing international institutions.<sup>22</sup>

In international regulation, two cooperation problems often loom large.<sup>23</sup> First, distributional conflict occurs when states disagree on the appropriate policy. On the one hand, domestic policy preferences differ. If the public is concerned with the health consequences of chemical use, for example, it is likely that a state supports stringent international standards.<sup>24</sup> Other states could see such standards as excessively costly and cumbersome. On the other hand, states often hesitate to engage in major policy reformulation due to high adjustment costs. Even if two states have similar views on appropriate international regulations, historical differences in domestic regulatory institutions can complicate bargaining.<sup>25</sup>

Second, states must enforce international compliance with international regulations.<sup>26</sup> A state can sometimes benefit by deviating from regulatory standards if they carry high domestic costs. The government can also build political support by protecting domestic producers from foreign competition.<sup>27</sup> If states agree on coordinating their health standards for agricultural products, a state could profitably deviate by imposing a standard that is less costly for domestic than foreign producers.<sup>28</sup> The magnitude of the enforcement problem ranges from negligible in simple coordination problems, such as technical compatibility standards, to major in issues that distort trade in key products, such as agricultural goods.<sup>29</sup>

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<sup>20</sup>DeSombre 2005; Stern 2006.

<sup>21</sup>Keohane 1984; Koremenos, Lipson and Snidal 2001.

<sup>22</sup>North 1990.

<sup>23</sup>See Fearon 1998.

<sup>24</sup>Vogel 2003.

<sup>25</sup>Brickman, Jasanoff and Ilgen 1985.

<sup>26</sup>States must also enforce domestic compliance by private actors, but the model in this paper does not provide insight into this problem. I focus on ensuring that states engaged in regulatory cooperation do not defect.

<sup>27</sup>Grossman and Helpman 1994.

<sup>28</sup>Otsuki, Wilson and Sewadeh 2001.

<sup>29</sup>Henson and Loader 2001.

### 3 Conditions for Success in International Regulation

I have characterized international regulation as a cooperation problem. In international cooperation theory, such problems are largely treated as exogenous. States take the international cooperation problem as given and design institutions to mitigate the detrimental consequences of unilateral policy formation. This analytical move allows tractable formulation of analytical statements on institutional design, but it has recently drawn fire from scholars who emphasize the importance of path dependence and evolutionary institutional change.<sup>30</sup> If states design international institutions in complex circumstances and under incomplete information, the critics argue, no reason exists to assume that the design is *ex post* optimal. Although states do their best to address the relevant concerns, the likelihood of failure is so high that traits of rationality should be difficult to find. Moreover, the sticky and path-dependent nature of institutions implies that they might survive for extended periods of time despite obvious inefficiencies. Indeed, scholars of rational institutional design have recently focused attention on flexibility provisions that allow institutional adaptation to changing circumstances.<sup>31</sup>

I engage this literature directly by modeling the *endogenous* origins of cooperation problems in international regulation. Although a dynamic perspective qualifies some theoretical results in the extant literature, the path-dependent nature of international institutions does not warrant the conclusion that strategic factors are of secondary importance in international regulation. Instead, states can sometimes use path dependencies to prevent future trouble through timely intervention.

#### 3.1 The Origins of Distributional Conflict and Enforcement Problems in International Regulation

To conduct the theoretical analysis, I first identify the endogenous aspects of the cooperation problem. The analysis is specific to international regulation, because in other issue areas the nature of endogeneity could be very different. I consider an element of the international cooperation problem endogenous when the relevant policymakers could have directly manipulated it in the past. Notably, this definition excludes the distant past.

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<sup>30</sup>Crouch and Farrell 2004; March and Olsen 1998; Pierson 2000*b*.

<sup>31</sup>Koremenos 2001; Koremenos, Lipson and Snidal 2001.

In international regulation, the most salient endogenous elements are the domestic regulatory institutions, which I define as the “humanly devised constraints that shape human interaction” on the regulated domain.<sup>32</sup> States have developed elaborate institutional arrangements to generate and implement politically optimal regulations. These institutions include substantive and procedural legislation, interagency relations, informal expectations on appropriate behavior, and the role of interest groups in the process. They have an endogenous component because a state can shape them by enacting legislation. Although a government makes such legislative decisions under constraints, it always has some leeway – otherwise the concept of governance would be essentially meaningless.

The relevance of domestic regulatory institutions is embodied in the possibility of mutual *incompatibility*. If harmonization requires that domestic regulatory institutions operate in certain ways, a state that has previously adopted institutions incapable of doing so must adjust. For example, if an international regulation requires that governments share data provided by private companies, a stringent statute on the confidentiality of business information is incompatible with it.<sup>33</sup> This complicates the negotiations unless all parties agree that governments should not share data.

Incompatibilities complicate international regulatory cooperation in two ways. First, they create or amplify distributional conflict. When incompatibilities prevent effective international regulation so that harmonization is necessary, at least one state must incur adjustment costs. Given that domestic institutions are subject to increasing returns, commonly due to learning effects, and often involve substantial sunk costs, the cost of adjusting can be high.<sup>34</sup> International negotiations on regulation can be thorny when the bargaining parties insist on retaining their domestic institutional arrangements.<sup>35</sup> On the other hand, without genuine incompatibilities, minor technical adjustments are enough for effective international regulation.

An illustrative example is the harmonization of measurement systems in late medieval Europe.<sup>36</sup> To increase the volume of economic exchange, polities such as city leagues and city states had to reduce the number of wildly divergent local mea-

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<sup>32</sup>North 1990, 3. In many cases, a regulation *per se* is an element of the institutional environment. This overlap does not affect the logic of the analysis.

<sup>33</sup>This problem is central to the case of chemical testing requirements that I analyze below.

<sup>34</sup>Pierson 2000*a*.

<sup>35</sup>Martinez-Diaz 2005. To be sure, states can seek a compromise through bargaining techniques such as issue linkage (Sebenius 1983).

<sup>36</sup>Spruyt 2001.

surement systems. These measurement systems were formal or informal regulations underpinned by domestic regulatory institutions that govern and facilitate economic exchange. The decrease in transaction costs would have boosted economic growth and innovation, but each polity had an incentive to retain its domestic measurement system to avoid imposing adjustment costs on local merchants and customers. Convergence therefore took centuries.

Second, a subtler consequence is that when an enforcement problem is already present, incompatibility amplifies it. The more incompatible the domestic regulatory institutions are, the less experience and information regulators have on the relevant foreign institutional arrangements. Game theorists have shown that such lack of information impedes the enforcement of collectively optimal behavior.<sup>37</sup> If the regulators cannot distinguish a necessary emergency measure under extreme domestic hardship from opportunism, it is difficult to sustain ambitious cooperation.<sup>38</sup> For example, an American trade specialist is probably more skilled in investigating alleged protectionist measures in Canada or Great Britain than in China or Mongolia.

Consider finally the nature of international regulation in the absence of incompatibilities. In this case, *ceteris paribus*, the adjustment costs are lower and a potential agreement is easier to enforce than in the presence of incompatibilities. States should be able to create more effective international regulations without incurring excessive bargaining costs. Indeed, some empirical evidence exists for such tendencies. For example, research by Zacher and Sutton shows that states were able to set an essentially uniform international standard on the domestic regulation of shipping, despite chronic fears that the whole industry would “drown in a sea of red tape” in the absence of coordination.<sup>39</sup> Although the negotiations involved dozens of major shipping states, they produced an effective and enforceable agreement because the gains from harmonization were high enough relative to the minor cost of harmonization. Without incompatibilities, major domestic adjustments were unnecessary.

### 3.2 The Logic of Preventive Care

I now turn to the strategic implications of endogenous domestic regulatory institutions. If states engage in regulatory cooperation in a given issue area at time  $t$ , they can modify the cooperation problem that they face at time  $t + 1$ . Most importantly,

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<sup>37</sup>Abreu 1988; Green and Porter 1984.

<sup>38</sup>Downs and Rocke 1995.

<sup>39</sup>Zacher and Sutton 1996.



I show that the challenge of removing detrimental incompatibilities is less formidable when states choose to cooperate early.

This logic of preventive care can be summarized as follows. If the demand for international regulation emerges against a backdrop of incompatible domestic regulatory institutions and adjustment costs are high, cooperation is hampered by distributional conflict and enforcement problems. Had the states recognized the problem *before* the lock-in of domestic regulatory institutions, they could have bargained over the distribution of substantially lower adjustment costs. Through timely intervention to coordinate the development of domestic regulatory institutions, states can prevent the emergence of distributional conflict and enforcement problems. If such coordination is possible and not too costly, the negotiations produce cost-effective international regulations. Appendix A presents a simple game-theoretic model that formalizes the most important insights of the theory.

The medical metaphor of preventive care is appropriate. In conventional cooperation theory, the problem is fixed. This assumption corresponds to a medical treatment plan when a patient has sought expert advice on to a health problem. If the doctor finds a health problem, he or she must prescribe a treatment to cure it. However, sometimes healthy individuals schedule a routine examination or seek advice on healthy diet or exercise. If the doctor finds no pressing health problems but identifies risk factors, such as obesity or smoking, he or she can suggest that the patient change behavior to prevent future illness.

When should states choose preventive care? To begin with, prevention must be feasible. If states do not recognize future demand for harmonization or a risk of incompatibilities, they cannot engage in preventive care. For example, it was impossible for the Founding Fathers to design the U.S. Constitution in light of international regulation in the 21st century. Similarly, the domestic institutions must be malleable. Although these institutions are always endogenous in principle, they could be shaped by historical developments that render timely intervention too costly or impossible. For example, Vogel documents fundamental differences in American and European approaches to environmental regulation that have emerged as a response to major exogenous shocks.<sup>40</sup> These differences set stringent constraints on institutional development.

In addition to feasibility, states must have a genuine incentive to engage in international regulation. On the one hand, the absence of low adjustment costs is irrelevant if states are in fundamental disagreement over the appropriate regulation. In the case

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<sup>40</sup>Vogel 2003.

of genetically modified organisms, it is improbable that a clean “institutional slate” would prompt full harmonization in light of diverging perceptions of risk and the positions of the agricultural lobbies.<sup>41</sup> On the other hand, the gains from harmonization must be large enough. If international regulation produces few benefits, states have little incentive to prevent future incompatibilities. For example, harmonizing regulations on non-tradables with little foreign direct investment does not boost economic growth.

Yet another disincentive to engage in international regulation is power asymmetry. If one of the states has enough market power to impose its domestic regulation on other states, it does not desire cooperation.<sup>42</sup>

If the feasibility conditions are met, prevention creates significant gains for states. Most importantly, the absence of domestic institutional lock-in implies that states can remove any nascent incompatibilities through simple coordination and information exchange. With low adjustment costs, reaching a compromise is easy and does not require costly bargaining at the highest political level. The negotiations can focus on maximizing the size of the pie instead of zero-sum distributional bargaining.<sup>43</sup> For example, if states engage in negotiations on regulating a new industry that is relatively unaffected by past institutional choices, the design of domestic regulatory institutions is unlikely to carry high adjustment costs.

Moreover, preventive care is self-enforcing. In addition to mitigating distributional conflict, it provides a solution to the enforcement problem. If states successfully coordinate the development of domestic regulatory institutions, any future deviations are subject to high adjustment costs due to increasing returns and sunk costs. Consequently, future distributional conflict in the issue area is unlikely to occur and the likelihood of enforcement problems is lower. For example, the development of the European internal market makes it difficult for member states to clandestinely impose non-tariff barriers to trade. The European regulatory institutions are sufficiently harmonized that any significant deviations are easily observable and subject to high adjustment costs.

Two disadvantages of preventive care should be noted. First, preventive care is difficult if states do not understand the nature of the regulatory problem or flexible tools to achieve compatibility are not available. If they must prepare for all possible problems in the future, the cost of designing redundant regulations could exceed

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<sup>41</sup>Raustiala and Victor 2004, 296.

<sup>42</sup>Krasner 1991.

<sup>43</sup>Fisher and Ury 1983; Young 1989.

the expected adjustment costs in the future. Second, preventive care could sometimes suppress competition among regulatory solutions. If states coordinate domestic product standards, for instance, the market cannot “pick the winner.”

### 3.3 Empirical Implications

Preventive care has important empirical implications. The first implication is that international cooperation takes the form of technical collaboration between regulators, not high-level political officials.<sup>44</sup> According to the logic of preventive care, states have little reason to invest political capital in negotiations when adjustment costs are low and the preferences regarding different solutions are weak. If the bargaining parties understand that the collective incentive to achieve harmonization overrides the individual incentive to retain pre-existing domestic institutions, it is most important to ensure technical effectiveness, so the negotiations are harmonious. Even issue areas that contain the seeds of distributional conflict sometimes see impressive and self-enforcing cooperation by regulators through simple coordination and exchange of information, while high-profile negotiations in the same issue area collapse due to fundamental distributional conflict or anticipated enforcement problems.

This finding has an interesting corollary with regard to “epistemic communities” in international cooperation.<sup>45</sup> According to the theory of epistemic communities, a community of scientific or other elites with a shared understanding of the problem at hand can be a tremendous force in promoting successful international cooperation. The logic of preventive care implies a more cautious statement: epistemic communities are successful when adjustment costs are sufficiently low. When a cognitive elite forms in an issue area with little institutional deadweight, it can give international cooperation a strong push. But if adjustment costs are high, policymakers do not assign sufficient weight on scientific evidence to break the negotiation deadlock. The conditional nature of this statement could explain why empirical evidence on epistemic communities supports neither the claim that they are generally effective nor the claim that they are irrelevant.<sup>46</sup>

Another important implication pertains to institutional design. If the preconditions for preventive care are met, states need not design intrusive dispute reso-

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<sup>44</sup>Slaughter 2004.

<sup>45</sup>Dimitrov 2006; Haas 1990, 1992; Haas and Haas 1995.

<sup>46</sup>Downs 2000; Haas and Haas 1995.

lution or monitoring mechanisms.<sup>47</sup> The self-enforcing nature of prevention allows effective international regulation without costly bargaining over the design of strong international institutions. Instead, states design institutions to maximize technical effectiveness and create an environment conducive to rapid transmission of technical information between regulators. According to the theory, such institutions are enough to ensure long-term cooperative efforts without explicit enforcement mechanisms. For example, the theory implies that some seemingly toothless regulatory initiatives in the OECD could have far-reaching consequences for international regulation. Even though the OECD cannot enforce these initiatives, incentives to deviate disappear over time because the cost of readjusting the relevant domestic regulatory institutions grows.

When should these implications hold? If the most important precondition for preventive care is the absence of domestic institutional lock-in, it most likely applies to new issue areas in which states are not constrained by pre-existing domestic regulatory institutions. For instance, it should be difficult for states to adjust domestic regulatory institutions for international aviation now, given that they have gradually evolved on the basis of pre-existing institutions.<sup>48</sup> On the other hand, setting new international standards on issues such as nanotechnology should be easier as long as differences in the broad contours of regulatory philosophies do not stand in the way.

Another important determinant of prevention is the presence of transnational actors with accurate information and incentives to promote harmonization. In international regulation, such transnational actors usually belong to the business community.<sup>49</sup> Given that one of the most important driving forces behind international regulation is the need to reduce barriers to trade and investment, transnational companies and international business organizations are in a unique position to facilitate the exchange of information and alert states as to potential future incompatibilities. Indeed, Vogel finds that transatlantic efforts to reduce non-tariff barriers to trade have been enthusiastically welcomed by transnational companies that have invested on both sides of the Atlantic.<sup>50</sup>

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<sup>47</sup>Empirically, Koremenos 2007 finds that the design of dispute resolution mechanisms is systematically related to the nature of the cooperation problem.

<sup>48</sup>Richards 2001.

<sup>49</sup>Braithwaite and Drahos 2000.

<sup>50</sup>Vogel 1997.

## 4 The Internationalization of Chemical Regulation

The chemical industry is among the most important sectors of any modern economy. The annual value of the 70,000 chemicals produced by the industry is approximately two trillion dollars, and few sectors in the world economy are not somehow dependent on chemicals.<sup>51</sup> Despite rapid growth in developing countries, OECD members still produce three quarters of the annual value, and the European Union and the United States are the most important political actors that regulate the chemical industry. The industry is dominated by large transnational companies engaging in extensive foreign direct investment.<sup>52</sup>

The political-economic salience of the chemical industry is boosted by the regulatory challenge of governing the environmental, health, and safety impact of chemical production and consumption.<sup>53</sup> The complex composition of modern chemicals implies that both the potential consequences and the cost of obtaining information on them through testing are high. Moreover, the strong international dimension of the chemical industry implies that any regulation risks raising non-tariff barriers to trade and investment.<sup>54</sup> Such barriers are often an unwanted consequence of regulatory divergence, but the deliberate use of chemical regulation as a protectionist measure is a real possibility.<sup>55</sup>

I focus on chemical testing requirements for three reasons.<sup>56</sup> First, the intrinsic importance of the industry and the dilemma of regulation imply that the stakes are high and any significant variation in outcomes is unlikely to be explained by coincidence. Second, chemical testing entails genuine potential for international cooperation. For example, the OECD estimates that the direct cost savings from mutual acceptance of data alone amount to 60 million dollars annually.<sup>57</sup> If the general cost-benefit structure of regulation holds, the indirect savings are much higher.<sup>58</sup> Finally, the variation within the issue area and over time is significant and puzzling, as the two stylized patterns that I now introduce indicate.

First, international cooperation on chemical testing requirements was prompted

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<sup>51</sup>“The Right Chemistry.” *OECD Observer* 266, March 2008.

<sup>52</sup>Interviews at the ACC; CEFIC; OECD. All acronyms are defined in Appendix B.

<sup>53</sup>Prakash 2000.

<sup>54</sup>Biles 1983; Brickman, Jasanoff and Ilgen 1985; Selin 2007.

<sup>55</sup>Biles 1983; Interviews at the ACC, U.S. DC.

<sup>56</sup>Biles 1983; Brickman, Jasanoff and Ilgen 1985; Wilkinson 1980.

<sup>57</sup>OECD 2001.

<sup>58</sup>Bradford 2003.

by the U.S. Toxic Substances Control Act (TSCA) of 1976, the first comprehensive national legislation on chemical testing requirements.<sup>59</sup> The United States took the issue to the OECD while the European Community finally managed to forge an internal compromise on its own legislation, known as the “Sixth Amendment.”<sup>60</sup> The OECD negotiations focused on two issues, the mutual acceptance of data (MAD) and the mutual acceptance of notification (MAN). The parties quickly reached an agreement on MAD, which continues to underpin much international cooperation on chemical testing requirements, but the negotiations on MAN produced an awkward compromise that was soon discarded by the Reagan administration.<sup>61</sup>

Second, the pattern of international cooperation over time is puzzling. After the initial negotiations in the OECD, the coming two decades saw a gradual expansion of regulatory collaboration. This collaboration was largely technical and the primary obstacles to progress were not political, some minor disagreements on burden sharing notwithstanding.<sup>62</sup> Towards the end of the 1990’s, however, the pressures in the European Union accumulated to adopt a significantly more stringent regulatory scheme for existing chemicals.<sup>63</sup> The Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) met intense resistance by the United States and the chemical industry, but ultimately the European Union did pass the legislation that required data on some 30,000 chemicals in the market. Why did international cooperation take the form of technical collaboration and exhibit gradual evolution, only to be swept away by an abrupt shift in the European Union but not in the United States or other OECD countries?

## 4.1 Research Design

I conduct a comparative analysis within an issue area and over time. This setting is ideal for a plausibility probe of the theory, as it combines the necessary variation with substantive features that the theory should be able to explain. The usual caveat applies: a case study is not a test of the theory. Nevertheless, the case allows a thorough assessment of its plausibility and generates ideas for further theoretical development and systematic empirical testing.

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<sup>59</sup>Biles 1983; Brickman, Jasanoff and Ilgen 1985.

<sup>60</sup>Wilkinson 1980.

<sup>61</sup>Brickman, Jasanoff and Ilgen 1985; Interviews at the ACC; OECD; U.S. EPA; U.S. DC; DG Enterprise.

<sup>62</sup>“EPA Waves Stick in the U.S.-EU Dispute.” *Chemical Week* April 3, 1996.

<sup>63</sup>Selin 2007.

I consider three dependent variables of interest. First, the *form* of international cooperation refers to the distinction between high-level political interaction and low-level technical collaboration. Second, the *consolidation* of international cooperation indicates the extent to which international cooperation is self-enforcing and grows stronger over time without explicit enforcement provisions. Finally, the *forum* of international cooperation captures the institutional environment in which states choose to cooperate.

The most important independent variable is *lock-in* of domestic regulatory institutions, which predicts technical *form* and *forum*, and *consolidation*. Another variable of interest is *indifference*, which indicates the extent to which the parties have an interest in any particular solution in the absence of lock-in. The impact of indifference on the dependent variables is exactly the opposite of *lock-in*. Finally, I verify that *gains from harmonization* were present. Without such gains, the feasibility conditions for preventive care would fail to hold. Table 1 summarizes the relationship between the independent and dependent variables.

[TABLE 1 ABOUT HERE]

I analyze the case in three phases. In the first phase, which covers approximately years 1976-1981, I concentrate on comparing the OECD negotiations on MAD and MAN. The discussion focuses mostly on the international process, but I also refer to bargaining within the European Community, which proves to be crucial. In the second phase, I consider the long period of technical collaboration between years 1981 and 1998. Most of the events during this period relate to the extension of international cooperation from new to existing chemicals produced in high volume.<sup>64</sup> I also refer to events after 1998 to the extent that they are directly relevant. The third stage involves the period between 1998 and 2008, and focuses on the impact of REACH on international cooperation.

The sources of information that I use are threefold. First, I use secondary sources to form a picture of the overall process. In particular, I have analyzed all relevant articles of the leading industry newspaper, *Chemical Week*, between 1976 and 2008. Second, I use primary sources such as OECD publications and official regulations by the United States and the European Union. Finally, and most importantly, I have conducted 25 elite interviews with regulators and industry representatives in the United States, the European Union, and the OECD. Appendix B describes the

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<sup>64</sup>Interviews at the ACC; OECD; U.S. EPA.

interviews.

## 4.2 Harmony and Discord in the OECD, 1976-1981

In 1976, the U.S. Congress adopted the TSCA in response to increasing alarm among the domestic population on the detrimental consequences of chemicals.<sup>65</sup> As Vogel argues, the TSCA was indicative of a broader wave of regulation that took place against the backdrop of a series of highly visible failures to protect human health and the environment.<sup>66</sup> It was also a first step towards a regime of chemical regulation and only required that companies provide test data on new chemicals prior to manufacturing, a practice known as premanufacturing notification.<sup>67</sup> The narrow focus left existing chemicals in the market unregulated and dramatically reduced the cost of compliance to the industry.

Although the TSCA also covered imported chemicals, it left the Carter administration with an international economic problem. In an era of rapid internationalization and stiff competition from aggressive European producers,<sup>68</sup> it was imperative to push for international standards based on the TSCA to create a first-mover advantage for the American chemical industry.<sup>69</sup> Reflecting this sentiment, Biles writes that “economic considerations – in particular the avoidance (or minimization) of non-tariff barriers to trade – constitute the principal force behind virtually all ... multilateral efforts.”<sup>70</sup> Consequently, the Carter administration requested that international negotiations in the OECD be initiated.

The TSCA posed major problems for the European Community.<sup>71</sup> The European chemical producers, accusing the United States of unilateralist policies, complained that the TSCA was incomprehensible and discriminatory. The Europeans had negotiated on a common regulatory regime since 1974 when “the Commission proposed the introduction of more stringent marketing controls over dangerous substances,”<sup>72</sup> but fundamental disagreement among major member states – Germany and Great

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<sup>65</sup>Brickman, Jasanoff and Ilgen 1985.

<sup>66</sup>Vogel 2003, 558-562.

<sup>67</sup>Biles 1983, 39.

<sup>68</sup>Chandler 2005.

<sup>69</sup>Brickman, Jasanoff and Ilgen 1985; Kenis and Schneider 1987.

<sup>70</sup>Biles 1983, 55.

<sup>71</sup>Brickman, Jasanoff and Ilgen 1985; Kenis and Schneider 1987.

<sup>72</sup>Wilkinson 1980, 470.



Britain in particular – had prevented a compromise.<sup>73</sup> The dispute escalated to a point at which France threatened to implement a national policy despite the threat to the internal market, and it was the external pressure created by the TSCA that prompted an agreement on the Sixth Amendment. The agreement was only possible, however, on terms that were incompatible with the TSCA in important ways. For example, the Sixth Amendment requires premarketing, as opposed to premanufacturing, data and imposes a mandatory set of specific tests on all new chemicals, whereas the TSCA adopts a more flexible approach.<sup>74</sup>

The OECD negotiations, which began in 1977, focused on two particularly important issues. The politically most salient and, as Biles puts it, “perhaps the most controversial” aspect of the negotiations was the imposition of a common, minimum set of required tests for MAN.<sup>75</sup> This requirement was promoted by the European Community, as it was fully compatible with the Sixth Amendment, while the United States expressed concern over incompatibilities with the more flexible TSCA.<sup>76</sup> After years of intense negotiations, the OECD Chemicals Group found a mutually acceptable compromise in 1980.<sup>77</sup> The compromise proved to be short-lived, however, as the Reagan administration rewarded intense lobbying by the Chemical Manufacturers Association – the predecessor of the ACC – by refusing to endorse the OECD Council Decision on MAN in 1981.<sup>78</sup>

Another issue of major interest was the MAD, which comprised guidelines for Good Laboratory Practice (GLP) and chemical testing. In this issue, the United States had a first-mover advantage in that it had already established its own guidelines.<sup>79</sup> The OECD agreed on developing compatible, although not identical, guidelines. In consequence, the OECD Council adopted a Decision that data generated according to these guidelines would have to be accepted by other member states and recommended that the member states voluntarily adopt these guidelines for national use.<sup>80</sup>

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<sup>73</sup>Brickman, Jasanoff and Ilgen 1985.

<sup>74</sup>Biles 1983; Wilkinson 1980. Interviews at the ACC; OECD; U.S. EPA.

<sup>75</sup>Biles 1983, 52.

<sup>76</sup>“Acceptance of MPD Rules Might Be a Boomerang.” *Chemical Week* July 15, 1981.

<sup>77</sup>“OECD Moves to Share Test Data.” *Chemical Week* October 29, 1980; Biles 1983; Brickman, Jasanoff and Ilgen 1985.

<sup>78</sup>“U.S. Will Oppose Mandatory New-Chemical Tests.” *Chemical Week* August 5, 1981.

<sup>79</sup>Interviews at the OECD; U.S. EPA.

<sup>80</sup>Biles 1983; OECD 1981.

This trajectory can be summarized in as follows. The proximate cause of intensive international cooperation was the TSCA, an ambitious regulation driven by purely domestic factors that prompted a coordinated European response in the form of the Sixth Amendment. The Carter administration took the issue to the OECD, which launched negotiations on MAN and MAD. The former issue was politically controversial and the negotiations failed to produce lasting results, while the member states resolved the latter issue smoothly.

### 4.3 The Period of Consolidation, 1981-1998

The OECD Council Decision on MAD was an important milestone. Although the failure to agree on MAN exposed the constraints under which OECD governments operated,<sup>81</sup> the successful resolution of issues surrounding MAD was seen by the parties as an important step towards a flexible international regulatory regime.<sup>82</sup> The Sixth Amendment also proved to be a remarkable success in the European Community.<sup>83</sup>

The next major effort for regulatory cooperation in the OECD resulted from the creeping recognition that the focus on new chemicals had left most chemicals unregulated. Against the backdrop of increased concern over chemicals, elevated by major disasters such as the explosion of a Union Carbide subsidiary pesticide plant in Bhopal, India, the OECD member states agreed to develop and share test data on 1,000 high-production volume (HPV) chemicals in March 1987.<sup>84</sup> The intent was to use MAD as a basis for an international “screening information dataset” on existing chemicals for which no data are available.<sup>85</sup> The OECD also applied its “polluter pays” principle and required that the industry cover the expenses.

Initially, three issues reduced the effectiveness of the program. First, the program laid heavy emphasis on chemical exposure, which differs across countries and thus forms a difficult basis for cooperation.<sup>86</sup> An OECD official remarked that this choice “slowed down the program terribly.”<sup>87</sup> Second, the program failed to involve the chemical industry. Although the industry had recognized the necessity of proac-

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<sup>81</sup>Biles 1983; Brickman, Jasanoff and Ilgen 1985.

<sup>82</sup>“A Step Closer on Toxic Testing.” *Chemical Week* August 24, 1983.

<sup>83</sup>Brickman, Jasanoff and Ilgen 1985; Kenis and Schneider 1987.

<sup>84</sup>“Test-data Sharing Goes Global.” *Chemical Week* March 25, 1987.

<sup>85</sup>“OECD Moves to Fill Risk Data Gap.” *Chemical Week* February 7, 1990.

<sup>86</sup>“Pilot Project Advances Global Testing Rules.” *Chemical Week* May 24, 1995.

<sup>87</sup>Interview at the OECD.

tive participation and established the International Council of Chemical Associations (ICCA) in 1989, the original design emphasized government sponsorship and did not facilitate voluntary test data provision.<sup>88</sup> Finally, the United States and the European Union disagreed on burden sharing.<sup>89</sup>

The OECD program proved its robustness when the pressure to acquire the test data mounted. In 1997, the American environmental advocacy group Environmental Defense Fund published its famous *Toxic Ignorance* report, which suggested that “even the most basic toxicity testing results cannot be found in the public record for nearly 75% of the top-volume chemicals in commercial use.”<sup>90</sup> In part as a response to this alarming finding, Vice President Al Gore announced the Chemicals Right-to-Know Initiative and the ACC established its voluntary HPV Challenge Program.<sup>91</sup> Internationally, the ICCA also announced its HPV Initiative in conjunction with the HPV Challenge. These efforts have led to a significant increase in the number of submissions. The OECD reports that by the end of 2004, “close to 500 HPV chemicals had agreed OECD assessments.”<sup>92</sup> The interviews indicate that the cautiously positive sentiment is shared by officials and the industry.<sup>93</sup>

In summary, the OECD member states expanded international cooperation on chemical regulation to the provision of test data on HPV chemicals over a period of almost two decades. Collaboration in the OECD on HPV chemicals built on MAD and previously acquired institutional capabilities, but faults in the original design and implementation of the program reduced its effectiveness for almost ten years. Responding to increased urgency in 1997 and 1998, the OECD and the chemical industry were able to correct past failures. In consequence, the OECD has been able to develop a dataset of hundreds of HPV chemicals.

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<sup>88</sup>Interviews at the OECD; U.S. EPA.

<sup>89</sup>“EPA Waves Stick in U.S.-EU Dispute.” *Chemical Week* April 4, 1996.

<sup>90</sup>EDF 1997.

<sup>91</sup>“Vice President Gore Announces Program to Close Gap in Public’s Right-to-Know about Potentially Harmful Chemicals.” *The White House, Office of the Vice President* October 9, 1998; “High-Production Volume (HPV) Challenge.” *American Chemistry Council*. Available at [http://www.americanchemistry.com/S\\_ACC/sec\\_policyissues.asp?CID=431&DID=1492](http://www.americanchemistry.com/S_ACC/sec_policyissues.asp?CID=431&DID=1492).

<sup>92</sup>OECD 2005.

<sup>93</sup>Interviews at the ACC; CEFIC; DG Enterprise; DG Environment; OECD; U.S. EPA.

#### 4.4 Worlds Apart, 1998-2008

Towards the end of the 1990's, pressures to reform European chemical regulation mounted. Following the publication of *Toxic Ignorance*, the European Environmental Agency and the United Nations Environment Programme conducted a similar assessment for chemicals used in Europe, titled *Chemicals in the European Environment*.<sup>94</sup> The final report validated the fears that little information was available on existing chemicals, and gave the proponents of more stringent regulation a powerful argument. An increasingly powerful coalition of environmentalists, "green" member states, and DG Environment in the European Commission, pushed the regulatory reform forward.<sup>95</sup>

The policy formation process gained salience in 2001 when the European Commission published its *White Paper on a Strategy for a Future Chemicals Policy*.<sup>96</sup> The proposal received both support and criticism, but for present purposes the most noteworthy reactions were those from the chemical industry and the United States. Although the supporters of REACH argued that it would contribute to the European internal market by simplifying and unifying existing legislation, the industry expressed anger over the plan to regulate some 30,000 existing chemicals at the cost of billions of dollars to the industry.<sup>97</sup> The director of CEFIC, Alain Perroy, characterized REACH as "the biggest single issue the European chemical industry has had to face for the past few decades."<sup>98</sup> The Bush administration also coordinated a campaign with the industry to shape REACH through multiple channels.<sup>99</sup> REACH finally entered into force in December 2007. The legislation requires that the 30,000 existing chemicals subject to testing requirements be registered over an 11-year period, with the stringency of the tests required increasing with the annual production volume.

The long-term impact of REACH on international cooperation unfolds only over time, but the increased workload on European regulators has already reduced the European Union's participation in the OECD. Moreover, the relevance of the OECD for the European Union has decreased, as REACH does not maintain the distinction between new and existing chemicals.<sup>100</sup> For other OECD Member States, some as-

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<sup>94</sup>EEA and UNEP 1999.

<sup>95</sup>Selin 2007.

<sup>96</sup>European Commission 2001.

<sup>97</sup>Interviews at the ACC; CEFIC.

<sup>98</sup>"Industry Sees Red on EU White Paper." *Chemical Week* July 17, 2002.

<sup>99</sup>U.S. House of Representatives 2004.

<sup>100</sup>Interviews at DG Environment; OECD.

pects of REACH also pose issues of incompatibility. For example, to reduce the cost of testing, product chemistry is excluded from the use of GLP. According to an EPA official, this decision “shocked” the U.S. regulators.<sup>101</sup>

REACH has also attracted some interest outside the European Union.<sup>102</sup> Many non-OECD countries, particularly in Asia, have yet to develop comprehensive regulatory regimes for chemicals, and for them REACH is an opportunity to learn more about different institutional designs. If REACH proves to be a success, it is possible that a “race to the top”<sup>103</sup> occurs as other governments move to harmonize their systems with the global “gold standard.” The test data that REACH requires are also public, so other countries can use it as a basis for risk management without cost.

The most important impact of REACH, however, is uncertainty. All interviewees viewed its impact as a subject surrounded by major uncertainty that covers multiple dimensions.<sup>104</sup> Regarding the regulatory dimensions, it is unclear how useful the data generated by REACH ultimately are and whether the institutional design proves to be effective. These factors are important for other states as they continue to adjust their chemical regulations. On the economic side, the direct cost of REACH to the industry is itself a major source of uncertainty, and even less is known about the broader economic implications on trade and investment. Possible future scenarios include positive evolution towards a worldwide agreement on chemical testing if REACH proves as expedient as its promoters claim, the isolation of the European Union due to an excessively burdensome and ineffective regulatory system, and regulatory rivalry between the European Union and the United States.

## 4.5 Analysis

The results are summarized in Figure 3.1. I proceed temporally.

[FIGURE 3.1 ABOUT HERE]

Analytically, the OECD negotiations on MAD and MAN can be seen as two games of international regulation. In both games, the players are the European Community

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<sup>101</sup>Interview at the U.S. EPA.

<sup>102</sup>Interviews at DG Environment; OECD; U.S. EPA.

<sup>103</sup>Vogel 1995.

<sup>104</sup>Interviews at AmCham EU; DG Environment; DG Enterprise; OECD; TBDA; U.S. DC; U.S. EPA.

and the United States who try to coordinate their domestic standards on chemical testing. If the theory that I have developed in this paper is valid, the divergent outcomes of the negotiations on MAN and MAD should follow from the values of the independent variables accompanied by a plausible causal mechanism.

To begin with, the presence of substantial *gains from harmonization* is apparent in both games.<sup>105</sup> Already in the 1970's, the value of international trade in chemicals had reached hundred of billions of dollars and the dominance of the United States and the European Community was even more pronounced than today.<sup>106</sup> In the absence of an agreement on MAD, all tests that the industry conducts to fulfill the requirements of either regulatory regime would have to be duplicated to secure market access. Such duplication distorts the market, diverts resources from productive investment, and increases the burden on regulators. Without MAN, one set of tests for either regulatory regime is not necessarily sufficient to guarantee market access for the other regime.

The two negotiations differ substantially in terms of domestic institutional *lock-in*. The negotiations on MAD centered on an issue for which only the United States had already established the required domestic institutions in the form of GLP and chemical testing guidelines.<sup>107</sup> As other OECD member states had little domestic institutional deadweight, they simply adopted the OECD guidelines that were made compatible with the American guidelines. No statutory changes were necessary by either player. The interviewees emphasized the importance of having a “clean slate” or an “empty table” in the negotiations.<sup>108</sup> The Europeans incurred no adjustment costs by adopting a regime compatible with the U.S. GLP. To the contrary, the negotiations on MAD involved incompatible standards, such as the difference between premanufacturing and premarketing notification, that were already written in the relevant statutes. The domestic origins and pioneer position of the TSCA guaranteed that the U.S. legislators could not fully consider the problem of international compatibility down the road, which left the negotiators with the extraordinary challenge of reaching an agreement despite the high cost of changing existing legislation.

The pattern of preferences, reflected by the presence and absence of *indifference* on MAD and MAN respectively, is similar. In the negotiations on MAD, both parties agreed on the desirability of guidelines that reflect good scientific practice. The lack of

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<sup>105</sup>Interviews at the ACC; CEFIC; DG Environment; DG Enterprise; OECD; TABD; U.S. EPA; U.S. DC.

<sup>106</sup>Biles 1983.

<sup>107</sup>Interviews at the U.S. EPA; OECD.

<sup>108</sup>Interviews at the OECD; U.S. DC; U.S. EPA; OECD.

any past experience in the European Community implied that the adoption of guidelines in line with the U.S. guidelines was acceptable, while the United States obviously had no reason to resist the development of OECD guidelines that closely reflect its domestic approach. In stark contrast, the negotiations on MAN involved difficult questions such as the appropriate scope of the minimum premarket dataset. Whereas the TSCA allowed the U.S. EPA substantial flexibility and case-by-case decisionmaking, the Sixth Amendment required such a dataset. Similarly, international notification would have required sharing confidential business information, which posed a particularly hard problem because it would have been difficult to prevent its diffusion, especially in those European countries with corporatist regulatory regimes.

Put together, the two negotiations represent two analytical extremes. The negotiations on MAD involved a setting without domestic institutional incompatibilities and less intense preferences. This setup, the theory predicts, should have created an opportunity for preventive care. The negotiations on MAN were burdened with a combination of domestic institutional incompatibilities with very high adjustment costs and strong preferences reflecting different regulatory philosophies and societal preferences. The interviews clearly indicate that both *lock-in* and absence of *indifference* had a role to play, which solves the problem of observational indeterminacy resulting from simultaneous variation in the values of two independent variables.<sup>109</sup>

The *form* of international cooperation corroborates the predictions of the theory. The negotiations on MAD focused on streamlining the technical components of GLP and chemical testing guidelines, while the negotiations on MAN involved highly salient political bargaining and, ultimately, a dramatic reversal of the U.S. position by the Reagan administration. Tellingly, a leading expert on the negotiations remarked in personal communication that scientific collaboration on MAD “had the effect of creating ... an international ‘epistemic community’ on these matters.” Such degree of collaboration was not achieved on MAN, as the OECD Council could not pass a Decision without the United States. Interviewees confirmed that cooperation on issues related to MAN was, and continues to be, easier and less politically loaded than on MAD.<sup>110</sup>

Contrary to the theory, the *forum* of international cooperation was the OECD in both issues. As Kenis and Schneider argue, an important reason was the dominant position of the United States in the organization and the limited role of the European

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<sup>109</sup>King, Keohane and Verba 1994.

<sup>110</sup>Interviews at the ACC; OECD; U.S. EPA; U.S. DC.

Commission.<sup>111</sup> Many interviewees were puzzled by the question of alternative fora, as the OECD was seen as the “only game in town” due to the composition of its membership and its technical capabilities.<sup>112</sup> A plausible interpretation is that the political aspect made the OECD appropriate for negotiations on MAN while the technical capabilities increased the attractiveness of the OECD for negotiations on MAD, but the tight connection between the two issues prevents a direct verification of this conjecture. Nevertheless, it seems that increasing returns at the international level were an important determinant to use the OECD.<sup>113</sup>

The second stage of the game is most useful for the analysis of *consolidation*. The negotiations on MAN never succeeded in the first place, so the question of *consolidation* is moot, but the theory is applicable to the role of MAD in OECD cooperation. Specifically, the theory predicts that MAD should provide a basis for self-enforcing international cooperation on related issues in the future. To investigate the validity of this prediction, the analysis should focus on two elements. First, international cooperation after MAD should build on previous domestic and international structures to a great extent. This element is present if the values of *form* and *forum* remain unchanged as a result of a deliberate decision. Second, international cooperation should grow stronger over time despite potential enforcement problems.

The evidence offers strong support for *consolidation*. To cooperate on existing chemicals in the OECD was not a politically contentious decision, and the major member states of the OECD rapidly agreed on international burden sharing.<sup>114</sup> For conducting the tests, an agreement on MAD based on GLP and chemical testing guidelines was essential. One interviewee at the OECD remarked that “the GLP and test guidelines are the cornerstone of everything we do in the OECD,” while another OECD official said that “structures and practices traveled.” Interviewees at the OECD and the member countries also saw cooperation on existing chemicals as a natural extension of cooperation on new chemicals.<sup>115</sup>

The role of enforcement problems as an obstacle to cooperation was relatively minor and, tellingly, lost importance over time without specific action to enforce cooperation. The OECD did establish a compliance program for the GLP,<sup>116</sup> but the interviewees agreed that the need to cross-validate compliance through joint inspec-

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<sup>111</sup>Kenis and Schneider 1987.

<sup>112</sup>Interviews at DG Enterprise; OECD; U.S. EPA.

<sup>113</sup>Interview at DG Environment.

<sup>114</sup>“Test-data Sharing Goes Global.” *Chemical Week* March 25, 1987.

<sup>115</sup>Interviews at the OECD; U.S. EPA.

<sup>116</sup>Diderich 2007.



tions has decreased over time.<sup>117</sup> One interviewee also remarked that the transparent nature of the principles made it relatively easy to detect any problems with data provided by foreign laboratories.<sup>118</sup> A more serious problem than deliberate defection was initial ignorance among authorities and regulators.<sup>119</sup>

To be sure, the political environment for international cooperation was conducive with respect to *lock-in* and *indifference* as well. Neither the United States nor the European Union had comprehensive legislation on existing chemicals, so statutory changes were not necessary to collaborate on existing chemicals. Only two minor exceptions qualify this claim. First, the TSCA does contain limited provisions that grant the EPA authority to investigate existing chemicals,<sup>120</sup> but these provisions were rarely put to use and they did not impede international cooperation in the OECD. Second, the European Union passed its Regulation on Existing Substances in 1993,<sup>121</sup> which fed the conflict over burden sharing as the European regulators had to focus on chemicals that contradicted the OECD priorities.<sup>122</sup>

To characterize the United States and the European Union as indifferent with respect to chemical regulation would be somewhat inappropriate, but the mutual understanding on the need to provide test data on existing chemicals in the 1980's and the 1990's is theoretically equivalent to *indifference*. Although it would have been hard to reach an agreement on risk management *per se*, the parties did not disagree on the need to provide screening information or focusing on HPV chemicals.<sup>123</sup> Combined with the absence of domestic lock-in, this consensus was essential for successful cooperation.<sup>124</sup>

Most recently, the policy formation process that led to the enactment of REACH offers a sobering example of the limits of international cooperation. In theoretical terms, REACH resulted from a structural shift in European preferences on chemical regulation.<sup>125</sup> Unlike the United States, which reacted to *Toxic Ignorance* by simply accelerating its voluntary initiatives, the demands for mandatory chemical testing grew stronger in the European Union. REACH thus allows an ideal assessment of a contraposition to the theory, given that *indifference* does not apply.

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<sup>117</sup>Interviews at the OECD; U.S. EPA.

<sup>118</sup>Interview at the U.S. EPA.

<sup>119</sup>Interviews at the OECD; U.S. EPA.

<sup>120</sup>Biles 1983.

<sup>121</sup>Selin 2007.

<sup>122</sup>“EPA Waves Stick in U.S.-EU Dispute.” *Chemical Week* April 4, 1996.

<sup>123</sup>Interview at the OECD.

<sup>124</sup>“Test-data Sharing Goes Global.” *Chemical Week* March 25, 1987.

<sup>125</sup>Vogel 2003; Interview at DG Environment.

Although the absence of *indifference* was the major driver behind the conflict over REACH, domestic *lock-in* in the United States also had an important role. To enact REACH, the pro-regulation coalition had to overcome resistance by powerful business interests and concern with European competitiveness. Similarly, to reform the TSCA a hypothetical U.S. pro-regulation coalition would have had to surmount obstacles such as the decidedly anti-regulation coalition in the U.S. Congress and Senate and, from the year 2000 on, the Bush administration's staunch resistance to chemical regulation. Domestic *lock-in* in the United States gave the already powerful anti-regulation coalition the upper hand.

Curiously, some interviewees also suggested that past cooperation in the OECD facilitated the implementation of REACH. An OECD official hesitantly acknowledged that international cooperation made the European Commission "comfortable" with the idea of mandatory chemical testing requirements, and the public alarm over chemicals that resulted from *Toxic Ignorance* and *Chemicals in the European Environment* was directly related to the initial problems with the OECD program on existing chemicals. These events imply that previous cooperation can also sow the seeds of future conflict, although not deliberately. The evidence suggests that the European Commission was uncertain as to the costs and benefits of chemical regulation in the first part of the 1990's, but cooperation in the OECD suggested that a working regulatory scheme was possible. Thus, *consolidation* can also have side effects that complicate international cooperation in the future.

The transatlantic conflict over REACH changed the *form* of international cooperation. Although the interviewees confirmed that the European regulators did voluntarily consult with the U.S. EPA and the OECD on the design of REACH, the Bush administration engaged in high level political bargaining with individual member states and the European Commission.<sup>126</sup> The high stakes and the absence of common interest tilted the balance towards politicization, reversing the long pattern of technical collaboration in the OECD. Similarly, the OECD lost its importance as the *forum* of international cooperation. The Bush administration directly targeted the European Union and key member states, with the purpose of shaping the legislative process in Brussels.

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<sup>126</sup>U.S. House of Representatives 2004. Interviews at the OECD; U.S. EPA.

## 5 Conclusion

In this paper, I have developed an institutionalist model of international regulation. The analysis focuses on a key problem, domestic institutional incompatibilities that increase adjustment costs and therefore decrease the likelihood of achieving a mutually acceptable compromise. Domestic institutions are endogenous over time, and incompatibilities result from a lock-in due to increasing returns and sunk costs. If states correctly perceive the possibility of future incompatibilities, however, they can intervene by coordinating domestic institutional development to avoid the detrimental lock-in of incompatibilities. Such preventive care facilitates bargaining through lower adjustment costs and results in self-enforcing international cooperation, as a lock-in of mutually compatible domestic regulatory institutions occurs.

I have applied the model to international cooperation on chemical regulation, with particular focus on transatlantic interactions in the OECD. It provides a detailed and plausible account of the negotiations over three decades, explaining startling variation within a seemingly technical issue area. Empirically, the model provides an analytical basis for understanding the relationships between such key factors as preferences, adjustment costs, increasing returns, and domestic institutions.<sup>127</sup> It allows a dynamic analytical interpretation of a historical narrative, in which the outcome of past strategic interactions influences the parameters of the game in the present

To conclude, I would like to elaborate on the broader theoretical implications of the analysis. Perhaps the most salient theoretical dispute among scholars that share an institutional approach to political economy has recently been the extent to which institutions are rationally designed in a world of bounded rationality, transaction costs, and path dependencies.<sup>128</sup> In this paper, I have combined elements of both schools by showing how states, and by direct extension other actors, behave strategically upon anticipation of an institutional lock-in. This formulation allows strategic behavior without adopting a view of the political economy as a static equilibrium. If similar mechanisms are to be found elsewhere, an institutionalist synthesis is needed.

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<sup>127</sup>Arthur 1989; Frieden and Martin 2002; Milner 1997; Pierson 2000*a*.

<sup>128</sup>Koremenos, Lipson and Snidal 2001; March and Olsen 1998; Pierson 2000*a, b*.

## Appendix A: The Formal Model

The model can be formalized as a two-period game. In the first period, players  $A$  and  $B$  choose a domestic regulatory institution. Without loss of generality, label  $A$ 's choice  $\alpha$  and  $B$ 's choice either  $\alpha$  or  $\beta$ , depending on compatibility with  $A$ 's choice. In the second period, they bargain on adopting an international regulation. If the domestic institutions are compatible  $\{\alpha, \alpha\}$ , the second-period game is on the left in Figure 3.2. If the domestic institutions are incompatible  $\{\alpha, \beta\}$ , the second-period game is on the right in Figure 3.2. In both games,  $1 > \theta > 0$ , and the pure-strategy equilibrium strategies are underlined. The payoff  $\theta$  reflects the gains from harmonization and the penalty  $-1$  reflects the adjustment cost.

[FIGURE 3.2 ABOUT HERE]

The game has two variants. In “preventive care,” player  $B$  sees the choice set  $\{\alpha, \beta\}$  in the first period. It is easy to verify that in the unique equilibrium,  $B$  chooses  $\alpha$  in the first period and both players choose  $\alpha$  in the second period, which yields the first-best payoffs  $(\theta, \theta)$ . In “incompatibility,” player  $B$  sees the choice set  $\{\gamma, \delta\}$ , and the probability that  $\gamma = \alpha$  is exactly  $\frac{1}{2}$ . Regardless of  $B$ 's strategy, then, the players play the game on the left with probability  $\frac{1}{2}$  and obtain the first-best payoffs  $(\theta, \theta)$ . With probability  $\frac{1}{2}$ , the domestic institutions are incompatible and the players obtain the second-best payoffs  $(0, 0)$ .

“Incompatibility” also has two subcases. If  $\theta > \frac{1}{2}$ , it follows that  $2\theta - 1 > 0$ , so there is scope for compromise if one player compensates the other by offering  $\theta - 1$  in exchange for its standard. If  $\theta \leq \frac{1}{2}$ , it is the case that  $2\theta - 1 \leq 0$ , which implies that the adjustment costs preclude harmonization even if utility is transferable.

## Appendix B: The Interviews

I interviewed 25 officials and industry representatives in April and May 2008. The sites were the American Chamber of Commerce in the European Union (AmCham EU), the American Chemistry Council (ACC), the European Council of Chemical Associations (CEFIC), the Directorate General Environment (DG Environment) and the Directorate General Enterprise (DG Enterprise) of the European Commission, the OECD Department of Chemical Safety, the Transatlantic Business Dialogue (TABD), the Chemicals Team at the International Trade Administration of the U.S. Depart-

ment of Commerce (U.S. DC), and the Office of Pollution Prevention and Toxics and the Office of Compliance of the U.S. Environmental Protection Agency (U.S. EPA). All interviews were anonymous, but four of the interviews had two persons in the room.

The choice of interviewees was affected by three factors. First, I chose key officials and industry representatives to obtain information on specific events and developments. Second, I interviewed other persons based on the information obtained from previous interviews, thus expanding the network. Third, I chose some interviewees randomly to obtain a more balanced account.

The interviews were open-ended and lasted between 30 and 90 minutes. The questionnaire varied somewhat across interviews, but I structured the questions around four core themes. First, I asked general questions about international cooperation on chemical regulation. Second, I asked about international cooperation in the OECD on new chemicals, with particular focus on MAD and MAN. Third, I asked about international cooperation in the OECD on existing chemicals. Finally, I asked about REACH and the future of international cooperation on chemical regulation.

## Tables

<b>Hypotheses</b>	
<b>Dependent Variable</b>	<b>Independent Variable</b>
Technical form	Absence of lock-in Indifference
Political form	Presence of lock-in No indifference
Technical forum	Absence of lock-in Indifference
Political forum	Presence of lock-in No indifference
Consolidation	Absence of lock-in Indifference
No consolidation	Presence of lock-in No indifference

**Table 3.1.** The predicted relationship between the key independent and dependent variables.

## Figures

Scenario	Causes and Consequences		Worlds Apart
	Harmony and Discord	Consolidation	
<b>MAD</b>	Absence of lock-in → Indifference → ⇒ Technical form	⇒ Consolidation	Presence of lock-in No indifference ⇒ Political form ⇒ Political forum
<b>MAN</b>	Presence of lock-in → Indifference → ⇒ Technical form	⇒ No consolidation	

**Figure 3.1.** A summary of the results.

	$\alpha$	$\beta$
$\alpha$	$\theta, \theta$	$0, -1$
$\beta$	$-1, 0$	$-1, -1$

	$\alpha$	$\beta$
$\alpha$	$\theta, \theta - 1$	$0, 0$
$\beta$	$-1, -1$	$\theta - 1, \theta$

**Figure 3.2.** Two games of international regulation.



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# Chapter 4

## A Cure Worse Than the Disease? Issue Linkage and Delegation in Multilateral Negotiations

### 1 Introduction

According to international cooperation theory, states resort to such bargaining techniques as issue linkage and delegation if they cannot otherwise reach a mutually acceptable compromise in international negotiations. Through issue linkage, they exchange concessions across issue areas and thus expand the bargaining space.<sup>1</sup> By delegating authority to a legitimate international body, they commit to an uncertain legal settlement and generate a “focal point” for policy coordination.<sup>2</sup>

This functionalist model of voluntary international cooperation is based on the critical assumption that issue linkage and delegation as bargaining techniques are consensual decisions, which ensures that they cannot reduce the payoff relative to the *status quo* for any state. That mutual consent is a necessary condition for issue linkage or delegation is certainly innocuous when two states bargain, for Ego cannot force Alter to engage in linkage bargaining or delegate sovereignty.<sup>3</sup> But it is un-

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<sup>1</sup>Koremenos, Lipson and Snidal 2001; Leebbron 2002; Sebenius 1983; Stein 1980; Tollison and Willett 1979. Another use of the term “issue linkage” in the literature is interdependence of two issue areas (Leebron 2002; Limão 2005). In this article, I only focus on issue linkage as a bargaining technique.

<sup>2</sup>Allee and Huth 2006; Bradley and Kelley 2008; Garrett and Weingast 1993; Schelling 1960, 57.

<sup>3</sup>This does not imply that any given issue linkage or decision to delegate could not reduce the payoff to some state upon implementation (Sebenius 1983). However, a sovereign state that expects to lose can simply refuse to link issues or delegate unless explicit coercion is possible.

clear whether this logic is applicable to multilateral cooperation. Are issue linkage and delegation unambiguously beneficial bargaining techniques if they can shape the fortunes of third parties, as is the case in multilateral cooperation? Or can the mere opportunity to use these seemingly innocuous bargaining techniques cause rather than prevent collective-action failure in a multilateral context?

Given the difficulties that multilateral negotiations over such issues of paramount importance as trade liberalization, global warming, and financial regulation involve, this question merits a thorough examination. Should states encourage unconditional and pervasive use of issue linkage and delegation in multilateral negotiations, or is it sometimes expedient to deliberately *proscribe* – as opposed to simply refrain from – using these bargaining techniques?

Unfortunately, the extant literature on multilateral cooperation does not examine this possibility systematically.<sup>4</sup> Gruber comes closest to addressing this possibility in his analysis of international institutionalization as a form of power politics: some states collude to impose their will on other states by manipulating the *status quo* through the design of international institutions.<sup>5</sup> But distributional conflict is not equivalent to a collective-action failure. In Gruber’s model, those states that design international institutions to impose their will on others gain from doing so. It remains unclear whether the option to use issue linkage and delegation could reduce the payoff to *all* parties, including the mighty and the powerful, in multilateral cooperation.

To investigate this possibility, I construct a game-theoretic model of international policy coordination under complete information. My key assumption is that full coordination is necessary to solve the problem at hand effectively, so that states have a real incentive to enter the negotiations. To maximize the scope of the analysis, I make minimal assumptions regarding the set of feasible policies and the preferences that different actors have.

The major contribution of the analysis is a full characterization of the conditions

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<sup>4</sup>Martin 1992 and Ruggie 1992 study “multilateralism” as an alternative to “bilateralism.” Crump and Glendon 2003 and Zartman 1994 examine the “complexity” of multilateral negotiations. Downs, Rocke and Barsoom 1998 and Gilligan 2004 focus on the “broader-deeper” tradeoff in multilateral cooperation. Kahler 1992 examines the difference between multilateral collective action with “large and small numbers” of parties. Sebenius 1983 studies the “negotiation arithmetic” of adding and subtracting issues and parties in international negotiations. For a summary of the role of the “number” of states in international cooperation theory, see Koremenos, Lipson and Snidal 2001. These works do not address the possible inefficiencies that the availability of issue linkage and delegation induces.

<sup>5</sup>Gruber 2000.

under which the mere opportunity to link issues or delegate decision-making power reduce the payoff from policy coordination to *every* state. I first show that when issue linkage and delegation require a consensus decision by all states, they are innocuous; and if there is exactly one coalition of states that can link issues or delegate decision-making power, this option unambiguously works to their advantage. To the contrary, if different coalitions can use issue linkage or delegation to increase their influence and opportunistically impose their preference on other states, the outcome of the international negotiations can be unambiguously worse than without these options. When this is so, all states prefer to ban issue linkage and delegation.

What drives this result is a perverse and paradoxical consequence of the commitment capacity that issue linkage and delegation create. When states can use issue linkage or delegation to lock in a favorable policy, they enter the multilateral negotiations with a credible threat not to coordinate policies with others unless their preferred policy is chosen. If multiple coalitions have the opportunity to use such “committal tactics,”<sup>6</sup> they adopt rigid bargaining positions that prevent full coordination. In equilibrium, these “rivaling blocs” cannot back down out of fear that others use issue linkage or delegation to dominate the negotiations, despite empty promises not to do so. Issue linkage and delegation give rise to an endogenous Prisoner’s Dilemma, creating international collective-action problems where they previously did not exist.

The occurrence of such problems is systematically related to the nature of the international cooperation problem, and I derive empirical predictions regarding the preferences of different states over international institutional designs that facilitate or impede issue linkage and delegation. Which states desire “cross-cutting” international institutions that facilitate issue linkage and “strong” international committees that can issue binding decisions? I base these predictions on analytical results that reveal the conditions under which different states cannot possibly gain from issue linkage or delegation. These states, I maintain, should actively resist issue linkage and delegation.

Three predictions emerge. First, hegemonic states and their allies have a strong incentive to prevent issue linkage and delegation in issue areas that they dominate. Since they secure full coordination to their ideal policy anyway, they can but lose through issue linkage and delegation. Second, issue areas in which the incentive to coordinate policies dominates the incentive to promote one’s preferred policy are characterized by a unanimous agreement to ban issue linkage or delegation. This agreement can be difficult to enforce, however, since it is easy to dominate the negotiations through

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<sup>6</sup>Young 1989, 361.



issue linkage or delegation when others are willing to adopt any policy as long as full coordination ensues. Finally, states that have no credible claim to hegemony endorse issue linkage and delegation as ways to form a counterhegemonic coalition or achieve greater policy coordination.

The implications of the analysis for international cooperation and institutions are significant. The functionalist logic of conventional cooperation theory, best exemplified by the seminal work of Keohane and Koremenos, Lipson and Snidal,<sup>7</sup> systematically fails to hold in multilateral cooperation. States have a collective incentive to deliberately adopt rigid negotiation procedures and constrain international cooperation through issue linkage or delegation, whether multilateral negotiations carry high transaction costs or not. The rationale for rigidity and constraints on the forms of international cooperation is strictly strategic. In bilateral cooperation, it is true, the only reason not to use various bargaining techniques are the transaction costs that states incur. But in multilateral cooperation, seemingly innocuous bargaining techniques create opportunistic incentives that cause a collective-action failure.

To substantiate these claims, I proceed as follows. In section 2, I present the game-theoretic model of international policy coordination. In section 3, I introduce issue linkage and delegation. Section 4 presents the key result of this paper. In section 5, I derive the empirical predictions regarding the preferences of different states over international institutional designs that facilitate or impede issue linkage and delegation. Section 6 concludes.

## 2 Multilateral Policy Coordination

States engage in international negotiations over policy coordination when they expect a payoff from coordinated policies. For example, a global telecommunications standard is more expedient than multiple incompatible regional standards; global cooperation is necessary to prevent the collapse of oceanic fisheries when incentives to free ride are present; and trade liberalization is most effective when it is genuinely multilateral. In such circumstances, states must agree on a common course of action to maximize the gains from cooperation.

Sometimes states fail to coordinate policies due to distributional conflict. On the one hand, they may fail to coordinate policies. On the other hand, they may “water down” the agreement and settle on an ineffective compromise. In both cases, issue

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<sup>7</sup>Keohane 1984; Koremenos, Lipson and Snidal 2001.

linkage and delegation are potentially beneficial, because they expand the bargaining space and therefore facilitate policy coordination. By issue linkage, I refer to a unanimous decision by a group of states to condition the choice of policies on behavior in another issue area.<sup>8</sup> By delegation, I refer to a unanimous decision by a group of states to authorize an international body or committee to issue a binding policy decision for them.<sup>9</sup>

## 2.1 The Model

Let  $N = \{1, \dots, n\}$  be the set of states and assume  $n \geq 2$ , so that the model subsumes bilateral and multilateral cooperation. The positive *weight*  $w_i$  of state  $i$  represents the payoff to other states from coordinating policies with it in the relevant issue area. For example, in economic issues the gross domestic product is a plausible proxy for the weight of a state. The United States has a high weight in most issue areas, Botswana only in some. Normalize the weights such that  $\sum w_i = 1$ .

A *policy*  $t$  belongs to a finite set  $T$  that comprises all available alternatives. The *ideal point* of state  $i$  is one of the policies,  $t_i^{max} \in T^{max} \subset T$ . If states  $i$  and  $j$  have a common ideal point, they agree on what the best policy is. For example, the member states of the European Union could share a common preference if they negotiate with the United States on establishing a standard on genetically modified organisms.<sup>10</sup>

The *strategy* of state  $i$  is simply a policy  $s_i \in S_i = T$ . All states choose policies simultaneously. Each state  $i$  has a preference for full coordination to its ideal point  $t_i^{max}$ , but this is not necessarily possible. The utility representation of state  $i$  captures the potential schism between coordination and distribution:

$$U_i(s_i, s_{-i}) = g_i(W^{s_i}) \cdot u_i(s_i). \quad (1)$$

Here,  $W^{s_i}$  is the aggregate weight of all players that choose policy  $s_i$ . It determines the value of the gains from coordination. The value of the policy to state  $i$  is  $u_i$ . I assume  $g_i$  is strictly increasing such that  $g_i(0) = 0$  and  $u_i$  is non-negative, so that coordination never hurts a state.

This model is general. It covers a wide range of international cooperation problems in which states desire policy coordination, so the results do not depend on stringent

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<sup>8</sup>Sebenius 1983; Stein 1980.

<sup>9</sup>Bradley and Kelley 2008.

<sup>10</sup>Young 2003.

assumptions regarding preferences and the set of available policies. I require, however, that the marginal value of coordination does not diminish:

**Assumption 1** (marginal value of coordination). For any state  $i$  and any  $\lambda \in (0, 1)$ ,  $\lambda \cdot g_i(1) > g_i(\lambda)$ .

This assumption indicates that any state  $i$  finds full coordination to any policy with some probability  $\lambda$  preferable to partial coordination in a coalition of weight  $\lambda$ . An international telecommunications standard is clearly most useful when it is global. A universal agreement to prevent the collapse of oceanic fisheries is much more valuable than an agreement that leaves some states outside it. Without this assumption, it is possible that states do not even desire full coordination. Consequently, they have no incentive to participate in the multilateral negotiations. I omit this trivial possibility, because it does not pose an international cooperation problem.<sup>11</sup>

## 2.2 Solution Concepts

To solve the model, it is necessary to specify a bargaining protocol. The standard solution concept in non-cooperative game theory, the Nash equilibrium, is not suitable for modeling negotiations because it precludes pre-game communication.<sup>12</sup> For example, it permits full coordination to a policy even if *all* states agree that there is a superior, self-enforcing alternative. In reality, it seems plausible that one of the states simply propose this alternative be adopted.

One solution to this problem is to construct an elaborate bargaining structure, but the results from conventional bargaining models depend on the details and are unnecessarily complex for present purposes.<sup>13</sup> To avoid this problem, I adopt the *coalition-proof Nash equilibrium* as the equilibrium concept.<sup>14</sup> The formal definition

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<sup>11</sup>Specifically, if full coordination by all states to a common policy is not necessary to solve the international cooperation problem, one can simply focus on the problem of coordinating policies among those states that do benefit from full coordination among themselves.

<sup>12</sup>The Nash equilibrium also prohibits binding commitments. I maintain this restriction.

<sup>13</sup>In an insightful analysis, Gilligan 2004 uses a simple bargaining model to question the logic of broader-deeper tradeoff in multilateral cooperation.

<sup>14</sup>Bernheim, Peleg and Whinston 1987. A drawback of the coalition-proof Nash equilibrium is that it does not exist for some games that admit Nash equilibria. In

is relegated to the Appendix, but the intuition is straightforward. Write  $s_C$  for the policies chosen by coalition  $C$  and  $t_C$  if they adopt a common policy:

**Definition 1.** A **coalition-proof Nash equilibrium** is a commonly known probability distribution<sup>15</sup> over strategy vectors  $\{s_N^1, \dots, s_N^k\}$  such that for any *ex post* policy vector  $s_N^j$ , there is no coalition  $C$  with a profitable and self-enforcing deviation  $s_C$ .

Coalition-proof Nash equilibria are essentially international agreements that no coalition of states can credibly threaten to upset. Even though France could not credibly threaten to unilaterally prevent the reform of European agricultural policies, this threat might be credible if other states join the cause. The reform proposal is then a Nash equilibrium but not coalition-proof and hence an implausible outcome of multilateral negotiations. In bilateral cooperation, coalition-proofness excludes the implausible possibility that states fail to adopt a common policy that they both prefer to unilateral policies.

States can choose the policy randomly, which is useful because states can secure full coordination without deciding with certainty whose preferred policy will be adopted.<sup>16</sup> For example, both the United States and the European Union probably prefer that their domestic telecommunications standards be adopted globally with some probability to no international telecommunications standard at all. Figure 4.1 illustrates a simple bilateral model in which both states stand to benefit from random selection.

[FIGURE 4.1 ABOUT HERE]

Consider now those international negotiations that could pose an international cooperation problem. Under complete information, inefficiency must result from a commitment problem:

**Definition 2.** A coalition-proof Nash equilibrium is **efficient** if and only if no probability distribution on a set of strategy vectors is a weak *ex ante* Pareto-improvement

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the present context, the structure of payoffs is such that non-existence is unlikely. Throughout, I assume that at least one coalition-proof Nash equilibrium exists.

<sup>15</sup>Throughout, the set of probability distributions contains degenerate probability distributions that choose a strategy vector deterministically.

<sup>16</sup>Formally, I assume the players have access to a public randomization device.

over it.<sup>17</sup>

This is the conventional definition of Pareto-efficiency when random selection is permissible but players cannot commit to policies. Without commitment capacity, it must be that no coalition has an *ex post* incentive to deviate, regardless of the outcome of a possible random selection process.

Given that the marginal value of coordination does not decrease, it is easy to show that efficiency requires full coordination:

**Claim 1.** All efficient coalition-proof Nash equilibria prompt *ex post* full coordination to a common policy  $t_N = (t, \dots, t)$ .

This finding presents a necessary condition for success in multilateral negotiations: did the states ultimately choose a common policy or not? If not, **Assumption 1** ensures that they could improve on the outcome of the negotiations through random selection of a fully coordinated policy when adequate commitment capacity is available. Figure 4.2 illustrates.

[FIGURE 4.2 ABOUT HERE]

## 2.3 Equilibrium Analysis

To see whether policy coordination poses an international cooperation problem, I conduct an equilibrium analysis. The equilibria of the game are the possible outcomes of the international negotiations. If all equilibria of the game are efficient, states do not face an international cooperation problem, as the negotiations must produce an efficient outcome. Otherwise all states could potentially benefit from appropriate institutional designs to solve the problem. Interestingly, it turns out that potential cooperation problems in bilateral and multilateral cooperation are not qualitatively different, so the causes of inefficient issue linkage and delegation in the multilateral context must lie elsewhere.

Consider first the possibility of pure coordination:

**Equilibrium 1** (pure coordination). Suppose that for any common policy  $t_N$  and

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<sup>17</sup>The possibility of multiple equilibria, some of which are efficient while others are not, can be safely ignored because deviations by the grand coalition are permitted.

coalition  $C$ , there is no profitable deviation to a common policy  $t_C$  such that  $g_i(w_C) \cdot u_i(t_C) \geq g_i(1) \cdot u_i(t_N)$  for all  $i \in C$ . Then all equilibria of the game are probability distributions on efficient common policies.

In pure coordination games, all states assign high priority to coordination relative to distribution. When the returns to full coordination are high but the distributional consequences of different policies are negligible, states can credibly commit to any common policy. Perhaps the best example is a simple standardization problem, such as the adoption of a common calendar.<sup>18</sup> Another condition that increases the likelihood of pure coordination is the absence of large groups of states with similar preferences. The coalitions that could have a collective incentive to deviate from a common policy are small, which increases the cost of deviation. The threat by a small coalition to deviate is not credible; somewhat paradoxically, a fragmented preference landscape increases the likelihood of pure coordination.

An alternative form of full coordination is hegemony:

**Equilibrium 2** (hegemony). Suppose there is a unique ideal point  $t^{max}$  for which a coalition  $C$  exists such that  $g_i(w_C) \cdot u_i(t^{max}) \geq g_i(1) \cdot u_i(t)$  for all  $t$  and  $i \in C$ . Fix  $s_C = t^{max}$  for largest such coalition  $C$ . Unless there is another coalition  $D$  such that  $g_i(w_D) \cdot u_i(t_D) \geq g_i(1) \cdot u_i(t^{max})$  for some  $i \in D$  and  $t_D \neq t^{max}$ , and no subcoalition  $E \subseteq D$  such that  $g_i(w_{C \cup E}) \cdot u_i(t^{max}) \geq g_i(w_D) \cdot u_i(t_D)$  for all  $i \in E$ , the unique and efficient equilibrium of the game is full coordination to  $t_N = t^{max}$ .

When states that share an ideal point are alone in the position to credibly threaten withdrawal from a common policy, they are also in the position to force full coordination to their ideal point. Other states, who value coordination over distribution, submit to ensure full coordination. Hegemony is most likely when exactly one large group of states that share an ideal point is present, perhaps because the currently hegemonic state belongs to it. It is also most likely when the members of this group have intense preferences while other states are relatively indifferent between different policies.

Both pure coordination and hegemony ultimately result in the choice of an ideal point, but empirically it is more common in multilateral negotiations that states com-

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<sup>18</sup>Stein 1982, 314. Mattli and Bütte 2003 provide extensive empirical evidence that international standard setting in a global economy is not generally a simple coordination problem.

promise on the choice of a common policy:

**Equilibrium 3** (compromise). Suppose there exists a common policy  $t_N$  that is not an ideal point such that  $g_i(1) \cdot u_i(t_N) > g_i(w_C) \cdot u_i(t)$  for all coalitions  $C$ , at least one state  $i \in C$ , and all policies  $t$ . Then all probability distributions over such policies are coalition-proof Nash equilibria. These equilibria can be efficient or inefficient.

Compromise policies are not ideal points, so no state obtains its maximum payoff. The compromise is efficient if there is no other choice of policies that would make *all* bargaining parties better off, and inefficient otherwise.<sup>19</sup> For example, a multilateral trade agreement is efficient if any conceivable change in tariff levels or permissible trade policies leaves at least one state worse off. It is inefficient if there is a better agreement, such as universally lower tariff levels, but this policy is vulnerable to a deviation by a regional trading bloc.<sup>20</sup> States must then “water down” the multilateral trade agreement to implement it.

Finally, the archetypal international cooperation problem is coordination failure:

**Equilibrium 4** (coordination failure). Suppose there are separate policies  $\{t_{C_1}, \dots, t_{C_k}\}$  for coalitions  $\{C_1, \dots, C_k\}$  such that there is no profitable deviation for any coalition  $D \subseteq N$  and all  $i \in D$ . Then  $(t_{C_1}, \dots, t_{C_k})$  is a coalition-proof Nash equilibrium in which coordination failure occurs. Efficient equilibria can also exist.

When states have intense preferences and multiple coalitions can credibly threaten to withdraw from a common policy, states fail to coordinate policies. They form “rivaling blocs” and dissipate the surplus from policy coordination. By **Assumption 1**, all states prefer choosing a common policy randomly instead, but they cannot credibly commit to not renegeing if their preferred outcome is not chosen.

These equilibria, summarized in Table 4.1, are straightforward extensions of those found in canonical two-player games, such as the Battle of the Sexes. The equilibrium analysis therefore suggests that if qualitative differences exist between the

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<sup>19</sup>Importantly, this implies that these equilibria are *not* inefficient in the set of coalition-proof Nash equilibria, as at least one state prefers each one of them to efficient compromise. They are inefficient, however, in the set of possible outcomes when binding commitments are possible and therefore pose an international cooperation problem. If the efficient compromise is chosen, there is instead nothing states can do to improve everyone’s payoff.

<sup>20</sup>Mansfield and Reinhardt 2003.

strategic logic of bilateral and multilateral negotiations, they must be caused by more fundamental mechanisms of strategic interaction than the nature of the cooperation problem.

[TABLE 4.1 ABOUT HERE]

### 3 Issue Linkage and Delegation

I now turn to the impact of issue linkage and delegation. As conventional cooperation theory tells us, these techniques have potential to prevent coordination failure or inefficient compromise in international negotiations. The conditions under which issue linkage and delegation are unproblematic no-regret bargaining techniques, however, remain poorly understood.

#### 3.1 Who Can Link Issues and Delegate?

For both issue linkage and delegation, the first question to ask is who can use them. In multilateral negotiations, it is not clear that all states have access to such bargaining techniques. Consider first issue linkage. Some states could interact regularly across different issue areas, which creates scope for linkage bargaining, while others rarely have any reasons to negotiate at all. Some states could be institutionally constrained in the presence of domestic “veto players” that can prevent concessions in different issue areas, while others could easily exchange concessions across issue areas.<sup>21</sup>

This applies to delegation as well. Members of the Organisation for Economic Cooperation and Development can request that the relevant committee design a common policy, while other states could lack the institutional structure necessary to generate such decision-making power. More generally, some states could possess commitment capacity for legally binding decisions by an international committee, perhaps through a reputational or domestic institutional mechanism, while others lack such capacity.<sup>22</sup>

Formally, I assume that only exogenously given “bargaining groups” can use issue linkage or delegation:

**Definition 3.** To use issue linkage or delegation, state  $i$  must be a member of

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<sup>21</sup>See Tsebelis 2002 for veto-player theory.

<sup>22</sup>Chayes and Chayes 1993; Downs and Jones 2002; Martin 2000.



some exogenously given, non-singleton **bargaining group**  $B$ .

This definition is simpler to use than a more complex formulation according to which each state  $i$  can link issues or delegate at a cost.

Substantively, bargaining groups comprise states that simply happen to interact in another area simultaneously and possess the capacity to bargain across issues (issue linkage) or have the capacity to authorize an international committee to choose a policy (delegation). The definition does not imply that the members of a bargaining group have common interests; it is enough that they could potentially link issues or delegate decision-making power. I allow for the existence of multiple bargaining groups. To simplify the analysis without loss of essential insight, however, I assume that no state  $i$  belongs to multiple bargaining groups:

**Assumption 2.** Each state  $i$  can be a member of at most one bargaining group  $B$ .

It is useful to now classify bargaining groups according to their number and form:

**Definition 4.** A bargaining group  $B$  is **unique** if there are no other bargaining groups and **competitive** otherwise. If the unique bargaining group is the grand coalition  $N$ , it is **universal**.

These definitions are central to the results that I present below. When a unique bargaining group exists, its members need not consider the strategic implications of issue linkage or delegation. Competitive bargaining groups, on the other hand, must not forget that other states are present that can also use issue linkage or delegation.

Throughout, I do not differentiate between bargaining groups that can use issue linkage or delegation. Each bargaining group could also have multiple feasible issue linkages or opportunities to delegate. It turns out that such considerations are irrelevant for the analytical results, so I omit the formalization.

## 3.2 Issue Linkage and Delegation Defined

I am now in the position to introduce the mechanics of issue linkage and delegation. Following Sebenius, I submit that issues are “linked when they are simultaneously

discussed for joint settlement.”<sup>23</sup> If states fail to reach an agreement on a single issue, they can negotiate an agreement that spans two or more issue areas, so that the adoption of a common policy in either issue area depends on the adoption of another common policy in the other issue area. If states have the possibility to form linkages, they can expand the bargaining space for mutual advantage. Formally:

**Definition 5.** An **issue linkage** is a unanimous pre-game decision by a bargaining group  $B$  to adopt (possibly random) policies  $s_B$  in the policy coordination game and policies  $y_B$  in another game  $\Gamma_B$ . If any state  $i$  in bargaining group  $B$  deviates from these policies, all states in both games revert to the coalition-proof Nash equilibrium that would have been played without the issue linkage.

This definition highlights two issues. First, issue linkage is a unanimous pre-game decision. If the members of a bargaining group choose to link issues, other states know it under complete information. If any member of the bargaining group refuses to link issues, others cannot force it to do so. Second, the states deliberately condition policies in the two games on each other.<sup>24</sup> If any member of the bargaining group fails to honor the issue linkage in one issue area, others can also deviate. The issue linkage must therefore be incentive-compatible to have an effect.

Consider next delegation. In general, the concept refers to “a grant of authority by two or more states to an international body to make decisions or take actions.”<sup>25</sup> In the context of negotiations, the purpose of delegation is to allow an international “committee” select a common policy for the delegating states.<sup>26</sup> This stands in contrast to delegation for purposes of adjudication, that is, to enforce existing international agreements. I do not consider this possibility, because it is not directly relevant to the problem of policy coordination in international negotiations. Examples of international delegation include authorizing the European Commission to prepare an energy policy for the member states, *ad hoc* voluntary arbitration at the Permanent Court of International Arbitration, and the preparation of a common bargaining position in

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<sup>23</sup>Sebenius 1983, 287. See also Davis 2004; Koremenos, Lipson and Snidal 2001; Leebron 2002; Stein 1980.

<sup>24</sup>This is in contrast to another use of the term “issue linkage” in the literature, which refers to the possibility that two issue areas are somehow interdependent (Leebron 2002; Limão 2005).

<sup>25</sup>Bradley and Kelley 2008, 2.

<sup>26</sup>See Farrell and Saloner 1988; Hawkins et al. 2006; Johns 2007; Koremenos, Lipson and Snidal 2001.

multilateral trade negotiations by consulting legal experts on the relevant provisions of an existing regional trade agreement.

Under complete information, delegation can serve two purposes in international negotiations. The first is to generate a “focal point.”<sup>27</sup> If states can choose among multiple policies, as in the model above, they can “fix” a focal policy by asking an impartial and legitimate international committee to choose a policy for them. This possibility is already captured in the model, because I allow random selection. However, states can go beyond mere recommendations through a commitment to a binding decision by an international committee. This is the definition that I use:

**Definition 6. Delegation** is a unanimous, binding pre-game decision by a bargaining group  $B$  to adopt (possibly random) policies  $s_B$  in the policy coordination game.

This definition formalizes the “strong” form of international delegation. Instead of seeking recommendations, states announce a binding commitment to the decision made by the international committee. It can be useful when there are effective common policies that states fail to adopt because some coalitions have an incentive to deviate.

The assumption that issue linkage and delegation are pre-game decisions is plausible. If a bargaining group has the opportunity to use issue linkage or delegation, there is no reason why it could not do so before the multilateral negotiations. Since such pre-game decisions endow the members of a bargaining group with commitment capacity, the option to do so is unambiguously in their interest.

Consider now the nature of the augmented game. For any bargaining group  $B$ , both issue linkage and delegation permit a credible pre-game commitment to a probability distribution over some policy vectors  $\{s_B^j\}_j$ . The following observation thus simplifies the analysis:

**Claim 3.** In equilibrium, issue linkage and delegation are equivalent to a credible pre-game commitment to a probability distribution over policy vectors  $\{s_B^j\}_j$ .

The set of available policy vectors  $\{s_B^j\}_j$  to which states can commit, might be *inter alia* determined by the strength of the international committee for delegation or the set of available issue linkages. States can perhaps credibly commit to liberalizing

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<sup>27</sup>Schelling 1960, 57; Garrett and Weingast 1993.

trade or increasing their development aid, but a credible commitment to initiate an interstate conflict with a major power could be difficult to enforce.

Given that both issue linkage and delegation are pre-game decisions, focus should be restricted on subgame-perfect coalition-proof Nash equilibria. The extensive form of the game is now as follows:

1. All state  $i$  that belong to some bargaining group  $B$  announce simultaneously a probability distribution over available policy vectors  $\{s_B^j\}_j$ . If all members of a bargaining group  $B$  announce an identical probability distribution, it is a *credible pre-game commitment*.
2. Randomization occurs and the *ex post* policies  $\{s_i^*\}_i$  of all states  $i$  that belong to some bargaining group  $B$  with a credible pre-game commitment are fixed.
3. All states  $j$  that have not made a credible commitment choose policies simultaneously, taking the credible commitments  $\{s_i^*\}_i$  as given.

Both issue linkage and delegation are unanimous decisions, so two conditions must hold for all bargaining groups that link issues or delegate. First, no member of such a bargaining group should have an individual incentive to veto the decision. Second, there should be no other issue linkage or delegation opportunity that improves the payoff to all members of a bargaining group.

## 4 Results

With the mechanics of issue linkage and delegation intact, it is possible to examine their impact on international negotiations. I begin with the case of bilateral cooperation and then proceed to investigate the complications that multilateral cooperation raises.

### 4.1 Unproblematic Issue Linkage and Delegation

In bilateral cooperation, the logic of conventional cooperation theory holds:

**Proposition 1.** In bilateral cooperation, the option to link issues or delegate decision-making power cannot reduce the payoff to either state.

This result is firmly grounded in conventional cooperation theory. States cannot link issues or delegate decision-making power unilaterally, so issue linkage and delegation depend on mutual consent. When mutual consent is required, either state can simply refuse to use these bargaining techniques if it expects to lose. While any given issue linkage or decision to delegate could hurt both states, the *option value* is unambiguously non-negative. The functionalist logic of conventional cooperation theory holds because sovereign states can “exit” bargains that harm them.<sup>28</sup>

The unproblematic nature of issue linkage and delegation in bilateral cooperation has a counterpart in multilateral cooperation. If there is a unique bargaining group, it is never hurt by the opportunity to link issues or delegation. If the bargaining group is universal, this opportunity cannot hurt any of the bargaining parties:

**Proposition 2.** In multilateral cooperation, the option to link issues or delegate decision-making power by a unique bargaining group cannot reduce the payoff to its members. If this bargaining group is universal, this option cannot reduce the payoff to any state.

In the case of a unique bargaining group, issue linkage and delegation have no complex strategic implications. They simply allow a bargaining group to credibly commit to a common policy. If any member of the bargaining group expects to lose, it can refuse to use the option. And if the bargaining group is universal, each state has a veto over issue linkage and delegation, so issue linkage and delegation are all but unproblematic, exactly as conventional cooperation theory predicts. Again, any given issue linkage or decision to delegate is potentially harmful, but then the losers can simply prevent its implementation.

A universal bargaining group that used issue linkage efficiently can be found in the multilateral negotiations on the United Nations Law of the Sea. Sebenius writes that the developed and developing countries disagreed on the provisions that establish the ground rules for mining operations.<sup>29</sup> On the one hand, developing countries preferred high fees for mining operations while developed countries, which had greater opportunities to mine the seabed, preferred a flexible system of generally low fees. On the other hand, the developing countries insisted on long-term, interest-free loans to the International Seabed Authority, while the developed countries preferred a commercial financial mechanism. In isolation, these two issues were essentially single-dimensional

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<sup>28</sup>For the concept of exit, see Hirschman 1970.

<sup>29</sup>Sebenius 1983, 293-294.

bargaining games with multiple players and bifurcated preferences. Through a universal issue linkage, approved by the bargaining parties, they reached a mutually acceptable compromise. By successfully closing these multiyear negotiations, they established the foundation for the law of the sea.

The European Union offers an insightful example of an often unique bargaining group in multilateral negotiations. Internally, the agenda-setting and implementation capacities of the European Commission enable delegation by a universal bargaining group.<sup>30</sup> In many key issue areas, such as economic policy in the internal market or environmental and health regulation, the member states can seek to resolve their disagreements by delegating decision-making power to the Commission. A good example of a major policy initiative that would have hardly been possible without the input of the Commission is the “climate package” negotiated in 2008, which legally binds the member states to reduce their greenhouse gas emissions by one fifth by the year 2020.<sup>31</sup>

Externally, delegation to the European Commission increases the bargaining power of the Europeans. Mattli and Büthe provide compelling empirical evidence that in international standard setting, a key issue area in a global economy, the centralized mechanisms for European standardization have given the European Union a competitive edge over the United States and other countries.<sup>32</sup> By resolving their disputes internally and credibly committing to a unionwide standard, which covers the largest common market in the world, they entice other states to adopt the European standards out of fear of losing market share.

## 4.2 Problematic Issue Linkage and Delegation

When bargaining groups are competitive, issue linkage and delegation can cause inefficiencies:

**Proposition 3.** Fix a coalition-proof Nash equilibrium of the game without bargaining groups.

1. There exists a subgame-perfect coalition-proof Nash equilibrium that reduces the payoff to all states *only if* the original coalition-proof Nash equilibrium

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<sup>30</sup>Pollack 1997, 121-128.

<sup>31</sup>For the central role of the European Commission, see “Commission Unveils Plans to Cut Emissions by 20 Percent.” *Der Spiegel International* January 23, 2008.

<sup>32</sup>Mattli and Büthe 2003.

and all weak Pareto-improvements to it through issue linkage or delegation are not self-enforcing, because for each of them there is some coalition  $C$  that can profitably deviate through issue linkage or delegation such that the profitability of this deviation  $s_C$  depends on  $s_{N \setminus C}$ .

2. All equilibria of the game reduce the payoff to all states *if* the above condition holds for all coalition-proof Nash equilibria of the game and policy vectors not Pareto-dominated by them.

This is the central result of the paper. When the multilateral policy coordination game has an equilibrium without bargaining groups, opportunities to link issues or delegate can only cause inefficiency if multiple bargaining groups try to use them to enhance their influence. These bargaining groups engage in competition to entice other states to adopt their preferred policies, and they cannot abandon their rigid bargaining positions out of fear that they lose this competition over bargaining influence. If this competition “destroys” all existing coalition-proof Nash equilibria of the game and all attempts to improve upon them through using issue linkage or delegation, the resulting equilibrium must be strictly worse for all involved states.

The result highlights the fundamental importance of *opportunistic* gains from issue linkage or delegation. A necessary condition for inefficiency is that the original coalition-proof Nash equilibrium and any attempts to improve upon it through issue linkage or delegation are vulnerable to an opportunistic deviation through issue linkage or delegation that forces other states to adjust their policies. A sufficient condition for inefficiency is that this vulnerability applies to all coalition-proof Nash equilibria of the original game.

Why cannot the competitive bargaining groups avoid this tragic outcome, despite an obvious need to do so? The obstacle is the prospect of opportunistic gain, which is only possible because both issue linkage and delegation create commitment capacity. If the competitive bargaining groups agree not to use issue linkage or delegation, one of them can deviate by announcing a credible commitment to their preferred policy, which other states then choose to reap the gains from policy coordination.

The contest for bargaining power in the multilateral negotiations thus gives rise to an endogenous Prisoner’s Dilemma. The commitment capacity created by issue linkage or delegation paradoxically destroys both the original equilibria of the game and all attempts to improve upon them. **Proposition 3** shows that this fundamental problem is the only possible causal mechanism that can create an unambiguously harmful outcome in the multilateral negotiations. Figure 4.3 illustrates.

[FIGURE 4.3 ABOUT HERE]

Clear examples of competitive bargaining groups that made opportunistic use of issue linkage and delegation can be found from multilateral trade negotiations. Beginning with issue linkage, Narlikar investigates developing country bargaining tactics when the United States first brought the service sector to the agenda of the GATT in the 1980's.<sup>33</sup> The European Community had established an issue linkage between services and agriculture "to divert attention away from, or at least facilitate trade-offs on [the latter]." This issue linkage gave rise to a common transatlantic policy that services were to be liberalized in the negotiations. Although the majority of developing countries were willing to compromise and initiate negotiations on services, the Group of 10 refused to consider this possibility and precluded "[a]ny possibility of finding a middle ground with the other developing countries." The resulting deadlock impeded progress in the negotiations and forced the developing countries to fundamentally rethink their bargaining tactics.

Mansfield and Reinhardt show that states have formed preferential trading agreements to increase their bargaining power in multilateral trade negotiations.<sup>34</sup> They argue that, *inter alia*, these agreements "may increase leverage by accumulating market power of individual members, giving them greater ability to influence their terms of trade and to negotiate favorable settlements with outsiders." In my model, the agreements correspond to a credible commitment to a common policy. The competitive and opportunistic nature of these agreements is clear in the words of the U.S. Trade Representative Robert Zoellick, who is quoted by Mansfield and Reinhardt saying "I firmly believe that a process of ... competitive liberalization will enhance our ability to get Doha done."<sup>35</sup> Unfortunately, the dismal record of the Doha round shows how other states have also adopted inflexible positions and the negotiations have failed to produce a bargain.

**Proposition 3** is in striking contrast to the logic of conventional cooperation theory. Unlike bilateral negotiations, multilateral negotiations involve coalition formation. If this process of coalition formation involves competition over influence in the multilateral negotiations, it gives rise to negative externalities that hurt other

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<sup>33</sup>Narlikar 2003, 69-82.

<sup>34</sup>Mansfield and Reinhardt 2003.

<sup>35</sup>Mansfield and Reinhardt 2003, 838. Originally in *Washington Post* November 20, 2002.



states. Issue linkage and delegation do not require mutual consent, and the existence of opportunistic incentives pits competitive bargaining groups against each other in a collectively detrimental fashion. Multilateral negotiations that were to be a problem of coordination and distribution turn into a Prisoner's Dilemma that hurts everyone involved.

The result is more fundamental than related findings in the extant literature. Sebenius shows that an issue linkage can destroy the "zone of agreement," but he does not analyze the strategic implications of the issue.<sup>36</sup> As I have shown above, without multilateral strategic interaction, states can simply choose not to implement the detrimental issue linkage. Gruber analyzes a simple three-player model to show that international institutionalization in general can harm third parties, but his model does not permit an outcome in which *all* states are hurt.<sup>37</sup> While power politics can be troubling for normative reasons, the outcome is not inefficient *per se* because at least the most powerful states gain. **Proposition 3** shows that everyone can lose when issue linkage or delegation create opportunistic incentives.

To summarize, these findings provide a strictly strategic rationale for the limited scope and consensual decision-making rules in multilateral negotiations.<sup>38</sup> The conventional wisdom emphasizes the transaction costs of complex multilateral negotiations,<sup>39</sup> but the analysis above shows that states can have a collective incentive to limit interactions to a single issue area and discourage delegation even when these costs are negligible.

## 5 Higher-Order Distributional Conflict in Institutional Design

Given the generality of the model, a full comparative statics analysis is beyond the scope of this paper. Since I have provided a detailed analytical characterization of the conditions under which issue linkage and delegation cause inefficiency, it is nevertheless possible to generate empirical predictions on the politics of international

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<sup>36</sup>Sebenius 1983. Keohane 1984, 92 also notes that a functional regime should preclude "destructive linkages or bargains," but he does not define or analyze the concept.

<sup>37</sup>Gruber 2000. See also Stein 1980, 65-74.

<sup>38</sup>See Maggi and Morelli 2006 for an analysis of decision-making rules in the context of collective-action problems.

<sup>39</sup>Crump and Glendon 2003; Koremenos, Lipson and Snidal 2001, 787.

institutional design to facilitate issue linkage and delegation.<sup>40</sup>

## 5.1 International Institutions, Issue Linkage, and Delegation

If issue linkage and delegation are sometimes problematic in multilateral cooperation, it is of interest to examine how different states view institutional designs that facilitate or impede them. Are some states more willing to invest in international institutions that facilitate issue linkage and delegation? Do other states have incentives to actively resist such institutions?

To conduct the analysis, I assume that cases requiring international negotiation in an issue area share certain common features. For instance, I assume that if a state is hegemonic in one case, it is likely to be hegemonic in other cases in that issue area as well. As the European domination of the politics of international standard setting shows, this is not an implausible assumption. Building on this assumption, I ask which institutional designs a particular state, such as the hegemon, prefers when it faces a typical international cooperation problem in a given issue area.

To begin with, consider the reasons why certain international institutions facilitate issue linkage. The possibility of a strategic issue linkage to enable compromise hinges on establishing connections between unrelated issue areas.<sup>41</sup> Consequently, if such linkages carry transaction costs,<sup>42</sup> international institutions that reduce the cost of bargaining across issue areas encourage strategic linkages in multilateral cooperation.<sup>43</sup> Such institutions are aptly labeled “cross-cutting” because they permit bargains without substantive basis.

In contrast, some institutions actually impede the use of issue linkage. If an international institution focuses on the technical and managerial aspects of international cooperation, it increases the cost of cross-issue bargaining among the parties. Such institutions are best characterized as “isolated” because they limit the scope of multilateral negotiations to the issue at hand. To be sure, such an institution does not prevent some parties from bargaining on a linkage or using side payments in other fora. But isolation should *ceteris paribus* increase the cost of strategic issue linkages.<sup>44</sup>

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<sup>40</sup>Keohane 1984, 91-92; Koremenos, Lipson and Snidal 2001, 784-787.

<sup>41</sup>Leebron 2002.

<sup>42</sup>North 1990; Williamson 1975.

<sup>43</sup>Keohane 1984; Koremenos, Lipson and Snidal 2001.

<sup>44</sup>Snidal 1996, 127 attacks the claim that formal institutions have no role in international cooperation because any outcome that they bring about could be in principle implemented without them: “[i]nstitutions matter because they provide a stable

The distributional conflict over issue linkage concerns the choice between cross-cutting and isolated forms of international institutionalization. In delegation to a committee, a corresponding distributional conflict emerges over the choice between “strong” and “weak” international institutions.<sup>45</sup> A strong committee has the capabilities to enforce its policy decisions. These capabilities could vary from explicit sanctions to harmful reputational consequences. In the context of the model, a strong institution corresponds to the case of fully binding delegation studied above. The European Commission is probably the best example of a strong committee.

A weak committee, on the other hand, lacks the power to enforce its judgments, which are thus more appropriately seen as recommendations. The United Nations Codex Alimentarius for sanitary and phytosanitary standards, for example, has recommended thousands of international standards for common adoption, but compliance has been far from perfect.<sup>46</sup> In the model, a weak committee is simply a mechanism for randomly generating a non-binding focal point.

## 5.2 Results

I begin with issue areas in which pure coordination and efficient compromise are typical international cooperation problems. These issue areas are characterized by strong incentives to coordinate policies and the absence of a genuine international cooperation problem. It is therefore unsurprising that collective gains are not to be made through issue linkage or delegation:

**Corollary 1.** Under pure coordination or efficient compromise, issue linkage or delegation cannot increase the payoff to a state without reducing the payoff to another state.

This result is a straightforward consequence of the efficiency of the international negotiation outcomes in the absence of issue linkage and delegation. Its implications are far-reaching. Since the states can always achieve an efficient allocation of gains in environment for mutually beneficial decision-making as they guide and constrain behavior.”

<sup>45</sup>For the desirability of strong international institutions with enforcement powers in general, see Chayes and Chayes 1993 and Downs, Rocke and Barsoon 1996.

<sup>46</sup>Veggeland and Borgen 2005, 683-694 argue that the Codex was essentially a “gentleman’s club” before the Uruguay Round of the World Trade Organization (WTO), and that after 1995 its recommendations have been “semi-binding” for WTO members.

the form of a compromise, they have no demand for issue linkage or delegation, but as I have shown, issue linkage and delegation can reduce the payoff to all of them. The risk of this detrimental outcome thus creates an incentive to deliberately bar the use of issue linkage or delegation.

What is more, the potential benefits from opportunistic issue linkage or delegation to the winners are high. Since coordination is the primary motivation of most states in these issue areas, as the equilibrium analysis above shows, they are quite sensitive to the choices of other states. By locking in an ideal point, a bargaining group can trigger an avalanche that prompts full coordination to its preferred policy. When the returns to opportunism are large, states find it difficult to prevent collectively detrimental outcomes.

This result leads to an interesting conjecture regarding the nature of “technical” issue areas in which politics seem to have a minor role to play. While it is possible that these issue areas are characterized by a true absence of distributional conflict,<sup>47</sup> it is equally plausible that states have deliberately moved to contain distributional conflict by barring such techniques as issue linkage or delegation that bargaining groups can use to increase their influence. In the International Telecommunication Union, an international organization and a bargaining forum for key decisions in global telecommunications, the role of technical regulators has been conspicuously prominent despite unusually high political stakes.<sup>48</sup> While telecommunications is a technical issue area, it is quite implausible that major powers such as the United States and the European Union could not negotiate in explicitly political terms with support from technical experts and engage in linkage bargaining.

Consider next the incentives of a state that expects to be hegemonic in an issue area of multilateral policy coordination:

**Corollary 2.** Under hegemony, issue linkage or delegation cannot increase the payoff to the hegemonic coalition.

The hegemon obtains its maximum payoff without issue linkage or delegation, so any change in the outcome of the negotiations goes against its interests. The large size and intense preferences of the hegemonic coalition, and the lack thereof elsewhere in the world, imply that straightforward international negotiations without bargaining techniques produce the first-best payoff for the hegemonic coalition.

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<sup>47</sup>See Vogel 1997.

<sup>48</sup>Cowhey and Aronson 1991, 310.

This finding implies that hegemonic states and their close allies with similar policy preferences have an incentive to actively resist attempts to engage in linkage bargaining or use delegation. As long as the hegemon can *divide et impera* by preventing other states from credibly committing to a common counterhegemonic policy, it secures full coordination to its ideal point. If other states resolve their internal disputes and form a unified front against the hegemon, it is possible that they deviate from the hegemon's preferred policy and leave the hegemon without the benefits of policy coordination.

When is the hegemon subject to a credible counterhegemonic challenge, so that other states could potentially benefit from issue linkage or delegation?

**Corollary 3.** Under hegemony, issue linkage or delegation can increase the payoff to non-hegemonic states only if the hegemonic coalition is small enough.

The size of the hegemonic coalition determines the extent to which deviation from its preference dissipates the surplus from policy coordination. If the hegemonic coalition is small, and only barely able to induce full coordination to its preference, issue linkage or delegation among the non-hegemonic states can create relatively extensive coordination to policies that are preferable to the hegemon's ideal point. If the hegemonic coalition is overwhelmingly dominant, such as the United States in its interactions in the aftermath of the Second World War, the non-hegemonic states cannot possibly improve their payoff even if they credibly commit to a policy.

These two results imply that hegemonic issue areas provoke distributional conflict over institutional design when the hegemonic coalition is "weak" and only barely able to achieve full coordination to its ideal point. In such circumstances, the hegemon must actively resist initiatives by other states to link issues or delegate decision-making power, perhaps through a system of rewards and punishments. When the hegemon is overwhelmingly dominant, it need not worry about challenges because there is no latent counterhegemonic coalition.

Consider finally the inefficient outcomes:

**Corollary 4.** Under coordination failure or inefficient compromise, issue linkage or delegation can increase the payoff to all states. If the bargaining group is universal, it cannot decrease the payoff to any state.

This result shows that the most likely case for mutually advantageous issue linkage

or delegation contains the elements of a complex problem of institutional design. On the one hand, issue linkage and delegation contain the potential for mutual gain and, even better, this is a no-regret technique as long as the bargaining group is universal. At the same time, however, individual states could eschew the universal bargaining group in the hope of imposing their will on the others. The problem of international institutional design boils down to facilitating universal bargaining groups that reflect the relative bargaining power of different states, without simultaneously opening the Pandora's box of competitive bargaining groups motivated by opportunistic gain and the resulting tragedies.

To summarize, the analysis of higher-order distributional conflict in international institutional design generates the following predictions. First, in issue areas in which coordination is the overwhelming priority, states have a collective incentive to bar the use of issue linkage and delegation. Little distributional conflict exists, as states are unanimous on alternative and less costly ways of distributing the surplus from full policy coordination, but opportunism remains a threat. Second, in issue areas dominated by a hegemonic state and its allies, the frequency and intensity of distributional conflict depends on the strength of the hegemonic coalition. When it is overwhelming, all states agree on the futility of issue linkage or delegation. When it is vulnerable to challenges by a counterhegemonic coalition, distributional conflict erupts as the hegemon resists initiatives to link issues or delegate decision-making power by other states. Third, under coordination failure or inefficient compromise, all states agree that issue linkage and delegation are useful, especially if they are universal. At the same time, however, different coalitions have incentives to use issue linkage or delegation for opportunistic purposes.

## 6 Conclusion

In this paper, I have shown that the functionalist logic of conventional cooperation theory does not apply to multilateral cooperation. Specifically, I have shown that while such bargaining techniques as issue linkage and delegation are innocuous in bilateral cooperation, they can cause rather than solve collective-action problems in multilateral cooperation. When issue linkage and delegation do not require consent by all bargaining parties and different coalitions of states can use them to opportunistically lock in their preferred policy, the commitment capacity that they create paradoxically effects an endogenous Prisoner's Dilemma. Using these analytical re-

sults, I have derived empirical predictions regarding the preferences that different states have over international institutional designs in different issue areas.

These findings highlight an important difference between bilateral and multilateral cooperation. In the bilateral context, any act of cooperation requires mutual consent by definition. In the multilateral context, an act of cooperation can involve a small number of states that seek to gain an upper hand in the negotiations with the rest of the world. If such cooperative efforts are directed against each other, as rivaling blocs of states compete for influence, the possibility of inefficiency cannot be precluded. This result shows that the complications of international cooperation extend well beyond the normatively troubling implications of cooperation among repressive regimes or the possibility of power politics when international cooperation benefits some states at the expense of others. Unlike bilateral cooperation, multilateral cooperation contains the seeds of outcomes that are unambiguously detrimental by any reasonable normative or positive metric of welfare.

This paper focuses on issue linkage and delegation for reasons of parsimony and analytical tractability, but the general applicability of the analytical thesis is not difficult to see. The problem is not the coordination function that both issue linkage and delegation perform, but the commitment capacity that is necessary to bring about and enforce the resulting settlement. This commitment capacity, commonly seen as a necessary condition for peace and prosperity in political theory, creates opportunistic incentives that result in acts of cooperation that hurt everyone involved. This is only possible in multilateral cooperation, and any bargaining technique that builds commitment capacity without universal consensus has the potential to bring about the collective-action failure.

The analysis opens avenues for future research, theoretical and empirical. Theoretically, the disconnect of bilateral and multilateral cooperation suggests fruitful extensions and consequential qualifications to the functionalist core of conventional cooperation theory. I have limited attention to the problem of policy coordination, and it is important to examine other issues such as incomplete information and endogenous enforcement in the multilateral context.<sup>49</sup> When can one conduct a logically coherent and empirically plausible analysis of international cooperation and institutions without abandoning the tremendous predictive power of functionalism? Which multilateral cooperation problems are comprehensible without a higher-order analysis of the potentially detrimental consequences of international cooperation? When

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<sup>49</sup>For promising recent theoretical research, see Barrett 1994; Gilligan 2004.

should one consider power politics following Krasner and Gruber?<sup>50</sup> And most importantly, when should we open the Pandora's box of metalevel international cooperation to avoid inefficiencies caused by international cooperation?

Empirically, the claims that I have made should be subjected to intense scrutiny. Are certain issue areas, such as multilateral trade negotiations, particularly vulnerable to opportunism? Are international institutions central to the implementation of issue linkage and delegation, and how important is the higher-order distributional conflict in international institutional design? How do states structure multilateral negotiations to avoid suboptimal outcomes? The model that I have analyzed offers a basis for examining these questions empirically.

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<sup>50</sup>Gruber 2000; Krasner 1991.



## Appendix

### Coalition-Proof Nash Equilibrium

The following definition is based on Bernheim, Peleg and Whinston 1987. In a single-player game, a strategy vector  $s_1^*$  is a coalition-proof Nash equilibrium if and only if it maximizes  $u_1$ , where  $u_1$  is the payoff for the single player.

Let the set of players  $N$  be non-singleton and suppose coalition-proof Nash equilibrium is well-defined for all reduced games with fewer than  $N$  players. Then

1. For any game in which the set of players is  $N$ , strategy vector  $s_N^*$  is **self-enforcing** if and only if  $s_J$  is a coalition-proof Nash equilibrium for any  $J \subsetneq N$  when  $s_{N \setminus J}^*$  is fixed.
2. For any game in which the set of players is  $N$ , strategy vector  $s_N^*$  is a **coalition-proof Nash equilibrium** if it is self-enforcing and there is no other self-enforcing strategy vector  $s_N^{**}$  such that  $u_i(s_N^{**}) > u_i(s_N^*)$  for all  $i \in N$ .

To allow random selection, assume the players have access to a public randomization device.

For the concept of subgame-perfect coalition-proof Nash equilibrium, see the definition of “Perfect Coalition-Proof Nash equilibrium” in Bernheim, Peleg and Whinston 1987, 10.

### Claim 1

Suppose not. Then there must be coalitions  $\{A, \dots, M\}$  such that  $t_K \neq t_L$  *ex post* for all  $K, L \in \{A, \dots, M\} : K \neq L$ . But by **Assumption 1**, for all  $i \in K$  and  $\lambda \in (0, 1)$ ,

$$\lambda \cdot g_i(1) \cdot u_i(t_K) > g_i(\lambda) \cdot u_i(t_K).$$

With  $u_i$  non-negative and  $g_i$  strictly increasing, it follows that the payoff from randomly selecting any common policy  $t_K$  with probability equal to weight  $w_K$ , is a strict payoff-improvement for any state  $i$  that belongs to any coalition  $L$ :

$$\sum_{K \in \{A, \dots, M\}} w_K \cdot g_i(1) \cdot u_i(t_K) > g_i(w_L) \cdot u_i(t_L),$$

so the claim follows. ■

## Equilibrium Analysis

I find the equilibria presented and conclude the analysis by showing that they exhaust the set of logically possible equilibria.

First, consider pure coordination. Existence is immediate for some parameter values, so consider the claim that all equilibria of the game are probability distributions on efficient common policies. To this end, first suppose there is a coalition-proof Nash equilibrium that fails to prompt full coordination. Then consider a deviation by the grand coalition such that each of the policies  $t_C$  chosen in equilibrium is selected randomly with probability  $w_C$  as a common policy for all  $i \in N$ . By **Assumption 1** and proof of **Claim 1**, this is a strict Pareto-improvement. But by the definition of a pure-coordination equilibrium, this deviation is a coalition-proof Nash equilibrium and therefore self-enforcing, a contradiction.

The other logical possibility is that in a coalition-proof Nash equilibrium, probability is assigned on an inefficient common policy  $t_N$ . But reduce this probability to zero and assign it instead on some efficient lottery. By the definition of a pure-coordination equilibrium, this deviation is itself a coalition-proof Nash equilibrium.

Second, consider hegemony. It is immediate that  $s_C = t^{max}$ . Then consider the remaining players  $N \setminus C$ . By assumption, there is no other policy  $t_{N \setminus C}$  such that any player  $i \in N \setminus C$  would not prefer a deviation by  $N \setminus C$  to  $t^{max}$ . But then  $t^{max}$  is a unique equilibrium, and efficiency follows by noting that it maximizes the payoff to at least one player because it is an ideal point.

Third, consider compromise. The assumption made covers all logically possible deviations, so the claim follows. The possibility of efficiency can be seen by considering a game such that  $g_i(1) \cdot u_i(t_N) > \sum_j \lambda_j g_i(w_C) \cdot u_i(t_j)$  for all coalitions  $C$ , states  $i \in C$ , policies  $t_j$ , and probabilities  $\lambda_j$ . The possibility of inefficiency follows if  $g_i(1) \cdot u_i(t_N) < \sum_j \lambda_j g_i(w_C) \cdot u_i(t_j)$  for all coalitions  $C$ , states  $i \in C$ , some policies  $t_j$ , and some probabilities  $\lambda_j$ .

Consider finally coordination failure. The assumption made covers all logically possible deviations.

Does this analysis exhaust the set of logically possible alternatives? Pure coordination, hegemony, and efficient and inefficient compromise allow full coordination to any common policy. Coordination failure covers all cases in which a common policy is not chosen. ■

### Claim 3

Delegation is a credible pre-game commitment by definition. In equilibrium, issue linkage changes the behavior of states if and only if no member of the relevant bargaining group has an incentive to deviate. Thus, an equilibrium issue linkage can be modeled as a credible pre-game commitment. ■

### Proof of Proposition 1

Fix a coalition-proof Nash equilibrium when  $n = 2$  and suppose issue linkage or delegation reduce the payoff to state  $i$ . By **Definition 5** and **Definition 6**, state  $i$  can deviate by refusing to link issues or delegate, a contradiction. ■

### Proof of Proposition 2

Fix a coalition-proof Nash equilibrium and suppose issue linkage or delegation reduces the payoff to state  $i \in C$ , where  $C$  is the unique bargaining group. By **Definition 5** and **Definition 6**, state  $i$  can deviate by refusing to link issues or delegate, a contradiction. But if  $C = N$ , this applies to all states  $i \in N$ . ■

### Proof of Proposition 3

Consider the necessary condition for existence. If there is no profitable deviation  $s_C$  from any *ex post* outcome  $s_N^j$  or from a Pareto-improvement over it, a reduced payoff to all states is clearly impossible. If there is a profitable deviation  $s_C$  from some *ex post* outcome  $s_N^j$  or from a Pareto-improvement over it achieved through issue linkage or delegation for some coalition  $C$ , but it does not depend on  $s_{N \setminus C}$ , then coalition  $C$  can secure their Pareto-improving payoffs regardless of  $s_{N \setminus C}$ . Thus, in any subgame-perfect coalition-proof Nash equilibrium, their payoff cannot decrease relative to the original coalition-proof Nash equilibrium..

Consider the sufficient condition for equivalence with the set of coalition-proof Nash equilibria. If this condition holds, no probability distribution on policy vectors not Pareto-dominated by the original coalition-proof Nash equilibria is a coalition-proof Nash equilibria. If equilibria exist, they must be Pareto-inferior to all coalition-proof Nash equilibria. ■

### **Proof of Corollary 1**

Under pure coordination or efficient compromise, the equilibrium without issue linkage or delegation is efficient. By **Definition 2**, it cannot be improved upon. ■

### **Proof of Corollary 2**

The payoff that the members  $i$  of the hegemonic coalition can obtain is  $g_i(1) \cdot u_i(1)$ , which is their maximum payoff from the game. It is therefore not possible that another coalition-proof Nash equilibrium resulting from issue linkage or delegation would improve their payoff. ■

### **Proof of Corollary 3**

Let  $C$  be the hegemonic coalition and suppose  $w_C$  approaches unity. Then the maximum payoff to issue linkage or delegation for any state  $i \notin C$  is  $g_i(w_{N \setminus C}) \cdot u_i(s_i) \rightarrow g_i(0) \cdot u_i(s_i) = 0$ . ■

### **Proof of Corollary 4**

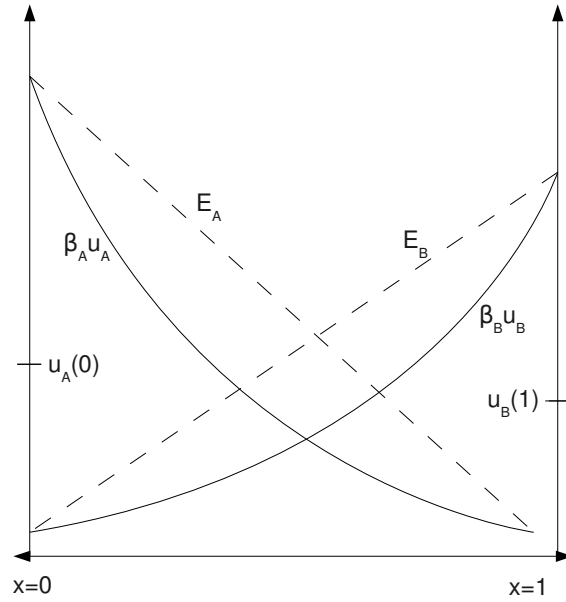
Consider first coordination failure and inefficient compromise, and suppose issue linkage or delegation allow a credible pre-game commitment to all ideal points by all states. Then they can achieve any efficient outcome of the game. If the bargaining group is universal, a state whose payoff decreases can veto issue linkage or delegation. ■

## Tables

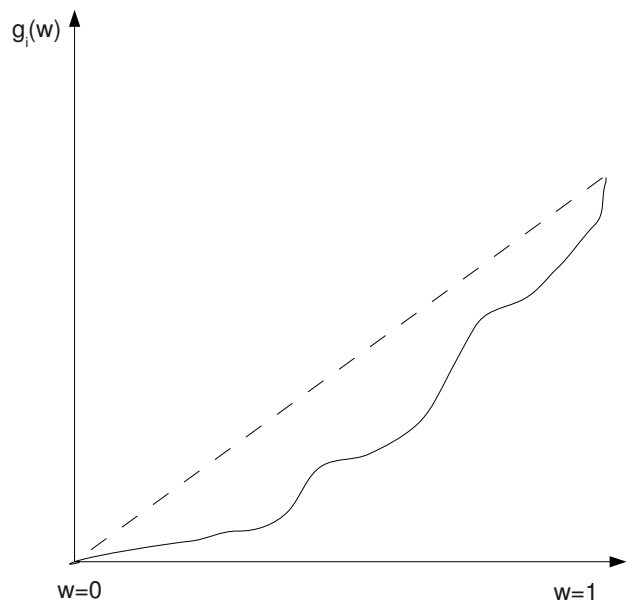
Equilibrium	Multiplicity	Efficiency	Other equilibria?
Full coordination	Possibly	Yes	No
Hegemony	No	Yes	Yes
Efficient compromise	Possibly	Yes	Yes
Inefficient compromise	Possibly	No	Yes
Coordination failure	Possibly	No	Yes

**Table 4.1.** Equilibria without issue linkage or delegation.

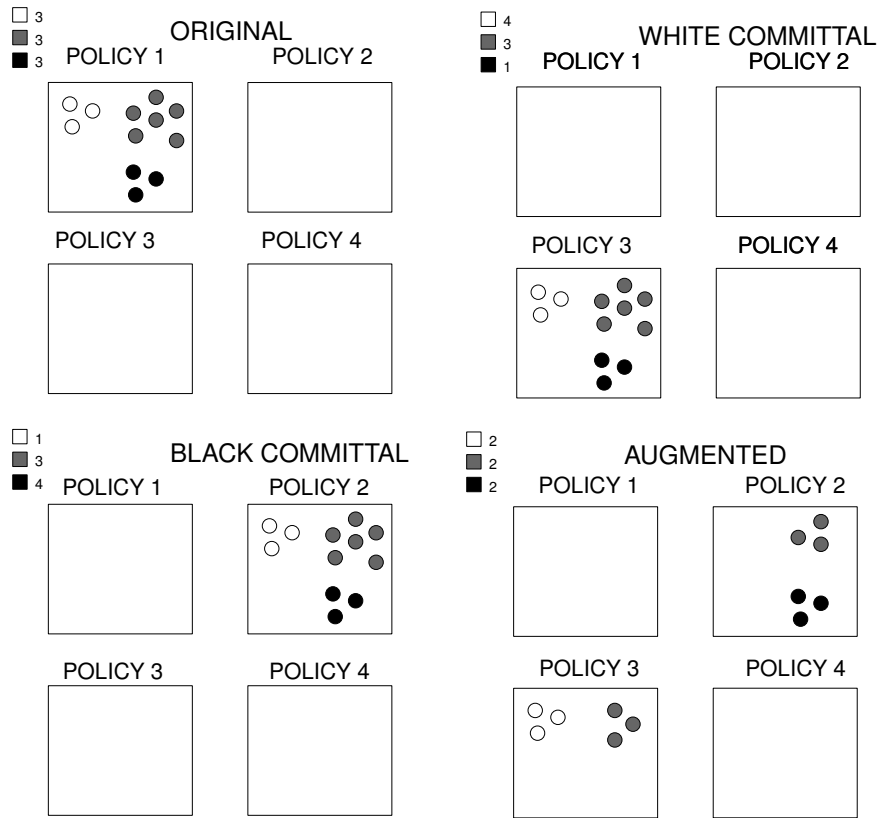
## Figures



**Figure 4.1.** The benefits of random policy selection. The dashed lines represent the payoffs from random selection of either of the ideal points ( $x = 0$  or  $x = 1$ ). States cannot credibly commit to it because if the outcome is unfavorable, both have an incentive to deviate to their ideal point unilaterally for higher payoffs ( $u_A(0)$  or  $u_B(1)$ ).



**Figure 4.2.** The continuous line represents the payoff from policy coordination  $g_i(w)$  as a function of weight  $w$ . The dashed line represents the expected payoff from full coordination,  $w \cdot g_i(1)$ , with probability  $w$ . Since the continuous line is everywhere above the dashed line, all states prefer full coordination with probability  $w$  to partial coordination. It must therefore be the case that in an efficient equilibrium, full coordination occurs *ex post*.



**Figure 4.3.** A multilateral policy coordination game with four policies. In the original coalition-proof Nash equilibrium (upper left), all players obtain a payoff of 3. When issue linkage and delegation are permissible, the augmented coalition-proof Nash equilibrium (lower right) produces an inferior payoff of 2, as the players are split between two policies. When either white or black players, but not both, are the only ones to delegate or link issues, they can credibly commit to their preferred policy (2 or 3); other players follow to avoid coordination failure. This opportunistic incentive destroys the original coalition-proof Nash equilibrium. Both black and white players commit simultaneously to their preferred policies, and the remaining players are split depending on which policy they prefer when partial coordination cannot be avoided. As a result, all players are worse off.



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## Chapter 5

# The Over- and Undersupply of Enforcement Power in International Public Good Provision

### 1 Introduction

If states are to mitigate global warming, combat transnational crime and terrorism, or protect oceanic fisheries, they must negotiate multilateral agreements for international public good provision. The modal multilateral agreement is based on the principle of “issue-specific reciprocity,” which implies that states enforce behavior by conditioning future cooperation on past compliance in that issue area.<sup>1</sup> For example, among the 152 multilateral environmental agreements that Mitchell has coded, 92 involve public good provision. In this subset, only the North American Agreement on Environmental Cooperation (1994), which permits trade restrictions, explicitly authorizes sanctions other than suspension of cooperation.<sup>2</sup> All other agreements in the dataset are based on reciprocity. The most salient multilateral agreements on international public good provision, such as the Kyoto Protocol (1997) or the United Nations Fisheries Agreement (1982), contain no provisions for such sanctions.

The use of reciprocity as a means to enforce compliance with multilateral agreements for international public good provision is puzzling, because reciprocal punishment inflicts collateral damage on the punishers.<sup>3</sup> For example, if states are to enforce

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<sup>1</sup>Keohane 1986.

<sup>2</sup>Mitchell 2002-2008. This agreement was negotiated simultaneously with the North American Free Trade Agreement. Steinberg 1997 analyzes the relationship between trade and the environment in these agreements.

<sup>3</sup>Mitchell and Keilbach 2001. This is so because a reduction in public good provision hurts all parties.

a fisheries agreement through reciprocity, they must punish violations by overfishing, so that the punishers hurt each other in the process. This raises the problem of “renegotiation:” states cannot credibly commit to implementing such a severe and collectively costly punishment.<sup>4</sup> Targeted sanctions through issue linkage, such as trade tariffs, seem a much more effective means to enforce compliance. Each state’s individual incentive to protect its domestic industries and the possibility of targeting the tariffs should produce an effective and credible punishment.<sup>5</sup>

Indeed, the largely dismal history of international public good provision has strengthened the calls for sanctions through issue linkage. These proposals are supported by sound theory, but they have not prompted action by policymakers.<sup>6</sup> In this paper, I investigate the sources of this inaction. Why do policymakers enforce multilateral agreements for international public good provision through reciprocity, instead of including provisions for sanctions through issue linkage?

I adopt a standard model of international public good provision as a repeated game in which states can enforce behavior by threatening punishment in the future. To capture the problem of renegotiation, I require that these threats are supported by a “deterrent coalition” of parties that stand to gain from punishing the deviator.<sup>7</sup> Drawing on Fearon’s seminal work on bargaining and enforcement, I also model the multilateral negotiations on an international agreement that furnishes the public goods.<sup>8</sup> First, I require that all parties expect gains that exceed possibly small negotiation costs. Second, I incorporate power politics in the model by assuming that the provisions of the international agreement are determined by the preferences of a “winning coalition” to which powerful states belong. I use this model to compare reciprocal enforcement with sanctions through issue linkage.

The analysis corroborates the expectation that reciprocal agreements suffer from an *undersupply of enforcement power*. The punishers’ collective incentive to renegotiate agreements that prescribe excessively costly punishment impedes international public good provision. Issue linkage, on the other hand, produces enforcement power because states can target punishments and thus avoid the collective cost. Conditional on reaching an agreement, states can sustain higher levels of public good provision.

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<sup>4</sup>Barrett 2003. In this paper, renegotiation refers to failure to implement a collectively costly punishment. For an analysis of formal renegotiation clauses as flexibility provisions, see Koremenos 2001.

<sup>5</sup>See Downs and Rocke 1995.

<sup>6</sup>Barrett 2003; Limão 2005.

<sup>7</sup>See Barrett 1994.

<sup>8</sup>See Fearon 1998.

The analysis yields counterintuitive theoretical results that provide support for reciprocal enforcement, however. The first central result is that while reciprocity is a less forceful enforcement mechanism than sanctions through issue linkage, it constrains exploitation by powerful states. It prompts a relatively equal distribution of gains, which entices weak states to negotiate. In other words, it permits a credible commitment by powerful states to a distribution of gains that renders cooperation lucrative for weak states. The driving force behind this result is the ensuing tradeoff between increased public good provision and unequal burden sharing. I show that both increased public good provision and exploitation require additional enforcement power. By constraining the supply of this power, reciprocity forces powerful states to choose between public goods and shifting the burden of provision on weak states. This tradeoff functions as a credible commitment mechanism.

The second central result is that if sanctions through issue linkage are on the table, limits to power politics disappear. If states have the power and the incentive to hurt others through targeted sanctions, issue linkage creates an *oversupply of enforcement power*. Powerful states need not exchange unequal burden sharing for increased provision, as increased enforcement power permits the pursuit of both. But weak states anticipate this problem and refuse to negotiate. Enforcement power cannot be separated from power as a vehicle of redistribution, so powerful states endorse reciprocity as a commitment to mutually profitable cooperation.

The analysis has important theoretical implications. Scholars of international cooperation have mostly lamented the lack of enforcement power under anarchy, but power is also a vehicle of redistribution.<sup>9</sup> If states are to take steps towards rule-based international politics, they must simultaneously produce enforcement power and credibly commit to constraining its use. This is a problem of “constitutional design,” not a problem of maximizing enforcement power.<sup>10</sup> Increased enforcement power is only desirable to the extent that it cannot be transformed into power for redistribution. Understanding the complex collective action problems that impede institutional design is not possible unless the dual role of power is acknowledged<sup>11</sup>

Empirically, I apply the theory to international public good provision in the contemporary world economy. First, developing countries’ bargaining power has steadily increased. This increase expands the size of the winning coalition necessary for insti-

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<sup>9</sup>Krasner 1991.

<sup>10</sup>See also Buchanan and Tullock 1962.

<sup>11</sup>This problem was already discussed in the context of domestic politics by classical scholars such as Locke 1980.

tutional design, which limits the role of power as a vehicle of redistribution. Second, the global and multilateral nature of contemporary international trade has eroded the effectiveness of targeted sanctions. Consequently, trade could provide an optimal amount of collective enforcement power for international public good provision as world market integration proceeds. A smoothly functioning world market and uniform world prices reduce states' ability to "hit hard," permitting credible commitment to a more equal distribution of gains.

## 2 A Model of International Public Good Provision

In this section, I introduce a baseline model with four core elements.<sup>12</sup> First, I study international public good provision as a repeated game. Second, I discuss the constraints on equilibria that capture the dual problem of enforcement and renegotiation. Third, I add a costly bargaining stage. Finally, I consider the role of power politics. Throughout, I use a hypothetical international agreement to reduce emissions of a transboundary air pollutant, such as carbon dioxide, as an illustration. The model characterizes a reciprocal agreement, according to which states condition future public good provision on present behavior. It does not contain provisions for sanctions through issue linkage, which I analyze in the following section by augmenting the model.

### 2.1 International Public Good Provision as a Repeated Game

International public goods are produced individually and consumed collectively by states.<sup>13</sup> Individual states incur the production cost but cannot prevent others from consuming the good, which creates a free-rider problem.<sup>14</sup> Scholars of international politics argue that the problem is particularly hard in international cooperation because no centralized authority exists to deter free riding.<sup>15</sup> Hegemonic provision notwithstanding, states must design multilateral institutions to enforce cooperation.<sup>16</sup>

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<sup>12</sup>See the Appendix for a full formalization.

<sup>13</sup>Conybeare 1984.

<sup>14</sup>Olson 1965.

<sup>15</sup>Oye 1986. Indeed, this paper sheds light on the reasons why states refrain from building collective enforcement power.

<sup>16</sup>Kindleberger 1986; Sandler 2004.

Examples of international public goods range from global and regional infrastructure to preserving biodiversity and mitigating global warming.<sup>17</sup>

The problem of international public good provision can be formalized as a repeated game. Let  $N = \{1, \dots, n\}$  be a set of states that repeatedly engage in public good provision. Each state  $i$  chooses a level of public good provision  $q_i^t \in [0, \infty)$  for each time period  $t \in \{0, \dots, \infty\}$ . The payoff from public good provision at time  $t$  is

$$u_i(q_i^t, q_{-i}^t) = b_i \left( \sum q_j^t \right) - c_i(q_i^t), \quad (1)$$

where  $b_i$  ( $c_i$ ) is a twice differentiable, increasing and strictly concave (convex) positive function for all  $i$  such that  $b'_i(\sum q_j^N) = c'_i(q_i^N)$  for some  $q_i^N$ , where  $q_i^N$  is small. The payoff from the repeated game is

$$U_i(q_i, q_{-i}) = \sum_{t=0}^{\infty} \delta^t \cdot u_i(q_i^t, q_{-i}^t), \quad (2)$$

where  $\delta \in (0, 1)$  is the common discount factor. Since the game is stationary, I drop the superscript  $t$  throughout.

This standard model of international public good provision captures two central features of the strategic problem. First, benefits are a function of aggregate provision but each state incurs an individual cost. This is why states have an incentive to free ride. Second, marginal benefits are decreasing but marginal costs are increasing. The demand for additional public good provision is highest when the shortage is acute, and each state is most willing to increase international public good provision when it does not require diversion of substantial resources from domestic consumption. For example, low levels of air pollution only cause inconvenience while high levels set ecosystems and human health under great stress. States are also often willing to collect the low-hanging fruit of improved production efficiency to reduce air pollution but hesitant to risk slower economic growth or higher levels of unemployment through extensive regulation.

Consider two benchmarks for the analysis.<sup>18</sup> First, in the unique *Nash equilibrium*  $q^N$  of the stage game, each state matches individual marginal costs with individual marginal benefits. Having set  $b'_i(\sum q_j^N) = c'_i(q_i^N)$ , where  $q_i^N$  is close to zero, in the Nash equilibrium states free ride by providing few public goods. This ensures that the game has the structure of a Prisoners' Dilemma, as is conventional in international cooperation theory. Second, in the unique *collective optimum*  $q^K$  of the stage

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<sup>17</sup>Sandler 2004; Stern 2006.

<sup>18</sup>Helm and Sprinz 2000.



game, each state matches individual marginal costs with collective marginal benefits:  $\sum b'_j(\sum q_j^K) = c'_i(q_i^K)$ . In public good provision, the Nash equilibrium is suboptimal, which creates a collective action problem. Figure 5.1 illustrates.

[FIGURE 5.1 ABOUT HERE]

## 2.2 Enforcement and Renegotiation

An international agreement for public good provision must be self-enforcing.<sup>19</sup> On the one hand, states must threaten severe enough punishment upon deviation to deter free riding by any individual state. On the other hand, the punishers must credibly commit to implementing the threatened punishment. Consider the two conditions in turn.

First, states can enforce higher levels of public good provision in repeated interaction only if they credibly deter free riding by threatening sufficiently severe punishment in the future. In the context of international public good provision, such punishment can be thought of as a “penal code.”<sup>20</sup> Suppose state  $i$  violates the international agreement by providing fewer public goods than it should. Then other states perceive the violation and punish the defector by also providing fewer public goods. The defector can restore cooperation by complying with the punishment through a higher level of public good provision, but any deviation during the punishment restarts it.<sup>21</sup> If any other player  $j \neq i$  defects during the punishment period, it is punished.

**Definition 1.** An *agreement* is a collection of  $n$ -coordinate vectors  $\{q^*, q^1, \dots, q^n\}$  and the following transition rule:

1. At time  $t = 0$ , begin playing  $q^*$  until some player  $i$  deviates.
2. If  $q_i \neq \hat{q}_i$  at time  $t$ , where  $\hat{q}_i$  is the prescribed action at time  $t$ , play  $q^i$  for  $T$  periods from time  $t + 1$ .

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<sup>19</sup>Axelrod and Keohane 1985.

<sup>20</sup>Abreu 1988.

<sup>21</sup>To reduce notation, the length of the punishment period  $T$  is constant across players. This assumption is empirically plausible, as international agreements rarely contain enforcement provisions tailored for individual states. The assumption is not necessary to derive the analytical results.

3. If no player  $j$  deviates from  $q_j^i$  during these  $T$  periods, begin playing  $q^*$  until some player  $k$  deviates.

To save space, I abuse notation by writing  $q^*$  instead of  $\{q^*, q^1, \dots, q^n\}$  when there is no danger of confusion.

An agreement is *subgame-perfect* if the following inequalities hold: for all  $i, k$  and  $q_i, q_k$ ,

$$\sum_{t=0}^T \delta^t \cdot u_i(q_i^*, q_{-i}^*) \geq u_i(q_i, q_{-i}^*) + \sum_{t=1}^T \delta^t \cdot u_i(q_i^i, q_{-i}^i), \quad (3)$$

$$\sum_{t=0}^{T-1} \delta^t \cdot u_k(q_k^i, q_{-k}^i) + \delta^T \cdot u_k(q_k^*, q_{-k}^*) \geq u_k(q_k, q_{-k}^i) + \sum_{t=1}^T \delta^t \cdot u_k(q_k^i, q_{-k}^i). \quad (4)$$

Equation (3) ensures that no state has incentive to defect. Equation (4) ensures that no state has an incentive to deviate from the penal code. Consider the example of transboundary air pollution. An international agreement supported by a penal code would prescribe a certain upper bound for emissions. If any party to the agreement defected by emitting more, the agreement would (partially) suspend cooperation until the deviator had compensated the other states by providing more than its share of the public good. If the cost of suspension was sufficiently high, defection would not be profitable.

Second, if states are to credibly threaten punishment, they must be willing to implement it, or a potential defector simply calls the bluff. This problem of renegotiation is severe in international public good provision, because punishing a deviator by temporarily suspending cooperation inevitably hurts third parties. Such punishment is only credible if states have no incentive to “forgive” a defection by immediately renegotiating the agreement to restore cooperation.

In the context of transboundary air pollution, the problem can be illustrated as follows. Suppose states sign an international agreement supported by a penal code, but three months later one of the states increases its emissions. The agreement requires that cooperation be suspended for six months to punish the defector. The other parties now face a dilemma. If they ignore the deviation, the agreement is not credible. If they suspend cooperation, they cause damage to each other by increasing their emissions.

How should the collective incentive to restore cooperation be formalized?<sup>22</sup> Sup-

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<sup>22</sup>In general, scholars have proposed various definitions of renegotiation-proofness. Following Barrett 1994, my definition is closest to that proposed by (Farrell and

pose the states consider a punishment prescribed by an international agreement. Does a sufficiently powerful coalition of states form to defend the punishment against calls to renegotiate?

**Definition 2.** An agreement  $q^*$  is *renegotiation-proof* if, upon deviation by any state  $i$ , each member  $k \neq i$  of an exogenous *deterrent coalition*  $D_i$  prefers the penal code  $q^i$  to restoring cooperation  $q^*$ .

Specifically, the following inequality must hold for each state  $i$  and  $k \in D_i$ :

$$u_k(q_k^i, q_{-k}^i) \geq u_k(q_k^*, q_{-k}^*). \quad (5)$$

This definition implies that upon defection, some states with enough bargaining power should have an incentive to implement the specified punishment.<sup>23</sup> In inequality (5), the left-hand side represents their payoff during the punishment period, while the right-hand side represents their payoff during cooperation. If the left-hand side is higher, they have no incentive to ignore the deviation.

This definition is fairly general and does not depend on the identity of the deterrent coalition. The advantage of this approach is that it applies regardless of the specific decision-making rules, formal or informal.<sup>24</sup> If any state can veto the punishment, for example, one can simply assume that almost all states must be in the deterrent coalition. Substantively, it seems plausible that the deterrent coalition should include major actors such as the United States and the European Union unless they are being punished. For example, if China defects, renegotiation-proofness might require a tacit transatlantic agreement on suspending cooperation. If either the United States or the European Union suffer from the punishment, perhaps due to high vulnerability to air pollution, they cannot credibly threaten to increase their emissions sufficiently to punish China.

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Maskin 1989).

<sup>23</sup>Each deterrent coalition is exogenous, so that its members are irreplaceable “veto players” (Tsebelis 2002), for analytical tractability. Endogenous deterrent coalitions do not compromise the analytical results below, because renegotiation-proofness ultimately constrains the deterrent coalition that results from any coalition-formation process.

<sup>24</sup>Maggi and Morelli 2006.

## 2.3 Costly Bargaining

If states are to cooperate on international public good provision, they must first negotiate a multilateral agreement. As Fearon forcefully argues, the bargaining stage interacts with enforcement.<sup>25</sup> Moreover, Chayes and Chayes investigate salient multilateral negotiations and find that they often span multiple years and involve hundreds of meetings, which suggests that the negotiations were not trivial.<sup>26</sup>

The purpose of an international agreement is to codify the rules of interaction. These rules often concern dispute resolution mechanisms, monitoring, and sanctions.<sup>27</sup> By formalizing the rules, states reduce uncertainty and transaction costs.<sup>28</sup> As Morrow argues, international agreements promote stable expectations and help states form “common conjectures” regarding the consequences of compliance and non-compliance.<sup>29</sup> Common conjectures are necessary to sustain cooperation because the deterrent effect of penal codes is based on expectations. In principle, states could establish international cooperation informally, but the process is highly precarious.

International agreements are costly to negotiate. States incur at least two sorts of costs. First, transaction costs refer to concrete expenditures such as assigning lawyers and diplomats to preparatory work. These costs can be substantial when negotiations last multiple years and require extensive legal and technical expertise.<sup>30</sup> Second, states must expend political capital to strike acceptable bargains with other states and domestic interest groups.<sup>31</sup> The political survival of a government depends on skillfully balancing interest groups’ demands, which is a tall order for an international agreement with substantial economic or political consequences.

Costly negotiation has an important implication for international cooperation: states engage in negotiations only if they expect gains that exceed the negotiation costs. For example, the Third World coalition operating under the auspices of the *G77* has in multiple instances refused to negotiate because developing countries fear that their voice will not be heard.<sup>32</sup> Many developing countries have limited financial and administrative capacity that they cannot waste in negotiations that are unlikely to produce concrete benefits.

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<sup>25</sup>Fearon 1998; see also Blaydes 2004.

<sup>26</sup>Chayes and Chayes 1995.

<sup>27</sup>Koremenos, Lipson and Snidal 2001.

<sup>28</sup>Abbott and Snidal 2000.

<sup>29</sup>Morrow 2002.

<sup>30</sup>Abbott and Snidal 2000; Koremenos 2005.

<sup>31</sup>Putnam 1988.

<sup>32</sup>Najam 2005.

Costly negotiation can be formalized as follows:

**Definition 3.** For each state  $i$ , fix a strictly positive negotiation cost  $z_i$ . An agreement  $q^*$  is *negotiable* if each state  $i$ 's individual gain exceeds the negotiation cost  $z_i$ .

Negotiability is particularly important in international public good provision. If some states opt out, they can free ride on provision by others. This is troubling because such agreements are inefficient and unlikely to gain political acceptance. If full participation is impossible, the prospects for effective public good provision are dim.<sup>33</sup> Formally, agreement  $q^*$  is negotiable if the following inequality holds for all  $i$  and  $z_i$ :

$$u_i(q_i^*, q_{-i}^*) - u_i(q_i^N, q_{-i}^N) \geq (1 - \delta) \cdot z_i. \quad (6)$$

Now suppose the collective optimum  $q^K$  cannot be enforced. If an agreement  $q^*$  is a subgame-perfect, renegotiation-proof, and negotiable equilibrium, it is a plausible outcome because states are willing to incur the bargaining cost and the resulting path of play is self-enforcing. For analytical clarity, it is useful to single out a *maximal feasible agreement*  $q^F$ , where  $q_i^N < q_i^F < q_i^K$  for all  $i$ , that maximizes utility  $u_i(q^*)$  subject to the three constraints outlined above.

A focus on this “utilitarian” solution is useful for three reasons. First, it conveys strong intuition on the tradeoffs that states face in international public good provision. Second, it is normatively appealing because it maximizes social welfare. Finally, it is a strict upper bound for equilibrium public good provision. In the case of transboundary air pollution, a maximal feasible agreement would minimize loss of human life, harm to ecosystems, and detrimental economic consequences subject to the constraints introduced above.

## 2.4 Power Politics

Consider finally the role of power politics in international cooperation.<sup>34</sup> On the one hand, states can use power to enforce behavior. For example, a powerful coalition of industrialized states can threaten to hurt a developing country that refuses to reduce

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<sup>33</sup>If some states are deemed irrelevant for international public good provision, one can simply remove them from the set of players and proceed without any loss of essential insight. The results hold regardless of the number of states as long as the model is multilateral.

<sup>34</sup>Krasner 1991.

air pollution. On the other hand, states can use power to redistribute the cost of international public good provision. The coalition of industrialized states could also shift the burden of provision on developing countries by refusing to provide financial and technological assistance.

To model power politics in multilateral cooperation, two aspects of power should be addressed. First, sovereign states can exit international agreements.<sup>35</sup> The exit option is a *de facto* standard, because explicit coercion is rarely feasible in international cooperation, and a *de jure* standard in a system of sovereign states. It is an important determinant of individual bargaining power because it specifies the minimum payoff that a state must accept, and shields it against exploitation by enabling a credible threat of reversion to *status quo*. This aspect of power is incorporated in the model because each state can choose to deviate permanently.<sup>36</sup>

Another central aspect of power in multilateral cooperation is coalition formation.<sup>37</sup> If many states are involved in the negotiations, it is unlikely that any individual state wields sufficient power to unilaterally dictate the terms of the agreement. Instead, states seek allies and form coalitions to promote common interests. This process often takes the form of informal bargaining among powerful states that ultimately present a “take it or leave it” offer to other negotiators.<sup>38</sup> Consequently, powerful states try to find an agreement that maximizes their payoff subject to the exit options that weak states have.

To formalize these aspects of power politics, assume throughout that each state is either “weak” or “powerful:”

**Definition 4.** Let the exogenous coalition  $C \subset N$  be the *winning coalition* and let  $D_i \subset C$  for all  $i$ . States  $i \in C$  are *powerful*. States  $i \notin C$  are *weak*.

Define now the effect of power politics on an international agreement for public good provision:

**Definition 5.** The *winning agreement*  $\{q^C, q^1, \dots, q^n\}$  is Pareto-efficient for powerful states in the set of subgame-perfect and renegotiation-proof agreements such that  $u_i(q^C) \geq u_i(q^F)$  for all  $i \in C$ .

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<sup>35</sup>Keohane 1984.

<sup>36</sup>This characterization is partial, however, because it does not allow alternatives to international cooperation.

<sup>37</sup>Zartman 1994.

<sup>38</sup>Gruber 2000.

The “winning coalition” comprises all states that have bargaining power.<sup>39</sup> These states are powerful and have a say in the negotiations, so the resulting “winning agreement” is an international agreement that reflects their interests. The winning agreement must be on the Pareto-frontier for the members of the winning coalition, because otherwise they could improve their payoff by negotiating another international agreement. A simplifying assumption is that the members of a deterrent coalition are members of the winning coalition. This is substantively plausible because the determinants of bargaining and renegotiation power are most likely highly correlated.

The example of transboundary air pollution is again illustrative. Suppose that the United States, the European Union, and Japan form the winning coalition. A winning agreement reflects the interests of these three actors, who only consider the interests of the rest of the world to prevent the latter’s exit. For example, the representatives of these three states could bargain informally and then present a “take it or leave it” proposal in the formal negotiations to other states. As long as this proposal does not directly hurt the rest of the world, they have no reason to turn it down. Thus, these states have bargaining power only through the threat of exit.<sup>40</sup>

This modeling technique has two elements worth elaboration. First, the membership of the winning coalition is unidentified. It seems plausible that major powers with substantial capabilities should belong to it, but I have chosen the most general approach to ensure that the results do not depend on *ad hoc* assumptions regarding the covariates of power.<sup>41</sup> For empirical applications, such assumptions are necessary to identify the winning coalition, but the theoretical results do not depend on the specific sources of power. *Inter alia*, the winning coalition could be the United States and its closest allies in the aftermath of the Second World War, a supermajority in the European Union, or any combination of major and minor powers. Its membership could depend on formal decision-making rules, but in most international applications *de facto* bargaining power is more relevant.<sup>42</sup>

Second, the distinction between the winning coalition and the rest of the world is a stark one. It might be more plausible to assume that bargaining power varies continuously across all states, and some of them have very little of it, but the simple

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<sup>39</sup>The winning coalition is exogenous for analytical tractability. The analysis can be extended by endogenizing the coalition-formation process, because the results below can be derived from equilibrium behavior after the winning coalition has formed.

<sup>40</sup>See Hirschman 1970.

<sup>41</sup>Baldwin 1979 discusses the difficulties involved with estimating power.

<sup>42</sup>See Maggi and Morelli 2006.

formulation allows precise and tractable analytical results.<sup>43</sup> Empirically, an illuminating example is the Green Room of the multilateral GATT/WTO trade negotiations.<sup>44</sup> In the Green Room, major powers have negotiated the key provisions of multilateral trade agreements and then presented them to the rest of the world, which has infuriated weak states in the developing world.<sup>45</sup>

### 3 Reciprocity, Sanctions, and Power Politics

I now compare two strategies for multilateral cooperation: reciprocity and sanctions. Recall that in a reciprocal agreement, states condition future public good provision on past compliance with the agreement. To the contrary, if states permit sanctions through issue linkage, they institutionalize a collective response to non-compliance that is potentially much stronger than simple reciprocity. The analysis yields the central analytical results of this paper. On the one hand, a “strong” international agreement that permits sanctions allows greater public good provision than a “weak” international agreement based on reciprocity. However, weak states refuse to participate in negotiations when sanctions are on the table because strong international agreements allow extensive redistribution.

#### 3.1 Reciprocity

The modal international agreement involves *issue-specific reciprocity*, or reciprocity for brevity. A reciprocal agreement embodies two central standards: “mutual gain” and “contingency.”<sup>46</sup> Both standards reflect the preconditions for cooperation in an “anarchic” system of sovereign states.<sup>47</sup> States sign agreements that benefit all parties and enforce them by reciprocity, which can be defined as conditioning future cooperation on past compliance with mutually set rules.<sup>48</sup> For example, in a typical bilateral

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<sup>43</sup>See Krasner 1991. Gilligan 2004 uses a similar technique but assumes that a single proposer is chosen randomly.

<sup>44</sup>Steinberg 2002.

<sup>45</sup>Narlikar 2003. Recently, the increased bargaining power of key developing countries has changed the nature of multilateral trade negotiations, as the failure to reach an agreement in the Doha Round illustrates.

<sup>46</sup>Keohane 1986.

<sup>47</sup>Oye 1986.

<sup>48</sup>Mitchell and Keilbach 2001.



trade agreement both parties commit to reducing tariffs conditional on compliance with the rules of the agreement, but the agreement does not permit the use of force to punish non-compliance.

The principle also applies to multilateral agreements on international public good provision. For example, in the dataset provided by Mitchell on 152 multilateral environmental agreements, 92 observations involve public good provision, but only the North American Agreement on Environmental Cooperation (1994) explicitly authorizes trade sanctions. States simply condition future public good provision on past compliance.<sup>49</sup> In these and other multilateral agreements, by far the most common punitive consequence is the reciprocal suspension of cooperation. This is so to the extent that in most cases, provisions for dispute resolution are absent or voluntary.<sup>50</sup> Finally, the evidence does not support the existence of tacit issue linkages. For instance, studies of international trade restrictions as a means to enforce environmental protection consistently emphasize the weakness of the linkage.<sup>51</sup>

The extension of reciprocity from bilateral to multilateral cooperation is surprising. As Axelrod and Keohane write, multilateral cooperation is difficult to enforce if punishments cannot be targeted, a problem that is always present in international public good provision.<sup>52</sup> This is the essence of renegotiation: punishments that are too costly for the punishers are not credible.

To understand the relationship between reciprocity and renegotiation in international public good provision, suppose that states sign and ratify the maximal feasible agreement  $q^F$  or the winning agreement  $q^C$  under reciprocity:

**Proposition 1.** In the maximal feasible agreement  $q^F$  and in the winning agreement  $q^C$ ,

1. Equation (3) or equation (4) is binding with equality for some states  $i, k$ ;
2. Equation (5) is binding with equality for some states  $i, k$ .

These findings are central to understanding multilateral cooperation under reciprocity. They convey the problem of balancing between severe punishments and renegotiation-proofness, which sets an upper bound for the severity of these punishments. First, if states are to maximize social welfare or the payoff to the powerful states, they must

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<sup>49</sup>Mitchell 2002-2008.

<sup>50</sup>Boockmann and Thurner 2006.

<sup>51</sup>Biermann 2001; Esty 2001; Steinberg 1997.

<sup>52</sup>Axelrod and Keohane 1985.

choose the most severe punishment possible. If defectors are not subjected to the most severe punishment, states can always marginally increase international public good provision without violating renegotiation-proofness. In the maximal feasible agreement, they do so for all states. In the winning agreement, the powerful states impose additional demands on weak states.

Second, if renegotiation is not relevant for punishing any state, they can always increase the severity of punishments and thus increase each state's public good provision. They can choose a more severe punishment without undermining its credibility because even the new punishment is preferable for a deterrent coalition. The maximal feasible agreement and the winning agreement are thus always on knife's edge. If it was not for renegotiation under reciprocity, states could increase public good provision. Consequently, reciprocal agreements suffer from an *undersupply of enforcement power*.

Reciprocity hinders the pursuit of efficiency by constraining the supply of enforcement power, but how does it interact with power politics? By focusing on powerful states' interests, as opposed to assuming the existence of a benevolent social planner, the nature of the tradeoff changes. In a maximal feasible agreement, states maximize their collective payoff. In a winning agreement, powerful states can also improve their payoff by choosing their preferred level and shifting the burden of provision to weak states. However, this shift is limited by reciprocity:

**Proposition 2.** Consider a winning agreement  $q^C$  in which the powerful states  $j \in C$  provide public goods according to  $\{q_j^C\}_{j \in C}$ . The aggregate level of public good provision  $\sum_{i \notin C} q_i^C$  by weak states  $i \notin C$  is maximal subject to subgame-perfection and renegotiation-proofness.

**Proposition 2** conveys important intuition. The ability of powerful states to exploit weak states by shifting the burden of international public good provision on them is constrained by reciprocity. They cannot secure abundant supply and free ride on provision by the weak states only. This tradeoff can be severe because renegotiation prevents drastic punishments, such as a permanent and total suspension of cooperation upon deviation. These punishments are necessary because exploitation maximizes the incentive to deviate.

As a specific illustration, consider public good provision  $q_i^C$  in the winning agreement by any state  $i$  for which subgame-perfection or renegotiation-proofness is binding in the maximal feasible agreement  $q^F$ :

**Proposition 3.** If subgame-perfection (3 or 4) or renegotiation-proofness (5) is binding with equality in the maximal feasible agreement  $q^F$  for states  $i, k$ , one of the following must hold:

1. The aggregate level of public good provision  $\sum q_j^C$  in the winning agreement is lower than the aggregate level of public good provision  $\sum q_j^F$  in the maximal feasible agreement.
2. The level of public good provision by state  $i$  is lower in the winning agreement ( $q_i^C$ ) than in the maximal feasible agreement ( $q_i^F$ ).

When public good provision by a weak state is barely enforceable in the maximal feasible agreement, the powerful states must choose between reducing public good provision or limiting exploitation of that weak state.

If reciprocity limits the use of power, as these propositions show, why do powerful states endorse the principle? One would expect powerful states to vigorously promote international institutions and principles that permit unconstrained use of power. To promote their interests, powerful states should initiate multilateral negotiations that permit strong sanctioning mechanisms without expectation of reciprocity. By circumventing the problem of renegotiation, they could ostensibly impose an unequal distribution of gains. The analysis yields an important result:

**Proposition 4.** Any winning agreement is negotiable under reciprocity for some negotiation costs  $z = (z_1, \dots, z_n)$ .

Multilateral agreements for international public good provision always produce non-negligible gains for all participants under reciprocity. Although weak states expect that powerful states dominate the negotiations, they never fully discount the benefits. If the powerful states attempt to exploit them by demanding unreasonable levels of provision, they can simply defect. Under reciprocity, the powerful states cannot carry out a punishment that would leave the defector worse off than without any cooperation at all, so any international agreement for public good provision that does not produce gains for all signatories is unenforceable. While reciprocity rules out explicit coercion, it also dictates a relatively equal distribution of gains because it precludes exploitative international agreements that are not negotiable. In other words, reciprocity prevents the *oversupply of enforcement power*.

In the case of transboundary air pollution, a reciprocal agreement rarely achieves the collective optimum. Renegotiation sets an upper bound for the severity of punishment, so states cannot credibly commit to optimal emissions reductions. However, the reciprocal agreement also ensures that weak states who do not belong to the winning coalition have an incentive to incur the cost of entering the negotiations. Although they have little say in the actual negotiations, the undersupply of enforcement power helps them avoid excessively stringent requirements and possibly even secure financial and technological assistance. If they expect a reciprocal agreement and the negotiation cost is not prohibitive, their payoff from designing the agreement is positive. For powerful states, reciprocity is essentially a commitment device.<sup>53</sup> Powerful states cannot generally commit to not using power, so they must find other means of enticing weak states to negotiate. By endorsing reciprocity, they constrain the supply of enforcement power, which limits redistribution.

This raises the question how powerful states can credibly commit to reciprocity. To be sure, promises of reciprocity are incredible in many contexts in which overt power politics prevail. However, both theoretical and empirical reasons exist to expect this is often not the case. Theoretically, powerful states can benefit from a reputation for keeping promises when coercion is costly, so that it is better to secure voluntary cooperation by weak states.<sup>54</sup> For example, Keohane gives multiple examples of “diffuse reciprocity” as a means to sustain cooperation in international politics.<sup>55</sup>

Empirically, a good example of a major issue area in which powerful states have refrained from coercion despite their inability to design optimal institutions is international environmental politics. As Najam argues, negotiations over global environmental institutions have made only slow progress over the last three decades.<sup>56</sup> Despite strong political pressure to achieve results, powerful industrialized countries have kept their promise to continue negotiating on reciprocal terms and refrained from applying extensive sanctions.<sup>57</sup> Instead of imposing their preferred policies on developing countries, industrialized countries have over time acknowledged underdevelopment as a cause of environmental degradation; recognized national sovereignty as a key principle of natural resource management; and accepted stringent constraints on the trade-environment linkage.<sup>58</sup> These concessions show that even powerful indus-

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<sup>53</sup>See Schelling 1960 for commitment problems.

<sup>54</sup>See Sartori 2002 for modeling reputations in repeated games.

<sup>55</sup>Keohane 1986. See also Tomz 2007.

<sup>56</sup>Najam 2005.

<sup>57</sup>Rowland 1973; Williams 1993.

<sup>58</sup>Ivanova 2007; Miller 1995; Steinberg 1997; Williams 2005.

trialized countries have preferred limited voluntary cooperation to explicit coercion.

## 3.2 Sanctions

The weak enforcement of reciprocal agreements has prompted a substantial literature on sanctions through issue linkage for enforcement purposes. The central proposition of this literature is that issue linkages can provide additional enforcement power and resolve the problem of renegotiation by enabling targeted punishments.<sup>59</sup> If multilateral public good provision is linked to bilateral cooperation, states can enforce behavior by threatening to suspend bilateral as opposed to multilateral cooperation. This suspension does not prompt renegotiation, because it produces no collateral damage.

The concept of sanctions here differs from that in the broad empirical literature on economic sanctions as a tool of foreign policy against adversaries in two ways.<sup>60</sup> First, while the literature emphasizes the incredibility and ineffectiveness of sanctions that a state actually has imposed, I focus on threats that states use to deter free riding and rarely if ever actually have to implement.<sup>61</sup> Indeed, this focus is empirically warranted. For example, Drezner finds that “significant number of coercion attempts end at the threat stage, before sanctions are imposed. These cases yield significantly larger concessions when compared to instances in which sanctions are imposed ... [e]conomic coercion is a more useful tool than the conventional wisdom believes.”<sup>62</sup>

Second, I require that the sanctions be self-enforcing in that the sender benefits from imposing them. In the empirical literature on economic sanctions, they often carry domestic political and economic costs for the sender. Here, I exclude such sanctions exactly because they are not credible. Instead, I focus on self-enforcing sanctions such as trade restrictions that domestic interest groups desire.<sup>63</sup>

To analyze the impact of sanctions on international public good provision, I augment the model by adding pairwise Prisoner’s Dilemmas for each pair of states. In this setting, states simultaneously negotiate bilateral and multilateral cooperation subject to restrictions that I introduce below. Formally, each state  $i$  also chooses a

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<sup>59</sup>Abrego et al. 2001; Axelrod and Keohane 1985; Barrett 2003; Leebron 2002; Limão 2005; Lohmann 1997.

<sup>60</sup>Baldwin 1986; Drezner 2000, 2003; Martin 1993.

<sup>61</sup>See Schelling 1960.

<sup>62</sup>Drezner 2003, 645.

<sup>63</sup>For models of politically motivated protectionism, see Downs and Rocke 1995; Grossman and Helpman 1994.

bilateral action  $s_{ij} \in \{C, D\}$  for each other state  $j \neq i$ . The payoff from the stage game is given by the conventional  $2 \times 2$  matrix:<sup>64</sup>

[FIGURE 5.2 ABOUT HERE]

Here,  $\beta_i > \alpha_i > 0 > \gamma_i$  for all  $i$ . The Nash equilibrium of the Prisoner's Dilemma is  $(s_{ij}^N, s_{ji}^N) = (D, D)$  and the collective optimum is  $(s_{ij}^K, s_{ji}^K) = (C, C)$ . The one-stage payoff from the augmented game is

$$\tilde{u}_i(q_i, q_{-i}, s_i, s_{-i}) = b_i \left( \sum_{j \neq i} q_j \right) - c_i(q_i) + \sum_{j \neq i} v_{ij}(s_{ij}, s_{ji}), \quad (7)$$

where  $v_{ij}(s_{ij}, s_{ji})$  is the payoff from the Prisoner's Dilemma. The pairwise Prisoner's Dilemmas are payoff-independent for analytical simplicity, which is a weak assumption regarding the consequences of coordinated sanctions.<sup>65</sup>

In the context of transboundary air pollution, these bilateral Prisoner's Dilemmas could represent bilateral trade relations. States could include a provision that permits the imposition of trade restrictions on a range of goods and services if a state increases its emissions beyond the level prescribed in the agreement. In such a situation, other states impose restrictions depending on domestic consequences and the defector is to comply with them to restore cooperation. These targeted punishments do not hurt third parties, which removes the problem of renegotiation.

Sanctions through issue linkage are most effective when they provide "slack enforcement power."<sup>66</sup> Slack enforcement power is present when states can sustain optimal cooperation in *another* issue area without linkages.<sup>67</sup> States can then "transfer" some enforcement power from that other issue area by threatening simultaneous punishment across issues upon deviation. For example, if a reciprocal punishment through reduced public good provision does not deter deviation, states could threaten trade sanctions. If the threat is credible, the linkage contains slack enforcement power in the form of trade sanctions. The amount of slack enforcement power depends on the most severe trade sanction that the punisher can credibly threaten to implement.

An agreement with sanctions through issue linkage is a vector  $(q^*, s^*)$  supported by a  $T$ -period penal code  $(q^i, s^i)$  for each state  $i$ . Subgame-perfection, renegotiation-

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<sup>64</sup>In a working paper, I consider Prisoner's Dilemmas in continuous strategies. All results continue to hold.

<sup>65</sup>Drezner 2000.

<sup>66</sup>Bernheim and Whinston 1990; Lohmann 1997.

<sup>67</sup>See the Appendix for a formalization.

proofness, and negotiability extend trivially to a linked agreement. I assume throughout that slack enforcement power is present for each pair in bilateral cooperation, so that states can sustain the collective optimum  $s_{ij}^K$  using the renegotiation-proof punishments  $(C, D)$  and  $(D, C)$ .<sup>68</sup> Issue linkages sometimes provide enforcement power without this assumption, but the analysis of such situations requires a considerably more complex model.<sup>69</sup>

For present purposes, slack enforcement power is particularly important because punishment in a pairwise Prisoner's Dilemma does not cause collective damage. Issue linkages should be doubly effective when renegotiation is a concern. This is indeed the case:

**Proposition 5.** Let  $q^F$  be the maximal feasible agreement under reciprocity. With sanctions through issue linkage, there exists a welfare-increasing, subgame-perfect, and renegotiation-proof agreement  $q^*$  such that  $q_i^* > q_i^F$  for all  $i$ .

**Proposition 5** underscores the qualitative difference between bilateral and multilateral enforcement. Bilateral enforcement never prompts the question of renegotiation, so it holds potential for boosting international public good provision. If states successfully include trade sanctions in the agreement on transboundary air pollution, for example, they can reduce their collective emissions to their collective advantage.

What about the bargaining stage? To analyze sanctions in the context of power politics, the concept of winning agreement requires elaboration. Recall that it constrains the set of equilibria to those that are Pareto-dominant for the winning coalition. How should one apply it to bilateral cooperation in pairwise Prisoner's Dilemmas? I assume that they are unaffected on the equilibrium path, because the winning coalition has neither a common interest nor a channel of influence to manipulate any particular pairwise Prisoner's Dilemma. The winning coalition can authorize bilateral punishments by manipulating the penal code  $s^i$  for any  $i \in N$ , but it cannot manipulate the vector  $s^* = s^K$  that determines the nature of bilateral cooperation. While this assumption is not necessarily appropriate in all contexts, it is plausible in multilateral negotiations. Equally important, it restricts the use of power and thus presents a least likely case for power politics.

For example, in the case of transboundary air pollution these limitations imply that the multilateral negotiations cannot shape the bilateral trading arrangements

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<sup>68</sup>See van Damme 1989 for a thorough analysis.

<sup>69</sup>See Limão 2005.

between the states. No member of the winning coalition has an incentive to use its bargaining power to help another member to exploit its trade partners, so it is not plausible that they would propose a pervasive reformulation of bilateral trading relationships completely irrelevant to the problem of transboundary air pollution. The winning coalition can, however, propose that collective sanctions be allowed to enforce international public good provision. By **Proposition 5**, all members of the winning coalition benefit from increased enforcement power, so it seems plausible that they use their bargaining power as a coalition to incorporate sanctions in the international agreement.

The following result emphasizes the fundamental importance of power politics in linked negotiations:

**Proposition 6.** Suppose that the collective optimum  $(q^K, s^K)$  is a subgame-perfect and renegotiation-proof agreement. If any slack enforcement power remains, the collective optimum is not a winning agreement.

**Proposition 6** implies that sanctions resurrect power politics. A winning coalition never leaves a profitable opportunity to redistribute gains underutilized, so it is not satisfied with the collective optimum. Powerful states use the enforcement power provided by sanctions to impose a stringent requirement on weak states. Issue linkages remove the problem of renegotiation that characterizes reciprocal agreements, but they also permit exploitation of the weak by the strong.

The implications of sanctions for negotiability are predictable. If powerful states can create sufficient enforcement power, they no longer have to accept mutual gain. They use the threat of bilateral punishment to extract the surplus from cooperation. However, weak states anticipate this and refuse to negotiate:

**Proposition 7.** If an agreement with sanctions through issue linkage creates enough slack enforcement power, the winning agreement is not negotiable.

**Proposition 7** tells that sanctions must be limited to avoid the oversupply of enforcement power. If weak states suspect that issue linkages for strong sanctions are on the table, they refuse to negotiate. Unless powerful states can somehow commit to precluding too strong sanctions or simply coerce the weak states to cooperate, international public good provision fails.

**Proposition 7** provides an explanation for the absence of sanctions in multilat-



eral agreements for international public good provision. If sanctions are permissible, the winning coalition is no longer constrained by the problem of renegotiation. Consequently, it can use its bargaining power to propose an agreement that is barely acceptable to the rest of the world. If the cost of entering the negotiations is high, however, these states refuse to participate in the negotiations and instead play the one-stage Nash equilibrium. It is only through a commitment to limit their collective enforcement power that the members of the winning coalition can initiate the multilateral negotiations.

## 4 Discussion

A reciprocal agreement with weak enforcement provisions is vulnerable to renegotiation and cannot achieve the optimal level of international public good provision. Surprisingly, however, this undersupply of enforcement power also permits a credible commitment to a division of gains that is acceptable for weak states. While sanctions through issue linkage increase enforcement power, they also resurrect power politics. Collective enforcement power is indivisible from power as a vehicle of redistribution, so weak states refuse to enter the negotiations in the first place. This finding provides a theoretical explanation for the absence of sanctions in multilateral agreements for international public good provision. In designing an international agreement to reduce transboundary air pollution, for example, a credible commitment to reciprocity implies that weak states outside the winning coalition expect non-negligible benefits from international cooperation. If an explicit or implicit threat of sanctions is present, however, many of them might prefer the *status quo* to costly negotiations and minimal gains in the future.

I have not explicitly modeled the mechanism that permits a credible commitment to reciprocity in general. The results depend on the assumption that commitment to reciprocity is *ceteris paribus* easier to establish than a commitment to eschew power politics under any circumstances. One possible avenue for future research is to embed the model in a systemic framework of international cooperation, and infer the conditions for “diffuse reciprocity” as a means to sustain issue-specific reciprocity in international public good provision.<sup>70</sup> While the present analysis is fully rationalist, another interesting possibility is to link the strategic mechanism to the normative foundations of international order. If diffuse reciprocity is a central norm underpin-

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<sup>70</sup>Keohane 1986.

ning the international order, the present analysis provides a complementary rationalist account of the material gains that states obtain when they endorse it. It is indeed plausible that a combination of rationalist and normative elements form the basis for reciprocity in international cooperation.

An alternative strategy for powerful states is to coerce public good provision. For example, they could unilaterally impose trade sanctions against weak states. If the cost of coercion is sufficiently low, this is a plausible possibility. If coercion is costly relative to the benefits from cooperation, however, powerful states stand to gain from voluntary participation by weak states. Importantly, these two models of international public good provision have different observational implications. If powerful states coerce public good provision, they need not even design international agreements, but the observed level of public good provision should be high. The analysis in this paper predicts that states design weak reciprocal agreements, and the level of public good provision is inefficiently low. As discussed above, international environmental politics is a good example of an issue area in which the model of this paper has substantial explanatory power.

The broader implications for institutional design are a topic for future research, but certain guidelines are readily observable. Most importantly, when states design international institutions they should ensure that these institutions are not vulnerable to power politics. Indeed, power asymmetries often impede the functioning of international institutions and thus hurt all parties because weak states refuse to participate seriously.<sup>71</sup> A promising possibility for future theoretical and empirical research is to investigate the mechanisms that permit mutually profitable cooperation despite the risk of exploitation in an institutionalized environment. Equally important, an exit option itself is insufficient to prevent cooperation failure. Even if opt-out or flexibility provisions prevent negative payoff from an international agreement, the expected payoff could be so small for weak states that they refuse to negotiate in the first place.

A useful point of comparison in the study of domestic politics is the problem of constitutional design.<sup>72</sup> A domestic society must simultaneously solve two problems: how can the government enforce public good provision and uphold order without exploiting its monopoly of violence? The solution is apparently a complex set of constitutional institutions that limit the use of state power to specific instances. The model above is a parsimonious account of a similar problem in international politics, so the study of constitutional design could offer important cues for understanding in-

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<sup>71</sup>See Streck 2001.

<sup>72</sup>Buchanan and Tullock 1962.

ternational cooperation as well. On the one hand, domestic societies may have found commitment mechanisms that are presently unavailable in international politics. On the other hand, it is also possible that the gains from international public good provision continue to be lower in international politics, so that powerful states are not willing to pay the price of commitment mechanisms stronger than reciprocity.

Finally, the model has an interesting connection to Fearon's seminal analysis of "bargaining and enforcement" in international cooperation.<sup>73</sup> While his model implies that states sometimes bargain harder if they expect a large shadow of future because the stakes are higher, my analysis suggests that collective enforcement power is indivisible from power as a vehicle of redistribution. Both models link distributional concerns to the enforcement problem, but the substantive implications differ. Fearon's analysis predicts that enforceable agreements complicate bargaining because the stakes are higher, while this paper suggests that enforcement power *per se* can be an obstacle to bargaining.

#### **4.1 International Public Good Provision in the Contemporary World Economy**

Empirically, the theory is applicable to international public good provision in the contemporary world economy. Understanding the consequences of power politics is crucial, because increased economic and environmental interdependence has prompted a surge in the demand for international public goods. If states are to combat transnational terrorism and crime, shift energy production from fossil fuels to clean energy, improve the infrastructure for international economic exchange, and constrain the unsustainable use of natural resources, they need to increase the supply of public goods as well. The payoff from constraining power politics to promote serious negotiations on international public good provision is high.

According to the theory, two recent changes in the world economy warrant optimism. First, the drastic increase in the bargaining power of developing countries such as China and India has mitigated the problem of global power asymmetries. Although practically all developing countries suffered from chronic internal and external vulnerability for most of the 20th century,<sup>74</sup> rapidly industrializing developing countries are now asserting their rights in international politics more vigorously than ever. Many weak states mostly in Africa still suffer from chronic political vulnerability, but the

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<sup>73</sup>Fearon 1998.

<sup>74</sup>Krasner 1985.

global power balance has grown more even.

Applying the model, the size of the winning coalition should consequently grow. The returns to exploitation and redistribution decrease and the importance of efficient public good provision increases.<sup>75</sup> If the increased power of developing countries implies that they are no longer vulnerable to exploitation and can successfully defend their interests, their incentive to engage in serious institutional design for international public good provision should increase. This change could remove an important impediment to overhauling the system of international institutions for public good provision.

Second, the changing nature of international trade is shaping the universe of available issue linkages. Trade sanctions are a prominent form of issue linkage, but according to the model the substantial damage they can cause has limited their applicability. However, if the benefits that targeted trade tariffs yield are decreasing, and the corresponding costs are increasing, the maximum punishment that states can credibly threaten is decreasing as well. This constrains the use of power for redistribution and thus enhances the supply of international public goods. In particular, the apparent contradiction between trade sanctions and liberalization disappears if states have little reason to use trade sanctions for protectionist purposes.

Has such change occurred? To begin with, the political economy of international trade has historically been characterized by strong incentives to protect domestic industries from competition.<sup>76</sup> In the period of mercantilism, states engaged in a zero-sum game of maximizing exports and minimizing imports. More generally, governments have pursued their political aims by preventing foreign competition and subsidizing important domestic producers.<sup>77</sup> Importantly, international trade has also had a strong bilateral element. High transaction costs and the absence of smoothly functioning world markets for goods and services have underscored the specificity of trade relations. For example, even a powerful state such as Great Britain in the 19th century found it difficult to find alternatives to American imports during the 1807-1809 embargo.<sup>78</sup> In this strategic environment, states had the incentive and power to hurt others by raising targeted tariffs against their products.

Recent changes in the world economy have undermined these incentives. As Milner writes, “[o]ne of the most salient changes in the world economy since 1980 has

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<sup>75</sup>See also Bueno de Mesquita et al. 2003.

<sup>76</sup>Kindleberger, 1986; Milner, 1999.

<sup>77</sup>Alt and Gilligan 1994; Grossman and Helpman 1994.

<sup>78</sup>Frankel 1982.

been the move toward freer trade among countries across the globe.”<sup>79</sup> Even unilateral liberalization seems to be the preferred strategy of many states because the cost of economic isolation has grown. Most importantly for present purposes, the attractiveness of targeted tariffs has declined. If states operate in a global market with relatively uniform prices, targeted tariffs produce little political gain. For example, if the United States was to raise tariffs against Chinese textiles, production would shift to countries like India and Mexico. Yang et al. show that U.S. sanctions on Chinese goods in place have mostly hurt both parties.<sup>80</sup> States still benefit from tariffs across the board, such as the Bush steel tariff, but such tariffs provide no slack enforcement power because they produce collateral damage. This effect is amplified by the multilateral nature of the trade regime, which limits the use of trade sanctions by the most-favored nation treatment.

These changes in the logic of international trade mitigate the oversupply of enforcement power. When targeted tariffs produce less political benefits, powerful states cannot use issue linkage for redistribution. For example, it is difficult to permit extensive trade sanctions for enforcing reductions in transboundary air pollution when bilateral protectionism is lucrative. As the attractiveness of bilateral trade tariffs decreases, weak states should be increasingly willing to negotiate on such provisions in an international agreement. Simply put, they have less reason to fear that trade sanctions provide powerful states with a credible threat that permits a redistribution of gains and losses. Ideally, states would strike a balance between the over- and undersupply of enforcement power.

The preceding discussion has a straightforward conclusion: recent changes in the world economy increase the supply of international public goods. This conclusion goes against the infamous “race to the bottom” hypothesis and warrants cautious optimism.<sup>81</sup> These changes also imply that in the future, most states will be more willing to engage in serious institutional design despite high transaction costs because they expect not to bear a disproportionate burden.

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<sup>79</sup>Milner 1999.

<sup>80</sup>Yang et al. 2004.

<sup>81</sup>See also Drezner 2001; Vogel 1995.

## 5 Conclusion

The elusive concept of power is central to international cooperation theory in two ways. First, enforcement power is necessary to deter opportunism and free riding.<sup>82</sup> Second, power politics is a common consequence of distributional conflict.<sup>83</sup> While bargaining power has been central to the study of international conflict, its role in international cooperation has received less attention.

The contribution of this paper is a theoretical account of the tradeoff between the over- and undersupply of enforcement power in the multilateral context of international public good provision. If states are to enforce adequate public good provision, they need to secure sufficient enforcement power while constraining its use as a vehicle of redistribution. If powerful states cannot credibly commit to such a constraint, weak states have every reason to anticipate minimal gains from cooperation. Consequently, they refuse to negotiate. The theory explains why issue linkages that produce slack enforcement power are relatively rare in international public good provision: weak states hesitate to provide powerful states with an opportunity to use power for redistribution. The reason for suboptimal levels of international public good provision is not lack of enforcement power but its dual role as a vehicle of redistribution.

The broader theoretical implications of the analysis pertain to questions of institutional design. Unlike conventional cooperation theory, the analysis suggests that states need to solve a complex problem of “constitutional” design: how to increase the supply of enforcement power while constraining its use? If this problem is empirically relevant, its primary implication is that powerful states must entice weak states to participate in negotiations through a credible commitment to an acceptable division of gains. Importantly, the role of power in bargaining cannot be separated from the role of power in enforcement. This indivisibility of power produces the paradoxical outcome in which powerful states are hurt by their excessive power.

Empirically, the theory is most readily applicable to multilateral negotiations with substantial power asymmetries. If a focal winning coalition is recognizable, one can investigate provisions that pertain to safeguards and compensation mechanisms. According to the theory, such provisions are necessary to engage weak and vulnerable states in the negotiations. They could take the form of financial assistance, technology transfer, issue linkage as a side payment, and economic “hostages” that create a situation of mutual vulnerability.

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<sup>82</sup>Keohane 1984.

<sup>83</sup>Krasner 1991.

Finally, the paper has direct implications for the contemporary undersupply of international public goods. With the increased bargaining power of rapidly industrializing countries and structural changes in international trade, the role of power politics in multilateral negotiations is diminishing. Consequently, states can achieve greater participation and secure mutually profitable agreements on international public good provision. From a policy perspective, such a change is welcome in an increasingly interdependent world.

## Appendix

### Equilibria under Reciprocity

The characterization of an agreement is given by **Definition 1**. Subgame-perfection, renegotiation-proofness, and negotiability are defined in the main text.

The collective optimum  $q^K$  solves the following program:

$$\max_q \sum_{j \in N} u_j(q),$$

the unique solution to which is given by the following first-order condition for all  $i$ :

$$\sum_{j \in N} b'_j \left( \sum_{j \in N} q_j^* \right) = c'_i(q_i).$$

Let  $X$  denote the set of subgame-perfect and renegotiation-proof agreements. A maximum feasible agreement  $q^F$  solves the following program:

$$\max_{q^*} \sum_{j \in N} u_j(q^*),$$

where  $\{q^*, q^1, \dots, q^n\} \in X$ . Throughout, it is assumed that  $q_i^F < q_i^K$  for all  $i$ .

A *winning agreement*  $q^C$  solves the following program:

$$\max_{q^*} \sum_{i \in C} \lambda_i u_i(q^*),$$

where  $\{q^*, q^1, \dots, q^n\} \in X$ ,  $u_i(q^*) \geq u_i(q^F)$  for all  $i \in C$ ,  $\lambda_i : 1 > \lambda_i > 0$  for all  $i \in C$ , and  $\sum_{i \in C} \lambda_i = 1$ . Throughout, it is assumed that  $u_i(q^C) > u_i(q^F)$  for at least one  $i \in C$ .

### Equilibria with Sanctions through Issue Linkage

With sanctions through issue linkage, an agreement is a collection of  $2n$ -coordinate vectors denoted by

$$\{(q^*, s^*), (q^1, s^1), \dots, (q^n, s^n)\},$$

and the following transition rule:

1. At  $t = 0$ , begin playing  $(q^*, s^*)$  until some player  $i$  deviates.



2. If player  $i$  plays  $(q_i, s_i) \neq (\hat{q}_i, \hat{s}_i)$  at time  $t$ , where  $(\hat{q}_i, \hat{s}_i)$  is the prescribed action, play  $(q^i, s^i)$  for  $T$  periods from time  $t + 1$ .
3. If no player  $j$  deviates from  $(q_j^i, s_j^i)$  during these  $T$  periods, begin playing  $q^*$  until some player  $k$  deviates.

Finally, fix  $s^* = s^K = (C, \dots, C)$  and  $s_{ij}^h = s_{ij}^* = (C, C)$  for  $h \neq i, j$ .

Subgame-perfection is now defined as follows: for all  $i, k$  and  $q_i, q_k$ ,

$$\sum_{t=0}^T \delta^t \cdot \tilde{u}_i(q^*, s^*) \geq \tilde{u}_i(q_i, q_{-i}^*, s_i, s_{-i}^*) + \sum_{t=1}^T \delta^t \cdot \tilde{u}_i(q^i, s^i)$$

and

$$\sum_{t=0}^{T-1} \delta^t \cdot \tilde{u}_k(q^i, s^i) + \delta^T \cdot \tilde{u}_k(q^*, s^*) \geq \tilde{u}_k(q_k, q_{-k}^i, s_k, s_{-k}^i) + \sum_{t=1}^T \delta^t \cdot \tilde{u}_k(q^k, s^k).$$

Renegotiation-proofness is defined as follows: for all  $i$  and  $k \in D_i$ ,

$$\tilde{u}_k(q^i, s^i) \geq \tilde{u}_k(q^*, s^*).$$

Negotiability is defined as

$$\tilde{u}_i(q^*, s^*) - \tilde{u}_i(q^N, s^*) \geq (1 - \delta) \cdot z_i$$

for all  $i \in N$ .

To enable collective enforcement, it is assumed that the tuple  $(\alpha_i, \beta_i, \gamma_i)$  is such that the renegotiation-proof pairwise punishments  $(C, D)$  can be enforced for all  $i$ .

*Slack enforcement power* is then measured as the non-negative scalar

$$-(n-1) \cdot \min \left\{ (\beta_i - \alpha_i) - \sum_{t=1}^T \delta^t \cdot (\alpha_i - \gamma_i), -\gamma_i - \delta^T \cdot (\alpha_i - \gamma_i) \right\}_{i \in N}.$$

The first element is the payoff from defection  $(\beta_i - \alpha_i)$  less the most stringent discounted punishment  $(\sum_{t=1}^T \delta^t \cdot (\alpha_i - \gamma_i))$ . The second element is the payoff from defection during punishment  $(-\gamma_i)$  less the continuation of punishment by one period  $(\delta^T \cdot (\alpha_i - \gamma_i))$ . The negation of this minimum, which is negative by construction, multiplied by  $(n-1)$  is therefore the additional damage that sanctions through issue linkage permit with  $n-1$  punishers when  $s^K$  must be enforced. In any subgame-perfect and

renegotiation-proof agreement  $\{(q^*, s^*), (q^1, s^1), \dots, (q^n, s^n)\}$ , slack enforcement power *remains* when the optimal deviation for any state  $i \in N$  reduces its payoff from the repeated game.

### Proof of Proposition 1

Let  $\hat{q}_i \in \{q_i^F, q_i^C\}$ , and write  $E = N$  when  $\hat{q}_i = q^F$  and  $E = N \setminus C$  when  $\hat{q}_i = q^C$ .

To prove the first part, suppose towards a contradiction that neither (3) nor (4) are binding with equality for any  $i, k$ . Consider another equilibrium path  $q^*$  such that  $q_i^* = \hat{q}_i + \varepsilon$  for all  $i \in E$ , where  $\varepsilon$  is a strictly positive but small enough scalar, and  $q_i^* = \hat{q}_i$  for all  $i \notin E$ . Increase  $q_j^i$  by  $\epsilon$  for all  $i, j \in N$ , where  $\epsilon$  is a strictly positive but small enough scalar. Examine (3) and (4) to observe that both equations remain nonbinding when  $(\varepsilon, \epsilon)$  is chosen appropriately. Furthermore, if the ratio  $\frac{\varepsilon}{\epsilon}$  is large enough, (5) is not violated.

Note that  $q_i^F < q_i^* < q_i^K$  for all  $i \in N$ , so  $\sum u_j(q^*) > \sum u_j(q^F)$ . Note that  $u_i(q^C)$  is strictly increasing in  $q_j^C$  for  $j \in E$ , so  $u_i(q^*) > u_i(q^C)$  for  $i \in C$ . Thus,  $q^F$  is not the maximal feasible agreement and  $q^C$  is not the winning agreement, a contradiction.

To prove the second part, suppose towards a contradiction that (5) is not binding with inequality for any  $i, k$ . Now consider another equilibrium path  $q^*$  such that  $q_i^* = \hat{q}_i + \varepsilon$  for all  $i \in E$ , where  $\varepsilon$  is a strictly positive but small enough scalar, and  $q_i^* = \hat{q}_i$  for all  $i \notin E$ . Increase  $q_j^i$  by  $\epsilon$  for all  $i, j \in N$ , where  $\epsilon$  is a strictly positive but small enough scalar. Examine (3) and (4) to observe that both equations hold when  $(\varepsilon, \epsilon)$  is chosen appropriately. If the ratio  $\frac{\varepsilon}{\epsilon}$  is large enough, (5) is not violated.

Note that  $q_i^F < q_i^* < q_i^K$  for all  $i \in N$ , so  $\sum u_j(q^*) > \sum u_j(q^F)$ . Note that  $u_i(q^C)$  is strictly increasing in  $q_j^C$  for  $j \in E$ , so  $u_i(q^*) > u_i(q^C)$  for  $i \in C$ . Thus,  $q^F$  is not the maximal feasible agreement and  $q^C$  is not the winning agreement, a contradiction.

### Proof of Proposition 2

Consider a winning agreement  $\{q^C, q^1, \dots, q^n\}$  and suppose towards a contradiction that the aggregate level of public good provision  $\sum_{i \notin C} q_i^C$  by weak states  $i \notin C$  can be increased without changing the pattern of public good provision  $\{q_j^C\}_{j \in C}$  by powerful states  $j \in C$ .

For all  $j \in C$ , the per-period payoff  $u_j(q^C)$  is independent of  $q_i^C$  for any  $i \notin C$  as long as  $\sum_{i \notin C} q_i^C$  is held constant. But then an increase relative to  $\sum_{i \notin C} q_i^C$  without changes in  $\{q_j^C\}_{j \in C}$  is a strict Pareto-improvement for all states  $j \in C$ , which

contradicts the notion that  $q^C$  is the equilibrium path for the winning agreement. Thus, it must be the case that  $\sum_{i \notin C} q_i^C$  is the highest attainable level of public good provision by weak states. ■

### Proof of Proposition 3

Towards a contradiction, suppose  $\sum q_j^C > \sum q_j^F$  and  $q_i^C > q_i^F$  for state  $i$  as specified in **Proposition 3**. Write the binding renegotiation-proofness condition for states  $i, k$  in the maximal feasible agreement  $q^F$  as

$$b_k(\sum q_j^i) - c_k(q_k^i) = b_k(\sum q_j^F) - c_k(q_k^F),$$

where  $q^i$  is the most severe subgame-perfect and renegotiation-proof punishment available. Formally, let

$$q^i \in \underset{q \in Q}{\operatorname{argmin}} u_i(q),$$

where  $Q$  is the set of subgame-perfect and renegotiation-proof penal codes given  $q^F$  on the equilibrium path.

With  $\sum q_j^C > \sum q_j^F$  and  $q_i^C > q_i^F$ , the gain from deviation is strictly larger for state  $i$ :

$$\max_{q_i} \{u_i(q_i, q_{-i}^C) - u_i(q_i^C, q_{-i}^C)\} > \max_{q_i} \{u_i(q_i, q_{-i}^F) - u_i(q_i^F, q_{-i}^F)\}.$$

By the definition of the winning agreement  $q^C$ , the benefits from cooperation are larger for all powerful states  $l \in C$ :

$$b_l(\sum q_j^C) - c_l(q_l^C) \geq b_l(\sum q_j^F) - c_l(q_l^F).$$

Thus,

$$b_k(\sum q_j^C) - c_k(q_k^C) \geq b_k(\sum q_j^F) - c_k(q_k^F) = b_k(\sum q_j^i) - c_k(q_k^i).$$

When  $q^i$  is by definition the most severe subgame-perfect and renegotiation-proof punishment available to enforce  $q^F$  for state  $i$ , and  $u_j(q^C) \geq u_j(q^F)$  for all powerful states  $j \in D_i \subset C$ , no penal code for state  $i$  exists that is subgame-perfect, renegotiation-proof, and more severe than  $q^i$ . But the gain from deviation is strictly larger to state  $i$ , so  $q^C$  is not in equilibrium, a contradiction. ■

### Proof of Proposition 4

For  $i \in C$ ,  $u_i(q^C) \geq u_i(q^F) > u_i(q^N)$  implies that (6) holds when  $z_i \rightarrow 0$ . Suppose towards a contradiction that there exists a winning agreement  $\{q^C, q^1, \dots, q^n\}$  such that  $u_i(q^C) \leq u_i(q^N)$  for some  $i \notin C$ . Given that  $q_j^F > q_j^N$  by assumption for all  $j$ , it must be that  $\sum q_j^C > \sum q_j^N$ . Given that  $u_i(q^C) \leq u_i(q^N)$ , it must be that  $q_i^C > q_i^N$ . It follows that deviation from  $q_i^C$  to some other  $q_i$  is strictly profitable if punishment is not forthcoming.

Consider now the penal code  $q^i$  and note that  $\sum_{j \neq i} q_j^i \geq 0$ . For subgame-perfection to hold, it must be that  $u_i(q^i) < u_i(q^C)$  when deviation from  $q_i^C$  is strictly profitable. But  $u_i(q^C) \leq u_i(q^N)$  implies that  $u_i(q^i) < u_i(q^C) \leq u_i(q^N)$ . With  $q_j^N$  close to zero for all  $j$ , state  $i$  can obtain a payoff arbitrarily close to  $u_i(q^N)$  by permanently deviating to  $q_i^N$ . Thus  $u_i(q^C)$  is not in equilibrium, which implies that any winning agreement  $q^C$  must produce a strictly positive payoff from negotiations  $u_i(q^C) - u_i(q^N)$  for all states  $i$ . It suffices that

$$(1 - \delta) \cdot z_i < u_i(q^C) - u_i(q^N)$$

holds for all  $i$  to ensure negotiability, which I have shown to be always attainable as  $z_i \rightarrow 0$  for all  $i$ . ■

### Proof of Proposition 5

Let  $q_i^* = q_i^F + \varepsilon$  for all  $i$ , where  $\varepsilon$  is a strictly positive but small scalar. Leave  $\{s^K, q^1, \dots, q^n\}$  as they are but set  $(s_{ji}^i, s_{ij}^i) = (D, C)$  for all  $i, j$ . Since both (3) and (4) hold under reciprocity, with slack enforcement power as formalized in this Appendix and sufficiently small  $\varepsilon$ , state  $i$  has no incentive to deviate.

Now recall that the collective optimum  $q^K$  cannot be achieved in equilibrium, so  $q_i^F < q_i^K$  for all  $i$ . For sufficiently small  $\varepsilon$ , it is the case that  $q_i^F < q_i^* < q_i^K$ , which implies that the equilibrium path  $q^*$  indeed increases welfare over  $q^F$ . ■

### Proof of Proposition 6

Consider  $\{q^K, q^1, \dots, q^n\}$ . Set  $q_i^C = q_i^K + \varepsilon$ , where  $\varepsilon$  is a strictly positive but small scalar, for all  $i \notin C$ . Set  $q_i^C = q_i^K$  for all  $i \in C$ . Leave  $\{q^1, \dots, q^n\}$  as they are and note that because  $q^K$  is not enforceable under reciprocity, it must be the case that  $(s_{ji}^i, s_{ij}^i) = (D, C)$ . With slack enforcement power remaining at  $\{q^K, q^1, \dots, q^n\}$  and  $\varepsilon$

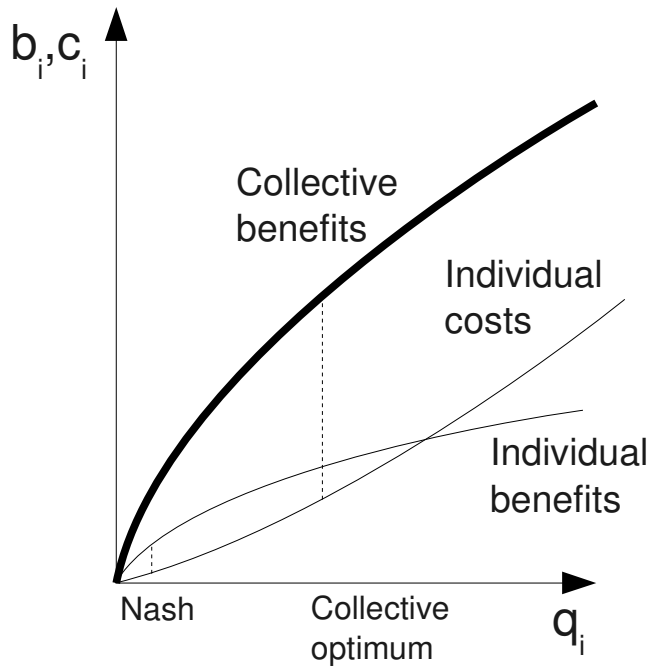
sufficiently small, state  $i$  has no incentive to deviate.

Now note that with  $q_i^C = q_i^K$  for all  $i \in C$  and  $q_i^C > q_i^K$  for all  $i \notin C$ , we have  $\sum \lambda_i \tilde{u}_i(q^C, s^K) > \sum \lambda_i \tilde{u}_i(q^K, s^K)$  because  $b$  is strictly increasing. Thus,  $q^K$  is not a winning agreement. ■

### **Proof of Proposition 7**

With enough slack enforcement power, one can set  $\delta \cdot \tilde{u}_i(q^i, s^i) < K$  for any finite real number  $K$ . Since  $(s_{ji}^i, s_{ij}^i) = (D, C)$  is assumed to be subgame-perfect and renegotiation-proof, it is therefore possible to choose a strictly negative  $\delta \cdot \tilde{u}_i(q^i, s^i)$  with any value. But then for any  $i$  and finite  $q_i^C$ , state  $i$  has no incentive to deviate as long as  $|\delta \cdot \tilde{u}_i(q^i, s^i)|$  is large enough. Thus, one can choose any finite  $q_i^C$ . By convexity of  $c$ , it immediately follows that  $\tilde{u}_i(q^C) < \tilde{u}_i(q^N)$ . But then for any  $z > 0$ , the winning agreement is not negotiable. ■

## Figures



**Figure 5.1.** The thick concave curve represents collective benefits and the thin concave curve represents individual benefits. The thin convex curve represents individual costs. In the Nash equilibrium  $q^N$ , each player free rides to maximize individual utility. In the collective optimum,  $q^K$  each player maximizes collective utility.

	<i>C</i>	<i>D</i>
<i>C</i>	$\alpha_i, \alpha_j$	$\gamma_i, \beta_j$
<i>D</i>	$\beta_i, \gamma_j$	$0, 0$

**Figure 5.2.** A Prisoners' Dilemma.

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# Chapter 6

## Conclusion

This dissertation focuses on international cooperation problems that give rise to inefficient compromise. When an international cooperation problem permits various effective solutions, but these effective solutions carry stark distributional consequences that some bargaining parties cannot accept, states must sometimes “water down” down the resulting international agreement. This empirically prevalent phenomenon raises two questions of substantive interest. First, why does inefficient compromise occur? Second, how can states avoid it through institutional design?

I have shown that increasing returns provide a coherent and broadly applicable explanation for inefficient compromise. When the marginal returns to increasing one’s share of the product of international cooperation are increasing, effective solutions to an international cooperation problem are asymmetric and thus carry stark distributional consequences. In these circumstances, states must find a way to choose one of these effective solutions without recourse to costly bargaining. The set of issues for which increasing returns are relevant contains territorial conflict, reputation, legal precedents, standard setting and regulation, and the choice of principles that underpin international regimes.

To avoid inefficient compromise, states can choose from a broad range of potentially applicable institutional designs. While the extant literature has focused on issue linkage and side payments, I have shown that a random allocation of the asset is an equally useful and feasible practice. The key to avoiding inefficient compromise is to find mechanisms that permit a credible commitment to effective but asymmetric allocations. Alternatively, states can try to prevent problems of inefficient compromise from emerging in the first place.

Specifically, the dissertation presents the following results. In Chapter 2, I show that the institutional features of interstate arbitration, as practiced *inter alia* at the Permanent Court of Arbitration and in the International Court of Justice, are a remarkably effective method to allocate a disputed asset randomly. It requires mutual

consent, so it cannot be used against the interests of a sovereign state. The states that submit a dispute for arbitration can design the proceedings, so they can tailor the rules of dispute resolution to resolve the dispute as effectively as possible. Arbitration tribunals tend to choose asymmetric allocations that indicate a clear winner, which is optimal when the disputed asset is subject to increasing returns.

In Chapter 3, I find that in international regulation, states can prevent the emergence of international cooperation problems that give rise to inefficient compromise. By coordinating the development of nascent domestic regulatory institutions, they lock in mutual compatibility and ensure harmonious cooperation over time. As an empirical application, I have studied the empirical record of transatlantic regulatory cooperation on chemical testing requirements.

In Chapter 4, I turn to multilateral cooperation. I show that both issue linkage and delegation of decision-making power to an international committee, while quite unproblematic in bilateral disputes, can cause rather than avoid inefficient compromise in multilateral policy coordination. This finding reveals a finding gap in the logic of institutional design between bilateral and multilateral cooperation.

In Chapter 5, I show that when enforcement power is necessary to fully exploit bargaining power because asymmetric and exploitative agreements create incentives to defect, powerful states benefit from choosing such weak enforcement mechanisms as reciprocity. When they do so, they entice weak states to enter the negotiations. This is particularly important in problems of international public good provision, which explains why states deliberately choose weak enforcement mechanisms despite the availability of stronger alternatives, such as trade restrictions against defectors.

Many questions remain for future research. The empirical content of the analysis is limited, so it is important to find indicators for the presence of increasing returns and rigorously test the arguments made in this dissertation. On the theoretical side, the results on preventing international cooperation problems and multilateral cooperation suggest fruitful avenues for future research.