

Courts as Coordinators: Endogenous Enforcement and Jurisdiction in Adjudication*

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Abstract

Why do individuals build courts, submit cases, and enforce court judgments? This paper examines the role of a court that is neither a “decider” of issues nor an “information-provider.” Litigation is costly and doesn’t reveal private information. The court’s ruling is not binding and bargaining can take place both before and after the court has ruled. Nevertheless, an alternative dispute resolution mechanism emerges: court rulings can coordinate endogenous enforcement. Disinterested individuals are willing to invest in costly punishments for noncompliance to ensure that they can profitably appeal to the court in the future. Accepting jurisdiction of the court allows an individual to make efficiency-enhancing “trades” over his future selves, winning high-value disputes in exchange for losing low-value disputes. Such trades are possible because litigation is a screening device: individuals only sue when they derive relatively high value from the asset in dispute. The use of the court as a coordination device for enforcement by disinterested individuals allows for the existence of a court with endogenous enforcement and jurisdiction.

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In 2002, the International Court of Justice (ICJ) ruled on a long-standing bloody border dispute between Cameroon and Nigeria over the Bakassi peninsula, a piece of land rich in natural resources.¹ The Court ruled that Cameroon was entitled to Bakassi, even though the land was predominantly populated by Nigerian citizens. Nigerian President Olusegun Obasanjo refused to accept unilaterally the Court's ruling, insisting that negotiations must take place: "We want peace, but the interest of Nigeria will not be sacrificed.... [W]hat may be legally right may not be politically expedient."² Following the ruling, Nigeria was under intense international pressure to reach a peaceful settlement over Bakassi (Paulson, 2004, 451). This strong support for the ICJ led to intervention by UN Secretary General Kofi Annan and the creation of an international commission to oversee a negotiated agreement on Bakassi.

Scholars of domestic and international institutions emphasize two primary functions of courts: deciding contentious issues via legal rulings and providing information about legal claims or past disputant behavior. However, the ICJ's ruling in the Bakassi dispute spurred post-adjudicative bargaining between Cameroon and Nigeria—it did not "decide" the issues in contention. Additionally, the long-standing nature of the border dispute and the fact that the ICJ lacks independent fact-finding capabilities makes it unlikely that the litigation process revealed new information to the disputants.

This suggests two closely-related and important research questions. First, can courts do more than decide issues and provide information—is there another way that courts contribute to governance? Second, can a court that is neither a decider nor an information-provider be a self-enforcing institution—that is, will individuals in an anarchic environment be willing to accept the jurisdiction of the court to rule on future disputes, and invest in costly enforcement for court rulings in which they have no inherent interest?

Studies of domestic courts usually focus on the role of courts in serving as "deciders" of contentious issues. Legislators and executives can engage in bargaining over various policy choices, but a ruling by a court creates a new status quo policy. Other branches of government may subsequently alter policy, but a judicial ruling creates constraints in the legislative process (Rogers and Vanberg, 2002; Stephenson, 2003, 2004). Accounts of courts as deciders rely upon the assumptions

¹See *Land and Maritime Boundary between Cameroon and Nigeria*, Judgment on the Merits of 10 October 2002.

²Quoted in Paulson (2004, 450).

that court rulings are enforced and the court has jurisdiction to rule on contentious disputes. That is, enforcement and jurisdiction are exogenous in most theoretical accounts of courts.

Recent empirical scholarship has challenged this view of courts as “deciders” by demonstrating that even courts that issue ostensibly binding rulings are highly sensitive to concerns about noncompliance. This sensitivity stems from the fact that courts lack the ability to directly enforce their own rulings. For example, Carrubba and Rogers (2003) argue that the U.S. Supreme Court has tempered its doctrine on the dormant Commerce Clause because of concerns about the enforceability of rulings and noncompliance by the other branches of government. Similarly, Vanberg (2005) argues that the German Constitutional Court is sensitive to the likelihood of government compliance with an adverse ruling. A key factor influencing the likelihood of compliance is voter awareness of the issue in contention. Greater public awareness creates more pressure for the government to comply with adverse rulings. Staton (2004, 2006) shows that similar dynamics are at work in Mexican domestic courts, with the Mexican Supreme Court strategically publicizing court rulings in order to build up voter support for the court’s authority. Additionally, Carrubba (2005, 2009) argues that enforcement is a key concern in international regulatory courts, such as the European Court of Justice.

As an alternative to the “decider” model of courts, recent accounts of both domestic and international courts have emphasized the role that courts play as “information-providers.” Such information can be generated by the court ruling itself or by the strategic behavior of disputants with asymmetric information (Gilligan, Johns and Rosendorff, 2009). For example, the sensitivity of domestic courts to public opinion—as demonstrated by Carrubba and Zorn (2009), Staton (2004, 2006), and Vanberg (2005)—implies that court rulings can provide vital information to domestic audiences about the validity or quality of government policy. Similarly, Johns and Rosendorff (2009) argue that a key function of adjudication in the World Trade Organization is that a legal ruling provides information to affected industries about the legal validity and anticipated consequences of government trade policy. Such information in turn provides consumers and industry groups with the information necessary to lobby their government (Mansfield, Milner and Rosendorff, 2002; Rosendorff, 2005). Use of the court as an information-provider ensures a social welfare justification for why states and individuals would be willing to accept jurisdiction of the court to rule.

The theoretical contribution of this paradigm to our understanding of courts is perhaps most apparent in the work of Carrubba (2005, 2009). In Carrubba’s formal work, two states are part of a regulatory regime in which the costs of cooperation (i.e. compliance with the regulatory regime) can change over time. States want to create a system in which cooperation takes place when there is a net benefit of cooperation, but tolerated defection occurs when the costs of compliance are high. The litigation process is assumed to reveal each state’s private information about its cost of compliance, thereby allowing for the endogenous development of punishment strategies by states. Enforcement takes the form of a refusal to cooperate in future periods with states that refuse to comply today. This increase in efficiency creates incentives for states to grant the court the power of judicial review; i.e. accept jurisdiction of the court to rule. The key mechanism in these models is that the litigation process credibly reveals private information about the costs of cooperation, which in turn allow states to enhance efficiency by conditioning punishment strategies on private information. This creates a basis for both endogenous enforcement and jurisdiction.

Carrubba’s accounts provide much insight into the development of both federal and international courts. However, the scope of his account is limited by three key empirical and theoretical dimensions. First, there exist many courts that don’t appear to function as “information-providers.” For example, the International Court of Justice (ICJ) is the main judicial organ of the United Nations and has ruled in many high-profile international disputes since its creation in 1946. The court lacks investigative authority and relies upon information provided by the states themselves in resolving disputes, so it is unlikely that private information is revealed by the litigation process. Lawsuits generally take place over long-standing disputes—such as the Bakassi dispute—for which there is likely to be little residual private information between the states. Additionally, evidentiary procedures of the court mean that court rulings are often based on a narrower set of facts than is available to the litigants themselves (Simons, 2007). Finally, there is little evidence to suggest that ICJ rulings are decisive in providing information to domestic political audiences.

Second, while the collective action framework of Carrubba (2005, 2009) covers many classes of political problems, courts must also often resolve distributional problems in which the preferences of two states or individuals over the division of an asset are directly opposed. For example, the ICJ’s most common type of case is disputes over land borders and maritime delimitations. While a

collective action framework can yield important insight into issues such as economic and environmental regulation, this is not an appropriate framework for examining the role of courts in many areas, including property rights and international security.

Third, many courts are nested in bargaining environments in which disputants have the opportunity to negotiate settlements both before and after a court has ruled. For example, over 60 percent of closed cases heard by the ICJ resulted in further diplomatic bargaining between the disputants.³ Similarly, the dispute settlement procedure of the World Trade Organization explicitly promotes negotiated settlement as a preferred alternative to litigation of trade disputes. How does the existence and use of a court affect such bargaining interactions between states?

In order to address these issues, I construct a theoretical model of a court that lacks the ability to provide private information and that issues non-binding legal rulings. Two players are randomly chosen to be involved in a dispute over the division of an asset and can choose whether to engage in bilateral bargaining or to refer the dispute to the court. If adjudication takes place and the loser engages in conflict rather than respecting the court's judgment or participating in post-adjudicative bargaining, then each of the disinterested players (that is, those individuals who were not chosen as disputants) must decide whether to enforce the court's judgment by imposing a one-time punishment. This punishment is costly to both the individual *receiving* the punishment and to the individual *imposing* the punishment. This basic stage game is infinitely-repeated, which allows individuals to develop reputations about their history of enforcing court judgments and ensures that any player that is a disinterested party in a given period can reasonably expect that it will be directly involved in a future dispute.

Despite the court's inability to provide private information or issue binding rulings, an alternative dispute resolution mechanism arises: court rulings can coordinate endogenous enforcement by disinterested individuals. Players who punish noncompliance when they are disinterested parties are "providers" of enforcement, while players that refuse to punish are "free-riders." If disinterested parties enforce Court judgments when the winner is a provider of enforcement and don't enforce when the winner is a free-rider, then it can be incentive-compatible for individuals to enforce judgments for disputes in which they have no inherent interest. This shows that even if an institution

³Data was collected by the author. Coding details and data are available upon request.

lacks explicit enforcement mechanisms, it is possible for actors to develop a shared set of expectations about behavior that lead to informal and incentive-compatible enforcement of the institution's decisions (Maggi, 1999; Milgrom, North and Weingast, 1990; Weingast, 1997). As such, equilibrium behavior in the game generates a self-enforcing norm of reciprocity of enforcement (Keohane, 1986).

The credible threat of such enforcement constrains post-adjudicative bargaining between individuals. When coordinated enforcement is provided by disinterested actors, a favorable court ruling allows the winner of adjudication to “lock in” a favorable position for subsequent post-adjudicative bargaining. A court ruling is not binding *per se*, yet the expectation of endogenous enforcement by disinterested parties ensures that legal rulings affect distributive outcomes. Strategic case submission—in order to lock in such favorable bargaining positions—ensures that litigation is a screening device: individuals only sue when they derive relatively high value from the asset in dispute. The existence of the court can therefore enhance the classical efficiency of post-adjudicative bargaining outcomes, even though bargaining outcomes reached without the use of the court are Pareto efficient. Accepting jurisdiction of the court allows an individual to make efficiency-enhancing “trades” over his future selves, winning high-value disputes in exchange for losing low-value disputes. This provides the rationale for endogenous jurisdiction of the court.

As such, there are three major contributions of my model. First, I show that endogenous enforcement and jurisdiction are possible even if the court is neither a “decider” nor an “information-provider.” Second, my model applies to a broad class of problems not previously examined in the literature: distributional conflicts between individuals in a multi-player environment. Third, I examine the role of courts when litigation is nested in a bargaining framework. The absence of informational asymmetries in my model might suggest that courts can offer little value to disputants since players can always negotiate a Pareto-efficient settlement without resorting to costly adjudication. Nevertheless, disputants can use the court to lock in favorable positions for subsequent bargaining interactions. I proceed by describing my theoretical model and deriving formal results. After discussing the substantive implications and robustness of these findings, I return to the case of the International Court of Justice as an illustration of my theoretical arguments.

1 Theoretical Model

There is a set of individuals, $N = \{1, 2, 3, \dots\}$, where $n \in N$ denotes an arbitrary player and the number of players is $|N|$. Each player begins the game by choosing whether to submit herself to the jurisdiction of the court.

1.1 Dispute Stage Game

In each time period t , the stage game begins with Nature selecting two players, i and j , to be involved in a dispute over an asset. Players i and j are “disputants,” and the other players are “disinterested” actors. Each player is equally likely to be chosen as a disputant, which means that the probability that Nature selects a given player to be involved in a dispute is $\frac{2}{|N|}$. Nature then selects the types of the disputants, which are the values that i and j assign to the asset in dispute. These values, v_i and v_j , are independently and identically distributed with full support along the unit interval according to the distribution function F . Each disputant’s type becomes common knowledge after it is drawn—there is no uncertainty regarding the value that i and j derive from the asset.

If either (or both) of the disputants has not accepted jurisdiction, then recourse to the court is not possible and players are restricted to bilateral bargaining. This subgame consists of a standard bargaining framework in which each disputant’s payoff from failure to reach an agreement (i.e. her disagreement payoff) is her expected utility from engaging in conflict over the asset.⁴ Let α_i and α_j represent the “strength” of player i and player j in conflict, respectively. Let $q(\alpha_i, \alpha_j)$ denote the probability that player i prevails in conflict and gains full control of the asset, where q is continuously differentiable in both of its arguments, $q(\alpha_i, \alpha_j) \in (0, 1)$ for all (α_i, α_j) , $\frac{\partial q}{\partial \alpha_i} > 0$ and $\frac{\partial q}{\partial \alpha_j} < 0$. So the stronger a state becomes, the higher the probability that it will prevail in conflict. Additionally, assume that: when states are equivalent in terms of strength, they have equal odds of prevailing in conflict (i.e. $q(\alpha_i, \alpha_j) = \frac{1}{2}$ if $\alpha_i = \alpha_j$); and a state’s probability of success in conflict is a function only of its strength and not of its role in the legal process (i.e. $q(\alpha_n, \alpha_m) = 1 - q(\alpha_m, \alpha_n)$). Let $\phi \in (0, 1)$ denote that probability that the asset is destroyed during

⁴See Muthoo (1999) for an introduction to bargaining problems.

conflict.⁵ Then each player’s disagreement payoff for bilateral bargaining is his expected utility from war over the asset: $w_i^B = q(\alpha_i, \alpha_j)(1 - \phi)v_i$ and $w_j^B = [1 - q(\alpha_i, \alpha_j)](1 - \phi)v_j$. Negotiations in anarchic environments, such as bilateral international disputes, lack a binding bargaining protocol since they lack fixed rules (Johns, 2007; Milner and Rosendorff, 1996). As such, I assume that the bargaining framework results in the selection of the Nash bargaining solution (NBS) because it yields outcomes that can result from a wide diversity of bargaining games in which a player’s ability to extract bargaining concessions is a function of her strength in conflict. Let player i ’s share of the asset in the NBS be denoted by x^B .⁶

In contrast, if both i and j have accepted jurisdiction, then there exists a clear basis for submitting disputes to the court, and each disputant must decide whether to engage in bilateral bargaining or to refer the case to adjudication.⁷ If both i and j choose to engage in bilateral bargaining, then disputants enter a subgame that is equivalent to the bargaining framework described above. However, if at least one disputant chooses adjudication, then the case is referred to the court. The adjudication process results in stochastic rulings, where $p \in [0, 1]$ is the probability that player i wins.⁸ If the court rules in favor of i , then the asset is fully allocated to i ; and if the court rules in favor of j , then the asset is fully allocated to j . Additionally, the legal process is costly, so each disputant pays a cost $k > 0$ if adjudication takes place.

Following the court’s judgment, players i and j may negotiate an agreement, but if the loser of the court’s ruling subsequently engages in conflict, all of the disinterested players—i.e. the non-disputants—have the opportunity to enforce the court’s ruling by imposing punishments on the loser. For example, if player i wins a ruling against player j , then the level of enforcement that is provided is

$$c_{ij} = \sum_{n \in N \setminus \{i, j\}} e_{nij}$$

where the choice variable $e_{nij} \geq 0$ is the enforcement cost paid by a disinterested actor n from

⁵This ensures that conflict is costly in expectation.

⁶See Nash (1950) and Muthoo (1999) for an overview of the NBS. Results are robust to alternative bargaining solutions, as discussed in the Technical Appendix.

⁷Figure 1 shows this subgame.

⁸As discussed in the Technical Appendix, all results hold if p is a function of asset valuations and $\frac{\partial p}{\partial v_i} > 0$ and $\frac{\partial p}{\partial v_j} < 0$. The assumption that either i or j wins the entire asset is made to simplify the exposition of the model. Suppose that the court is able to divide the asset between the two players and the stochastic process is a probabilistic distribution over a set of possible divisions, as in Fang (2006). Then all model results continue to hold, as shown in the Technical Appendix.

the set of non-disputants, $N \setminus \{i, j\}$, at the enforcement decision-node at which i has won a ruling against j . This punishment is costly for both the disputant receiving it and the non-disputant imposing it. So conflict is a credible threat in post-adjudicative bargaining for player j when i wins adjudication if $c_{ij} < [1 - q(\alpha_i, \alpha_j)](1 - \phi)v_j$. Similarly, conflict is a credible threat in post-adjudicative bargaining for player i when j wins adjudication if $c_{ji} < q(\alpha_i, \alpha_j)(1 - \phi)v_i$. This yields the following disagreement payoffs for post-adjudicative bargaining if i wins:

$$w^A(i) = (w_i^A(i), w_j^A(i)) = \begin{cases} (w_i^B - k, w_j^B - k - c_{ij}) & \text{if } c_{ij} < [1 - q(\alpha_i, \alpha_j)](1 - \phi)v_j \\ (v_i - k, -k) & \text{if } c_{ij} \geq [1 - q(\alpha_i, \alpha_j)](1 - \phi)v_j \end{cases}$$

If j wins, then the disagreement payoffs for post-adjudicative bargaining are:

$$w^A(j) = (w_i^A(j), w_j^A(j)) = \begin{cases} (w_i^B - k - c_{ji}, w_j^B - k) & \text{if } c_{ji} < q(\alpha_i, \alpha_j)(1 - \phi)v_i \\ (-k, v_j - k) & \text{if } c_{ji} \geq q(\alpha_i, \alpha_j)(1 - \phi)v_i \end{cases}$$

As in the bilateral bargaining subgame, I assume that post-adjudicative bargaining results in the choice of the NBS, where i 's share of the asset is denoted by $x^A(i)$ when i wins and $x^A(j)$ when j wins.⁹

[INSERT FIGURE 1 HERE.]

1.2 Reputation and Equilibrium Selection

At any point in time every player knows all actions that have been previously chosen because all actions are observed by all players. In repeated-game environments, most equilibrium concepts (including both the Nash equilibrium and subgame perfect equilibrium concepts) allow players to condition their actions on all possible components of the history of previous play. The well-known “folk theorems” of infinitely-repeated games have established that such a framework can support a large diversity of equilibrium behavior (Fudenberg and Tirole, 2000, 150-160). For example, there certainly exist equilibria of the game in which the court is ineffective in resolving disputes. However,

⁹An alternative modeling approach would allow for the court to serve as an outside option in the bilateral bargaining framework so that players are bargaining in the shadow of the court (Fang, 2006; Muthoo, 1999). This would ensure that no cases are actually submitted to the court in equilibrium, but all other substantive results would continue to hold. Results are in the Technical Appendix.

the interesting theoretical question is how such an institution can be effective even though it lacks basic elements of authority like compulsory jurisdiction and enforcement. Since I want to examine the ability of states to build an endogenous system of jurisdiction and reciprocal enforcement of court judgments, I restrict attention to equilibria in which each player develops a reputation over time pertaining to her past behavior as an enforcer of Court judgments.

Broadly speaking, the history of the game allows all players to be classified as either “free-riders” or “providers.”¹⁰ All players start the game with reputations as providers. Suppose that a disputant has decided to engage in conflict after losing a court ruling. If a non-disputant n imposes costs that are at least as large as her enforcement cost threshold, \hat{e}_n , then n retains her reputation as a provider. These thresholds are exogenous in the model. In contrast, if n does not impose costs that meet or exceed this threshold (i.e. if $e_{nij} < \hat{e}_n$), then she develops a reputation as an enforcement free-rider forever. The only time that a non-disputant can refuse to punish conflict without losing her reputation as a provider is if the winner of a court ruling is himself an enforcement free-rider. That is, disinterested third parties are not required to enforce court judgments on behalf of free-riders in order to preserve their own reputations as providers of enforcement. As such, I examine equilibria with a grim trigger reputational mechanism: once a state earns a reputation as a free-rider by failing to provide sufficient enforcement for court judgments, it can never regain its reputation as a provider of enforcement.¹¹ This grim trigger creates the greatest possible incentives for states to preserve their reputations, which in turn leads to the strongest system of reciprocal enforcement that is supportable in equilibrium.

Given the complexity of the game, I begin by characterizing properties of equilibria in which the grim trigger reputation mechanism holds. I first describe bargaining outcomes and then certain properties of enforcement decisions in equilibrium. Next I characterize properties of equilibrium behavior when a pair of disputants have accepted jurisdiction of the court, and then consider the decision by states about whether to initially accept jurisdiction. The conjunction of these derived properties allows me to then prove the existence of equilibria in which states accept jurisdiction of the court, submit cases to it, and engage in reciprocal enforcement of court rulings. Finally, I examine the issue of equilibrium selection as a proxy for endogenous institutional choice.

¹⁰A formal definition of the reputation variable is in the Appendix.

¹¹Robustness of model results to this reputational mechanism is discussed below.

1.3 Bargaining and Enforcement

A key factor affecting the willingness of individuals to use the court and accept its jurisdiction is how the legal process affects the terms of the final agreement negotiated by the two disputants. So it is necessary to characterize explicitly the outcomes of both bilateral and post-adjudicative bargaining.

Lemma 1 *In equilibrium,*

$$\begin{aligned}
 x^B &= \frac{\phi + 2q(\alpha_i, \alpha_j)(1 - \phi)}{2} \\
 x^A(i) &= \begin{cases} x^B + \frac{c_{ij}}{2v_j} & \text{if } c_{ij} < [1 - q(\alpha_i, \alpha_j)](1 - \phi)v_j \\ 1 & \text{if } c_{ij} \geq [1 - q(\alpha_i, \alpha_j)](1 - \phi)v_j \end{cases} \\
 x^A(j) &= \begin{cases} x^B - \frac{c_{ji}}{2v_i} & \text{if } c_{ji} < q(\alpha_i, \alpha_j)(1 - \phi)v_i \\ 0 & \text{if } c_{ji} \geq q(\alpha_i, \alpha_j)(1 - \phi)v_i \end{cases}
 \end{aligned}$$

As shown in Lemma 1, equilibrium bargaining behavior is contingent on the expected punishment for engaging in post-adjudicative conflict, the relative strength of the players in conflict, and the values that they derive from the asset. Strength in conflict always translates into a better bargaining position, and the ability of the winner of adjudication to extract favorable settlements is increasing as noncompliance punishments for her opponent increase. In particular, if the punishment for conflict is sufficiently high, then post-adjudicative bargaining is effectively forestalled. Since engaging in conflict is no longer a credible choice for the loser of adjudication, this means that the winner has no incentive to compensate the loser and retains full control over the asset. This raises an important substantive point: players can have the opportunity to engage in post-adjudicative bargaining, but choose not to do so. If we observe in a particular case that disputants fully implement a court ruling, that does not necessarily mean that the ruling was fully binding and that players lacked the ability to negotiate a new settlement. This leads to an examination of factors that are going to affect the willingness of disinterested actors to punish noncompliance in equilibrium.

Lemma 2 *In equilibrium, a disinterested actor will not enforce a judgment if: (a) the winner of*

the court ruling is a free-rider; (b) the disinterested actor is a free-rider; or (c) the disinterested actor hasn't accepted jurisdiction of the court.

The first part of this result clearly establishes that if an enforcement free-rider wins adjudication, he can expect that no punishment will be imposed on his opponent if she decides to engage in conflict over the asset. The second part of the result establishes that once a player declines to enforce a court judgment, the player will refuse to enforce any subsequent judgments. Similarly, players who don't accept jurisdiction have no incentive to invest in the enforcement of court judgments because they will never be involved in a dispute that can be submitted to the court.

1.4 Behavior When Jurisdiction is Established

Suppose that both disputants have accepted the jurisdiction of the court. When will they want to submit disputes to the court? Adjudication is preferable to bilateral bargaining for each player if:

$$px^A(i)v_i + (1-p)x^A(j)v_i - k \geq x^B v_i \quad \text{for player } i \quad (1)$$

$$p[1-x^A(i)]v_j + (1-p)[1-x^A(j)]v_j - k \geq (1-x^B)v_j \quad \text{for player } j \quad (2)$$

Whether each constraint holds is a function of anticipated bargaining outcomes, which in turn depend on the enforcement reputations of the disputants and the magnitude of enforcement. The following result describes key characteristics of these submission decisions.

Lemma 3 *In equilibrium: (a) i and j never both want to submit a dispute; (b) free-riders will never submit cases to the Court; and (c) free-riders are more likely than providers to have cases filed against them.*

Since the adjudication process is essentially a costly lottery over the two possible post-adjudicative bargaining outcomes, $x^A(i)$ and $x^A(j)$, if player i finds this gamble preferable to bilateral bargaining, then it must be the case that player j prefers bilateral bargaining to adjudication, and vice versa. This is the key factor supporting part (a) above (cf. Allee and Huth, 2006; Fang, 2006). Part (b) asserts that free-riders will not want to submit cases to adjudication. By Lemma 2, whenever a free-rider is successful in adjudication, she knows that her opponent will

not be punished for engaging in conflict. So a free-rider gains no benefit from successful adjudication. Additionally, if her opponent is a provider of enforcement, then she knows that she will be constrained in post-adjudicative bargaining if her opponent wins. This ensures that free-riders never find adjudication to be profitable. Finally, part (c) establishes that free-riders are desirable targets for litigation by providers of enforcement. Successful litigation against a free-rider induces a privileged post-adjudicative bargaining position. In contrast, if a provider loses a case against a free-rider, then the provider is not constrained in post-adjudicative bargaining because disinterested actors will not be willing to punish noncompliance.

Note that the combination of parts (b) and (c) of Lemma 3 suggests a powerful incentive for players who have accepted jurisdiction of the court to provide enforcement for court judgments when they are disinterested parties. The fact that free-riders never submit cases to the court means that the availability of the court is never beneficial to free-riders. Additionally, the fact that free-riders are desirable targets for litigation by providers of enforcement means that free-riders are at increased risk of being hurt by the availability of the court as an institution, relative to providers of enforcement. Suppose that the parameters of the game are such every player expects that with some positive probability she will be involved in a dispute that gets referred to the court. Then the following result establishes that clear incentives exist for states to preserve their reputations as providers of enforcement:

Lemma 4 *When there is a positive probability of adjudication, the expected utility for a player from being involved in a dispute is higher if she has a reputation as a provider than if she is an enforcement free-rider.*

So it is clearly beneficial for a player who has accepted jurisdiction of the court to have a reputation as a provider of enforcement if she expects that at some future period she will be involved in a case that gets referred to the court. In contrast, if a player knows that she will never be involved in a dispute that goes to the court, then her enforcement history has no effect on her expected utility because the only possible bargaining outcome, x^B , is not affected by her enforcement reputation. The combination of Lemmata 2 and 4 allows us to examine the willingness of disinterested players to enforce court judgments through the imposition of costly punishments.

Proposition 1 *In equilibrium, an enforcer who has accepted jurisdiction of the court is willing to impose costly punishments in order to preserve her reputation, and the upper bound on the costs that she is willing to impose is increasing in her expected benefit from preserving her reputation as a provider of enforcement.*¹²

So disinterested players will be willing to provide enforcement in equilibrium. Additionally, as the marginal benefit of being a provider (as opposed to a free-rider) increases, so does the willingness of players to bear the costs of enforcement. It is now possible to examine the strategic incentives of players to accept jurisdiction.

1.5 Endogenous Jurisdiction Decisions

In order to examine the strategic incentives of states to accept jurisdiction of the court, I restrict attention to cases in which there is a high degree of obligation to a court's rulings. When an institution is characterized by a strong enforcement regime, the large punishments for noncompliance induce a high degree of obligation: states will be bound by a legal ruling of the court (Abbott et al., 2000). This leads to the following definition of a high obligation system (HOS) within this model:

Definition. An international legal regime is a *high obligation system* (HOS) if the punishment that each player n receives for noncompliance when she loses a court ruling against every player m is always higher than her expected utility from conflict (i.e. $c_{mn} \geq q(\alpha_n, \alpha_m)(1 - \phi)$ for all $m \in N \setminus \{n\}$ and for all $n \in N$).

So if an international legal system is an HOS, then noncompliance punishments are sufficiently large that court rulings are always implemented fully without any subsequent attempts at renegotiation.¹³ The court's ruling is in effect fully binding and winners of litigation are unwilling to compensate losers. How does a player's strength in conflict affect her willingness to seek adjudication in an HOS?

Lemma 5 *In an equilibrium with an HOS, each player's (a) willingness to submit a case to the court and (b) expected benefit from availability of the court when matched against a particular opponent are both decreasing in her own strength and increasing in the strength of her opponent.*

¹²This upper bound is explicitly characterized in the Appendix.

¹³While we might interpret an HOS as an attribute of a particular institution, we could also interpret it as describing a particular area of law or subset of individuals, as discussed below.

When the ruling of the court is fully binding, the court is essentially an imperfect substitute for conflict: as the value of conflict for a particular player increases (via an increase to her α -value), her willingness to use the court declines. This substitution effect will be a key characteristic driving jurisdiction decisions in high obligation legal systems. Additionally, the greater the value of α_n , the less that player n benefits from the availability of the court in an HOS. Indeed, players who are ‘weakest’ in conflict (i.e. have the lowest values of α_n) derive the greatest benefit from the availability adjudication relative to bilateral bargaining without an institution, while players who are ‘strongest’ derive the least benefit. This leads to an examination of the equilibria of the game when players are able to choose whether to accept the court’s jurisdiction.

Proposition 2 *(a) There always exists a ‘no jurisdiction equilibrium’ in which all players refuse the jurisdiction of the court; and (b) all other possible equilibria with an HOS are monotonic: if a player with an α_n probability of success in conflict accepts jurisdiction, then all players with a lower probability of success in conflict will also accept jurisdiction.*

The decision about whether to accept jurisdiction of the court is inherently strategic in nature. If no other player accepts jurisdiction, then the court can never be used and there is no incentive to accept jurisdiction of the court. This logic ensures that there always exists a “no jurisdiction equilibrium” in which no players accept jurisdiction of the court. It is also possible for the game to have other types of equilibria, including a “universal jurisdiction equilibrium” in which all players accept jurisdiction of the court, and a “partial jurisdiction equilibrium” in which some players accept jurisdiction while others do not. As part (b) above establishes, if such a partial jurisdiction equilibrium with an HOS exists, there must be two groups of players: relatively weak players (with low α -values) who accept jurisdiction, and relatively strong players (with high α -values) who refuse jurisdiction.

The conjunction of all of the equilibrium properties derived above allow us to demonstrate an important existence result.

Proposition 3 *There exists a non-degenerate set of parameter values and distribution functions, $\{\alpha_1, \dots, \alpha_{|N|}, k, p, F(v), \delta, |N|\}$, for which there exist equilibria in which: there is a high obligation system (i.e. states endogenously provide enforcement such that court rulings are perfectly imple-*

mented); multiple states accept jurisdiction of the court; and states submit cases to the court.

This result does not fully characterize the necessary and sufficient conditions for a court to exist in which there is high degree of obligation to legal rulings. However, it does clearly establish that such institutions are possible, even though they lack compulsory jurisdiction and enforcement authority. Elements of the Proof of Proposition 3 provide intuition about when courts are likely to be effective in resolving disputes. The first key element driving the proof is that individuals that accept jurisdiction are relatively equal with regard to their strength parameter. When there are large asymmetries in strength, the strongest player has little (and sometimes no) incentive to accept jurisdiction since she can gain a lot through bilateral bargaining. This suggests that courts with strong enforcement regimes are more likely when they are created by a group of individuals that are relatively similar with regard to strength.

The second key factor driving the Proof of Proposition 3 is that case submission behavior enhances the classical efficiency of outcomes. For example, consider a player n who is deciding whether to accept jurisdiction of the court. Player n knows that if she is involved in a dispute and the case is not submitted to the court, then bilateral bargaining will take place. This gives player n the same payoff as if she had never accepted jurisdiction in the first place. In contrast, if player n submits a case, it must be because she places a high value on the asset and is likely to win adjudication; otherwise, she wouldn't be willing to bear the cost of litigation. Finally, if a case is submitted by player n 's opponent, then player n 's expected valuation of the asset is $E[v]$. The screening process that takes place due to litigation costs, k , ensures that the expected value of the asset when n sues is larger than her expected value when she is sued by someone else.

This means that players are making “trades” over their future selves by accepting jurisdiction. By committing to the ability to both sue and be sued, players are trading favorable court rulings on issues that they care a lot about with unfavorable rulings on issues that they care only moderately about.¹⁴ If the probability of high-value assets is sufficiently large (i.e. there is sufficiently high density on the upper tail of the distribution), then accepting jurisdiction is optimal. However, it is important to note that this “trading” dynamic is generated purely by selection effects and not by strategic court rulings (cf. Benvenisti, 2004). That is, even though court rulings are not affected

¹⁴Note that this holds *in expectation*. In equilibrium there is always positive probability that a state will lose a case that it cares a lot about and win a case that it cares little about.

by efficiency concerns (i.e. p is not a function of asset valuations), strategic case submission means that the institution can enhance classical efficiency. This creates incentives for states to accept jurisdiction of the court.

1.6 Equilibrium Selection as Institutional Choice

The model above presents us with the possibility of three different types of equilibria in a high obligation system. The no jurisdiction equilibrium always exists, so if a partial jurisdiction or universal jurisdiction equilibrium also exists, then there can be multiple equilibria for a given set of parameters of the game. Note that each of these equilibria corresponds to a different real-world institutional configuration. A “no jurisdiction equilibrium” is essentially a world that lacks a court. In contrast, a “universal jurisdiction equilibrium” is a world in which all individuals accept jurisdiction of a court and abide by its rulings. Finally, a “partial jurisdiction equilibrium” is a more moderate scenario in which some players accept and abide by the rulings of a court, while other players refuse to recognize the validity of the court and its actions. When multiple possible institutional configurations are possible, how do the players evaluate these competing possibilities? Would any of the players find it beneficial to invest in establishing a court with jurisdiction and enforcement, as opposed to living in a world without a court? One way to examine such an equilibrium selection question is to consider the payoffs of the various players across equilibria to examine which players have the greatest incentives to invest resources in establishing a particular equilibrium (Banks and Calvert, 1992; Calvert, 1995). This yields the following result.

Proposition 4 *If an HOS is in place and multiple equilibria are possible, then the universal jurisdiction equilibrium is preferred by all players to the partial jurisdiction equilibrium, which is in turn (weakly) preferred by all players to the no jurisdiction equilibrium.*

So if the universal jurisdiction equilibrium is possible, it is clearly optimal from the perspective of all players. However, if universal jurisdiction is not feasible, then the partial jurisdiction of the court is preferred to the no jurisdiction equilibrium by all players who would accept the court’s jurisdiction in the partial jurisdiction equilibrium. Each player who would refuse jurisdiction is indifferent as to which equilibrium prevails because the institutional choice of the other players does not affect her own payoff. Proposition 4 firmly establishes that if institutional change is possible

in a high obligation system (i.e. if multiple equilibria exist), then it is hindered by coordination problems, not by distributional problems. We can now consider how the incentives to switch between the various equilibria differ across the players in the game.

Proposition 5 *If an HOS is in place and multiple equilibria are possible, then: (a) when the no jurisdiction equilibrium is in place, incentives to switch to a partial jurisdiction or a universal jurisdiction equilibrium are both decreasing in α_n ; and (b) when the partial jurisdiction equilibrium is in place, the incentive to switch to a universal jurisdiction equilibrium is decreasing in α_n .*

This result shows unambiguously that the players with the greatest incentive to press for expansion of the court’s jurisdiction in a high obligation system are those players who are weakest in conflict and stand to gain the most from the availability of the court. This prompts two substantive points. First, we should expect these weaker players to be the most active in establishing institutions for adjudication in high obligation systems. Second, once such institutions are established, we should also expect these weaker players to be the most active in pushing for expansions in the jurisdiction of the court.

2 Discussion of Results and Robustness

Consider once more the Bakassi dispute between Nigeria and Cameroon. A conventional account of courts as “deciders” would argue that the ICJ was decisive in ending the conflict because it issued a legally binding ruling that created a new status quo between the two nation-states. An informational account would suggest that litigation revealed new information—for example, about the relative resolve of each state to win the dispute—that helped to resolve the conflict. My theory yields a different perspective: the ICJ ruling meant that states that had previously paid little attention to the decades-long conflict could now coordinate on which side to support during subsequent negotiations. The ruling did not itself “decide” the issue or reveal new information; rather, it changed the bargaining positions of the two countries involved in the dispute by opening the door to coordinated enforcement by disinterested states.

This theoretical structure departs significantly from previous accounts of endogenous self-enforcing courts (e.g. Carrubba, 2005, 2009; Milgrom, North and Weingast, 1990). These earlier

works examine the role of an institution in regulating cooperative interactions between individuals in Prisoners' Dilemma (PD) and collective action games. While actors in such games have short-term incentives to cheat trading partners, they also have long-term incentives to promote trust since mutual cooperation creates higher payoffs than mutual defection. I examine the role of courts in regulating a fundamentally different type of strategic interaction: distributive conflicts. In each time period, disputants have directly opposing preferences over the division of a common asset. One player's gain is a direct loss for his rival, and enforcing court rulings imposes a direct cost on disinterested individuals. Since the use of the institution does not create a cooperative surplus, the "value" that individuals derive from being a member of the institution is driven by a fundamentally different mechanism than in past models of courts. Additionally, I assume that enforcement imposes a direct costs on players who uphold the decision of the court. This differs from iterated PD or collective action games in which punishment consists of implementing a dominant strategy (i.e. defection) and means that the difficulty of supporting an enforcement regime is higher in my model than in past accounts.

In the model above, each state develops a reputation over time regarding its enforcement behavior, which endogenously affects how it is treated by other states in future disputes. I assume that there is an infinite reputational loss for a one-time failure to enforce a court judgment. Alternatively, we might expect that states or individuals can develop bad reputations in the short-run, but have the opportunity to regain their good reputations over time (McGillivray and Smith, 2008). Allowing for such finite periods of reputation loss does not change any of the substantive results of the model.¹⁵ Similarly, a key assumption supporting the willingness of non-disputants to enforce judgments is that they can refuse to impose punishments on behalf of free-riders without suffering a loss of reputation. However, suppose that disinterested players are required to enforce all judgments equally in order to preserve their reputation. Then the enforcement system totally collapses: since free-riders will no longer be disadvantaged in litigation, no player will be willing to enforce court judgments in order to preserve its reputation. In contrast, suppose that enforcement providers are required to provide some enforcement when a free-rider wins adjudication, but they are required to provide less than if the winner were a provider. All of the model results continue to

¹⁵See Technical Appendix for this result and other robustness checks discussed below.

hold. Finally, disputants may be punished for conflict for reasons that are exogenous to the model. All of the model results are robust to a framework in which states are punished for any form of conflict, provided that: (1) states are expected to impose larger punishments for conflict following a court ruling in order to preserve their reputations as providers; and (2) conflict is still sometimes a credible threat despite these exogenous punishments.

Note that key elements of the reputational framework are each player’s enforcement cost threshold, \hat{e}_n —that is, the level of enforcement that player n must provide in order to preserve her reputation as a provider of enforcement. Even though these thresholds are exogenous, the model can still accommodate a tremendous degree of variety in enforcement regimes. For example, we might believe that relatively weak and/or poor individuals should be expected to bear less of the enforcement burden than relatively strong and/or rich players.¹⁶ So not all players need to have the same threshold. Of course, the fact that these thresholds are exogenous means that this model does not comment on how expectations of obligations are formed or which set of expectations is optimal or to be expected empirically. This constitutes an interesting area for future research.

It is not self-evident why individuals have incentive to accept the jurisdiction of courts that are neither “deciders” nor “information-providers.” A key theoretical innovation of this model is that it demonstrates how strategic case submission and stochastic court rulings can enhance the classical efficiency of Pareto efficient bargaining outcomes. Even though the court is a simple “coin-flipper” and does not take asset valuations into account when issuing rulings, accepting jurisdiction of the court allows an individual to make efficiency-enhancing “trades” over his future selves, winning high-value disputes in exchange for losing low-value disputes. Such trades are possible because litigation is a screening device: individuals only sue when they derive relatively high value from the asset in dispute.

3 The Case of the International Court of Justice

The International Court of Justice is often believed to be a “toothless” institution because it lacks effective jurisdiction over international disputes and formal enforcement mechanisms. Additionally, as described above, the Court has limited ability to reveal private information to litigants or

¹⁶I thank Susan Hyde for this insight.

domestic audiences. Nonetheless, the Court is often successful in resolving contentious disputes (Schulte, 2004). Since the Court is neither a “decider” nor an “information-provider,” what explains its effectiveness and continued existence?

The practice of the ICJ yields strong support for the coordination mechanism highlighted in the model above. Even in difficult cases in which a party to a dispute refuses to comply immediately and fully, the issuance of a judgment by the Court usually opens the door to third-party involvement. These third parties often impose great diplomatic pressure to enforce the Court’s decisions, as well as overseeing negotiations over outcomes that were not previously acceptable to the disputants. As the Bakassi example illustrates, Court decisions result in post-adjudicative bargaining in over 60 percent of cases.¹⁷ Many rulings spur a return to negotiations in which the winner of the Court’s judgment makes concessions to the loser. Also, many Court cases consist of two states making competing claims over which legal principles should hold in allocating ownership of an asset. Once the Court has ruled on such principles, the disputants must subsequently return to the bargaining table in order to negotiate a final settlement.¹⁸ Judgments often contain explicit provisions urging litigants to reach a negotiated settlement in accordance with the principles established by the Court.¹⁹ In my model, the key factor differentiating these post-adjudicative negotiations from the bilateral bargaining that could have taken place in lieu of appeals to the Court is that open defiance of the Court’s ruling through the use of conflict can trigger punishment by disinterested actors.

While such punishments for noncompliance are off-the-equilibrium-path in the model above, it is worth considering whether blatant defiance of the ICJ’s rulings has actually triggered punishments in practice. Countries usually face positive costs from refusing to comply with the judgments of the ICJ (Paulson, 2004; Schulte, 2004). These costs include diplomatic pressure at the bilateral or multilateral level, trade sanctions, or even domestic pressure from an electorate or interest groups (Allee and Huth, 2006). For example, Australia and New Zealand sued France in 1973, challenging the legality of French atmospheric nuclear tests in the South Pacific. The ICJ ordered France to temporarily cease all tests.²⁰ France quickly announced that it would not comply, prompting formal opposition from governments all over the world, including the United Kingdom and numerous

¹⁷Data were collected by the author.

¹⁸E.g., *North Sea Continental Shelf*, Judgment on the Merits of 20 February 1969.

¹⁹E.g., *Case Concerning the Gabcikovo-Nagymaros Project*, Judgment on the Merits of 25 September 1997.

²⁰*Nuclear Tests Case*, Order on Interim Measures of Protection of 22 June 1973.

countries in the South Pacific and Latin America. Domestic constituency groups exerted pressure both internally and externally: the French clergy attacked military policy, while British trade unions boycotted French goods (Lewis, 1973; Robertson, 1973). Additionally, French noncompliance was highly criticized within international organizations (Trumbull, 1973). France soon bowed to the pressure and pledged to refrain from any future atmospheric nuclear tests, illustrating that even powerful states often find compliance with an ICJ judgment to be less costly than defiance.²¹

The ICJ operates on the principle of consent, so states must explicitly accept the jurisdiction of the Court in order to be involved in litigation.²² The principle of consent to jurisdiction does not mean that a state must consent to every single case to which it is a party before adjudication can proceed. Indeed, the analytical results above imply that once states are involved in a given dispute, they will never both want to submit it to the court. This accords with the majority of ICJ litigation: in over two-thirds of ICJ cases states have nominally accepted jurisdiction of the Court but argue that jurisdiction does not apply to the contested dispute.²³ There must exist an ostensible basis for jurisdiction in order for a state to submit a case to the Court, but the Court can rule that it has the authority to hear a particular case even if one of the disputants argues that the Court lacks jurisdiction. This means that accepting the jurisdiction of the Court enables a state to both sue and be sued, even if the state does not want the Court to rule on a particular case.

Thorough empirical testing of the model results above regarding the relationship between acceptance of jurisdiction and strength in conflict should be limited to issue-areas or subsets of states that constitute high obligation systems. However, past empirical research work in international relations provides some initial support for my model. Powell and Mitchell (2007) analyze acceptance of jurisdiction of the ICJ over time. While they find no relationship between military power and initial acceptance of jurisdiction, they do find that over time powerful states are significantly more likely to renounce jurisdiction of the Court than weaker states. Clearly powerful states derive less value than weaker states from the use of jurisdiction as a commitment device.

This leads to a broader question about institutional creation: why did major powers like the

²¹Even the recent U.S. Bush Administration has been pressured into complying with ICJ rulings (Kirgis, 2005).

²²See Gill (2003, 67-89).

²³Data were collected by the author.

United States and the United Kingdom initially support the creation of the ICJ? It is worth noting that the ICJ was negotiated, along with the Security Council and General Assembly, as part of the broader United Nations system. It is beyond the scope of this analysis to conduct a historical study of the extent to which major powers were supportive of the court during these negotiations. However, it is possible that strong states believed that their support for the Court was necessary to ensure their greater powers within political organs of the UN, like the veto power of the permanent five members of the Security Council. Vigorous domestic support within the U.S. for the notorious Connolly Amendment, which severely restricted the terms of the U.S. acceptance of ICJ jurisdiction, suggests that there was clearly a belief within the U.S. foreign policy elite that the court would significantly constrain the U.S. in future disputes (Murphy, 2004, 250-255). Additionally, both China and Russia were highly disdainful of the court from the outset. Finally, note that there is a fundamental difference between incentives to change institutions and the availability of resources to do so. This distinction is not captured in the results above. For example, both Belgium and Botswana can probably expect to gain much through the expansion of international adjudication. However, Botswana most likely lacks the resources to invest in the institution-building required to coordinate a change in equilibrium. To the extent that changing institutions and expectations about the behavior of others is costly and time-consuming, we should expect for leadership to come from countries that are rich in economic resources but weak in bilateral conflict, a pattern noticeably present in the creation of recent courts, such as the International Criminal Court.

4 Conclusion

The analysis above presents a stark model of a court that operates in an anarchic environment and that is neither a “decider” nor an “information-provider.” By assuming away past explanations for the existence of courts, we can identify another key function of courts: the coordination of endogenous punishments by disinterested states. These endogenous noncompliance costs allow the winner of adjudication to lock in favorable positions for future bargaining interactions. So even though the court’s ruling has no direct binding effect, the expectation of endogenous enforcement by disinterested parties ensures that legal rulings affect distributive outcomes.

Additionally, the theory above demonstrates that a court that is neither a decider nor an

information-provider can be a self-enforcing institution—that is, individuals in an anarchic environment will accept the jurisdiction of the court to rule on future disputes, and invest in costly enforcement for court rulings in which they have no inherent interest. Disinterested individuals are willing to invest in such costly punishments for noncompliance to ensure that they preserve their reputations as “providers” of enforcement so that they can profitably appeal to the court in the future. Additionally, accepting jurisdiction of the court allows an individual to make efficiency-enhancing “trades” over his future selves, winning high-value disputes in exchange for losing low-value disputes. Such trades are possible because litigation is a screening device: individuals only sue when they derive relatively high value from the asset in dispute.

In closing, it is important to emphasize that the starkness of the model is not intended to deny the important role that courts can play in changing status quo outcomes (when their rulings are enforced) and revealing information to disputants or outside audiences. Rather, the starkness of the model is necessary in order for us to identify another mechanism of dispute resolution. This alternative view of courts is sufficient to ensure the existence of self-enforcing judicial institutions. My analysis does not invalidate past accounts of the role of courts in resolving disputes; rather it provides a complimentary account of the way that courts can be used in order to support the development of governance.

Appendix

Definition of the Reputation Variable. For each $n \in N$ and history of actions h^t :

$$\rho_n(h^t) \equiv \begin{cases} 0 & \text{if } \exists t' < t \text{ s.t. for } t': n \in N \setminus \{i, j\}, n \text{ reached an enforcement decision-node} \\ & \text{at which } m \in \{i, j\} \text{ won adjudication, and } e_n < \hat{e}_n \rho_m(h^{t'}); \text{ and} \\ 1 & \text{otherwise.} \end{cases}$$

Let a reputation vector be denoted by: $\rho = (\rho_n, \rho_m)$.

General Definitions.

- Jurisdiction: Let $r_n \in \{0, 1\}$ and $r_n = 1$ iff n accepts jurisdiction of the Court. Define \mathbf{X} as the set of player who accept jurisdiction (i.e. $\mathbf{X} \equiv \{n \in N | r_n = 1\}$) and \mathbf{Y} as the set of players who reject jurisdiction (i.e. $\mathbf{Y} \equiv \{n \in N | r_n = 0\}$).
- Case submission: Define case submission regions as: $I(\rho) \equiv \{(v_i, v_j) | i \text{ submits}\}$ and $J(\rho) \equiv \{(v_i, v_j) | j \text{ submits}\}$.
- Expected payoffs Let $W_n(\cdot)$ denote the expected payoff to player n of being a disputant. If player n is matched in a dispute with player m , let $V_n(\rho | \alpha_m)$ denote player n 's expected utility when jurisdiction is established given ρ . Let $B_n(\alpha_m)$ denote n 's expected utility when jurisdiction is not established. Then:

$$W_n(\cdot) = \begin{cases} \frac{1}{|N|-1} \sum_{m \in N \setminus \{n\}} B_n(\alpha_m) & \text{if } r_n = 0; \text{ and} \\ \frac{1}{|N|-1} \left[\sum_{m \in \mathbf{X} \setminus \{n\}} V_n(\rho | \alpha_m) + \sum_{m \in \mathbf{Y}} B_n(\alpha_m) \right] & \text{if } r_n = 1. \end{cases}$$

Let $\Delta_n(\rho | \alpha_m) \equiv V_n(\rho | \alpha_m) - B_n(\alpha_m)$ denote player n 's expected benefit from availability of the Court when matched against player m . To consider matching against a subset of players, S , let $V_n(\rho | S) = E_{m \in S}[V_n(\rho | \alpha_m)]$, $B_n(S) = E_{m \in S}[B_n(\alpha_m)]$, and $\Delta_n(\rho | S) = E_{m \in S}[\Delta_n(\rho | \alpha_m)]$.

Proof of Lemma 1. Define the set of possible bargaining agreements as: $X \equiv \{(x_i, x_j) | x_i \in [0, 1] \wedge x_j = 1 - x_i\}$. Let $U_k(x_k)$ denote player k 's one-period utility from a share x_k . By definition, the NBS is the agreement that solves the following optimization problem: $\max_{(x_i, x_j) \in X} (U_i(x_i) - w_i)(U_j(x_j) - w_j)$. Disagreement payoffs (w_i, w_j) for each subgame are provided in the text. As

shown in Figure 1, for bilateral bargaining subgames, $(U_i(x_i), U_j(x_j)) = (x^B v_i, (1 - x_B) v_j)$. For post-adjudicative bargaining games, $(U_i(x_i), U_j(x_j)) = (x^A(i) v_i - k, (1 - x_A(i)) v_j - k)$ when i wins and $(U_i(x_i), U_j(x_j)) = (x^A(j) v_i - k, (1 - x_A(j)) v_j - k)$ when j wins. There is a unique NBS for every bargaining subgame in the model (Muthoo, 1999, 22-25). ■

Proof of Lemma 2. Consider an arbitrary disinterested actor n who reaches a decision-node in period t at which she must decide how much enforcement to provide. WLOG, suppose that disputant i has won a court ruling against disputant j . First, note that in equilibrium $e_n \in \{0, \hat{e}_n\}$ at this decision-node.

- (a) Suppose that i is a free-rider. Then $e_n = 0$ is optimal since it doesn't affect ρ_n .
- (b) Suppose that n is a free-rider. Then $\rho_n(h^{t'}) = 0$ for all $t < t'$. So $e_n = 0$ is optimal.
- (c) Suppose n has not accepted jurisdiction. Then W_n is invariant to ρ_n and $e_n = 0$ is optimal. ■

Proof of Lemma 3. (a) Eqns (1) and (2), are equivalent to:

$$[p x^A(i) + (1 - p) x^A(j) - x^B] v_i \geq k \quad \text{for player } i \quad (3)$$

$$[x^B - p x^A(i) - (1 - p) x^A(j)] v_j \geq k \quad \text{for player } j \quad (4)$$

Both constraints can't hold at the same time.

- (b) If player i is a free-rider, then there is no enforcement if he wins; i.e. $c_{ij} = 0$. So $x^A(i) = x^B$ and $x^A(j) \leq x^B$, which means that (3) fails. An analogous argument holds for player j .
- (c) Suppose that j is a provider. If player j wins, then the outcome, $x^A(j)$, does not depend upon whether player i is a free-rider. If player i wins, then the outcome, $x^A(i)$, is lower if i is a free-rider than if he is a provider. So (4) holds for a larger set of values of v_j if i is a free-rider than if he is a provider. An analogous argument holds for player j . ■

Proof of Lemma 4. Choose an arbitrary pair of players (n, m) who have accepted jurisdiction.

Suppose that the probability of trial is positive. Then:

$$\begin{aligned}
V_n(\rho|\alpha_m) &= Pr(i = n)V_n(\rho|i = n) + Pr(i = m)V_n(\rho|i = m) \\
&= \frac{1}{2} \left[\int \int_{I(\rho|i=n) \cup J(\rho|i=n)} [(px_{i=n}^A(i) + (1-p)x_{i=n}^A(j) - x_{i=n}^B)v_i - k] dF(v_i)dF(v_j) \right. \\
&\quad + \int \int_{I(\rho|i=m) \cup J(\rho|i=m)} [(x_{i=m}^B - px_{i=m}^A(i) - (1-p)x_{i=m}^A(j))v_j - k] dF(v_i)dF(v_j) \\
&\quad \left. + \int \int_{[0,1]^2} x_{i=n}^B v_i dF(v_i)dF(v_j) + \int \int_{[0,1]^2} (1 - x_{i=m}^B)v_j dF(v_i)dF(v_j) \right] \tag{5}
\end{aligned}$$

By the Proof of Lemma 3, expansions in $I(\rho)$ raise i 's utility and decrease j 's utility; the opposite holds for $J(\rho)$. Then parts (b) and (c) of Lemma 3 establish the result. ■

Proof of Proposition 1. Consider a player n who has accepted jurisdiction of the court and reaches a decision-node at which she must decide whether to enforce a ruling in which the winner is a provider of enforcement. In equilibrium, the probability of arriving at such a decision-node is zero. Suppose that player n adopts a strategy in which she always pays the enforcement threshold cost when the winner of the dispute is a provider, and does not enforce otherwise. Then her expected utility from arriving at this decision-node is: $-\hat{e}_n + \sum_{t=t'+1}^{\infty} \delta^{t-t'} \frac{2}{|N|} W_n(\rho_n = 1)$. (Note that this weakly dominates a strategy in which n enforces at this node, but not necessarily at other nodes.)²⁴ In contrast, n 's expected utility from providing zero enforcement at this decision-node is: $\sum_{t=t'+1}^{\infty} \delta^{t-t'} \frac{2}{|N|} W_n(\rho_n = 0)$. So player n will enforce iff:

$$\begin{aligned}
\hat{e}_n &\leq \sum_{t=t'+1}^{\infty} \delta^{t-t'} \frac{2}{|N|} W_n(\rho_n = 1) - \sum_{t=t'+1}^{\infty} \delta^{t-t'} \frac{2}{|N|} W_n(\rho_n = 0) \\
&= \frac{\delta}{1-\delta} \frac{2}{|N|} \frac{1}{|N|-1} \sum_{m \in \mathbf{X} \setminus \{n\}} [V_n(\rho_n = 1|\alpha_m) - V_n(\rho_n = 0|\alpha_m)]
\end{aligned}$$

■

Proof of Lemma 5. (a) By Lemma 1, $x^A(i) = 1$ and $x^A(j) = 0$ in an HOS. So case submission

²⁴This strategy yields an expected utility of $-\hat{e}_n + \sum_{t=t'+1}^{\infty} \delta^{t-t'} \frac{2}{|N|} W_n(\rho_n(h^t))$.

constraints are: $(\dagger) \equiv (p - x^B)v_i - k \geq 0$ and $(\ddagger) \equiv (x^B - p)v_j - k \geq 0$. Note that $\frac{\partial}{\partial \alpha_i}(\dagger) = -v_i(1 - \phi)\frac{\partial q}{\partial \alpha_i} < 0$, $\frac{\partial}{\partial \alpha_j}(\dagger) = -v_i(1 - \phi)\frac{\partial q}{\partial \alpha_j} > 0$, $\frac{\partial}{\partial \alpha_i}(\ddagger) = v_j(1 - \phi)\frac{\partial q}{\partial \alpha_i} > 0$, and $\frac{\partial}{\partial \alpha_j}(\ddagger) = v_j(1 - \phi)\frac{\partial q}{\partial \alpha_j} < 0$. (b) On the equilibrium path, states that accept jurisdiction are always providers because $\rho_n(h^1) = 1$ and enforcement decision-nodes are never reached in equilibrium play. So by eqn (5), player n 's expected benefit from availability of the court when matched with m is:

$$\Delta_n(\rho_n = 1|\alpha_m) = \frac{1}{2} \left[\int \int_{I(1,1|i=n) \cup J(1,1|i=n)} [(p - x_{i=n}^B)v_i - k] dF(v_i)dF(v_j) + \int \int_{I(1,1|i=m) \cup J(1,1|i=m)} [(x_{i=m}^B - p)v_j - k] dF(v_i)dF(v_j) \right]$$

Suppose $i = n$. Then an increase in $\alpha_n (= \alpha_i)$ contracts $I(1,1|i = n)$ and expands $J(1,1|i = n)$ by (a). Similarly, an increase in $\alpha_m (= \alpha_j)$ expands $I(1,1|i = n)$ and contracts $J(1,1|i = n)$. Additionally, (a) shows that the first integrand is decreasing in α_n and increasing in α_m at all points. So the first term of $\Delta_n(1|\alpha_m)$ is unambiguously decreasing in α_n and increasing in α_m . Now suppose $i = m$ and apply the same proof strategy to the second term of $\Delta_n(1|\alpha_m)$. ■

Proof of Proposition 2. (a) Consider an arbitrary n and suppose $r_n = 0$ for all n . Deviation by one player to $r_n = 1$ does not affect her expected payoff because all outcomes continue to be x_B .

(b) Consider a jurisdiction strategy profile, r , s.t. $\mathbf{X} \neq \emptyset$ and $\mathbf{Y} \neq \emptyset$. Player $y \in \mathbf{Y}$ has no incentive to deviate from r by accepting jurisdiction iff $EU_y(r) \geq EU_y(r_y = 1, r_{-y})$: $B_y(N \setminus \{y\}) \geq \frac{|\mathbf{X}|}{|N|-1}V_y(\rho|\mathbf{X}) + \frac{|\mathbf{Y}|-1}{|N|-1}B_y(\mathbf{Y} \setminus \{y\}) \Leftrightarrow 0 \geq V_y(\rho|\mathbf{X}) - B_y(\mathbf{X}) = \Delta_y(\rho|\mathbf{X})$. Player $x \in \mathbf{X}$ has no incentive to deviate from r by rejecting jurisdiction iff $EU_x(r) \geq EU_x(r_x = 0, r_{-x})$: $\frac{|\mathbf{X}|-1}{|N|-1}V_x(\rho|\mathbf{X} \setminus \{x\}) + \frac{|\mathbf{Y}|}{|N|-1}B_x(\mathbf{Y}) \geq B_x(N \setminus \{x\}) \Leftrightarrow \Delta_x(\rho|\mathbf{X} \setminus \{x\}) = V_x(\rho|\mathbf{X} \setminus \{x\}) - B_x(\mathbf{X} \setminus \{x\}) \geq 0$

Let x^* denote the player $x \in \mathbf{X}$ with the largest value of α_x . Suppose that there exists a player $y' \in \mathbf{Y}$ s.t. $\alpha_{y'} < \alpha_{x^*}$. Note the following: $\Delta_{x^*}(\rho|\mathbf{X} \setminus \{x\}) = \frac{1}{|\mathbf{X}|-1} \sum_{j \in \mathbf{X} \setminus \{x^*\}} \Delta_{x^*}(\rho|\alpha_j) \geq 0$ and $\Delta_{y'}(1|\mathbf{X}) = \frac{1}{|\mathbf{X}|} \sum_{j \in \mathbf{X}} \Delta_{y'}(\rho|\alpha_j) \leq 0$. By Lemma 4(b), $\Delta_{x^*}(\rho|\alpha_j) < \Delta_{y'}(\rho|\alpha_j)$ for all $j \in \mathbf{X} \setminus \{x^*\}$ and $\Delta_{y'}(\rho|\alpha_j) < \Delta_{y'}(\rho|\alpha_{x^*})$ for all $j \in \mathbf{X} \setminus \{x^*\}$. So $\Delta_{y'}(\rho|\mathbf{X}) > \Delta_{x^*}(\rho|\mathbf{X} \setminus \{x\}) \geq 0$, which is a contradiction. This implies the monotonicity of jurisdiction in α_n . ■

Proof of Proposition 3. The proof is broken into two parts. First, we suppose an HOS is in

place and then show that there exist parameter values s.t. states accept jurisdiction of the court and submit cases to it. Second, we show that the HOS is sustainable given these parameter values.

(1.) Suppose an HOS. Consider a strategy profile in which all players accept jurisdiction of the Court (i.e. $\mathbf{X} = N$). Let n denote the strongest state (i.e. $\alpha_n = \max_{x \in \mathbf{X}} \{\alpha_x\}$). Let m denote the weakest state (i.e. $\alpha_m = \min_{x \in \mathbf{X}} \{\alpha_x\}$). Define the probability that the Court rules in favor of player i as follows: $p \equiv x_{i=n}^B + \epsilon$ such that $\epsilon \in \left(\frac{2k}{1-E[v]}, 1 - x_{i=n}^B\right)$. (Note that for a given set of parameters of the game, the value of p is still fixed across all disputes and is exogenous. Note that we can always choose parameters and a distribution function such that $\frac{2k}{1-E[v]} < 1 - x_{i=n}^B$.) Then $x_{i=m}^B < x_{i=n}^B < p$, so a state will never want to submit a case to the Court when it is assigned to role j (i.e. $J(1, 1|i = n) = J(1, 1|i = m) = \emptyset$). The set of valuations of the asset (v_i, v_j) for which a player assigned to role i would want to submit the case to the Court are characterized by:

$$\begin{aligned} I(1, 1|i = n) &= \left\{ (v_i, v_j) \mid v_i \geq \frac{k}{p - x_{i=n}^B} = \frac{k}{\epsilon} \equiv \hat{v}_{in} \right\} \\ I(1, 1|i = m) &= \left\{ (v_i, v_j) \mid v_i \geq \frac{k}{p - (1 - x_{i=n}^B)} = \frac{k}{\epsilon + (1 - \phi)[2q(\alpha_n, \alpha_m) - 1]} \equiv \hat{v}_{im} \right\} \end{aligned}$$

Note that $q(\alpha_n, \alpha_m) > \frac{1}{2}$, so $0 < \hat{v}_{im} < \hat{v}_{in} < 1$. So each player is sometimes willing to submit a case when it is assigned to role i . The benefit to player n of having accepted jurisdiction of the Court when he is matched against player m is:

$$\begin{aligned} \Delta_n(\rho_n = 1|\alpha_m) &= \frac{1}{2} \left[\int \int_{I(1, 1|i=n)} [(p - x_{i=n}^B)v_i - k] dF(v_i)dF(v_j) \right. \\ &\quad \left. + \int \int_{I(1, 1|i=m)} [(1 - x_{i=n}^B - p)v_j - k] dF(v_i)dF(v_j) \right] \\ &\propto \int_{\hat{v}_{in}}^1 [\epsilon v - k] dF(v) + \int_{\hat{v}_{im}}^1 \{[(1 - \phi)[1 - 2q(\alpha_n, \alpha_m)] - \epsilon]E[v] - k\} dF(v) \end{aligned}$$

Note that $\lim_{\alpha_n \rightarrow \alpha_m} q(\alpha_n, \alpha_m) = \frac{1}{2}$, so $\lim_{\alpha_n \rightarrow \alpha_m} \hat{v}_{im} = \hat{v}_{in}$. This means that:

$$\lim_{\alpha_n \rightarrow \alpha_m} \Delta_n(\rho_n = 1|\alpha_m) \propto \int_{\frac{k}{\epsilon}}^1 [\epsilon(v - E[v]) - 2k] dF(v)$$

Note that the integrand, $\epsilon(v - E[v]) - 2k$, is monotonically increasing in v . So when sufficiently high density is placed on values from the interval $(\frac{2k}{\epsilon} + E[v], 1)$ relative to values from the interval $(\frac{k}{\epsilon}, \frac{2k}{\epsilon} + E[v])$, then $\lim_{\alpha_n \rightarrow \alpha_m} \Delta_n(1|\alpha_m) > 0$. Continuity of the parameter space and monotonicity of $\Delta_n(1|\alpha_m)$ in α_n and α_m in an HOS ensure that the jurisdiction strategy is consistent with equilibrium behavior.

(2.) In order to show that the HOS can be supported by equilibrium enforcement behavior, suppose that each player's enforcement threshold is set at its upper (endogenous) bound for each enforcement decision-node, as characterized in Proposition 1. Then the level of enforcement that is provided when players i and j are involved in a dispute is:

$$\begin{aligned} c_{ji} = c_{ij} &= \sum_{n \in N \setminus \{i,j\}} \hat{e}_n = \sum_{n \in N \setminus \{i,j\}} \frac{\delta}{1 - \delta} \frac{2}{|N|} \frac{1}{|N| - 1} \sum_{m \neq n} [V_n(\rho_n = 1|\alpha_m) - V_n(\rho_n = 0|\alpha_m)] \\ &= \frac{\delta}{1 - \delta} \frac{2}{|N|} \frac{1}{|N| - 1} \sum_{n \in N \setminus \{i,j\}} \sum_{m \neq n} [\Delta_n(\rho_n = 1|\alpha_m) - \Delta_n(\rho_n = 0|\alpha_m)] \end{aligned}$$

Define \bar{c} as the limit of c_{ij} as $\alpha = (\alpha_1, \dots, \alpha_{|N|})$ approaches $\bar{\alpha} = (\hat{\alpha}, \dots, \hat{\alpha})$ (i.e. $\bar{c} \equiv \lim_{\alpha \rightarrow \bar{\alpha}} c_{ij}$).

Then:

$$\begin{aligned} \bar{c} &= \frac{\delta}{1 - \delta} \frac{2}{|N|} \frac{1}{|N| - 1} \sum_{n \in N \setminus \{i,j\}} \sum_{m \neq n} \lim_{\alpha \rightarrow \bar{\alpha}} [\Delta_n(\rho_n = 1|\alpha_m) - \Delta_n(\rho_n = 0|\alpha_m)] \\ &= \frac{\delta}{1 - \delta} \left(2 - \frac{4}{|N|} \right) \left[\lim_{\alpha \rightarrow \bar{\alpha}} \Delta_n(\rho_n = 1|\alpha_m) - \lim_{\alpha \rightarrow \bar{\alpha}} \Delta_n(\rho_n = 0|\alpha_m) \right] \end{aligned}$$

Note that for $|N| > 2$, it must be that $2 - \frac{4}{|N|} \in (1, 2)$. Also, as $\delta \rightarrow 1$, $\frac{\delta}{1 - \delta} \rightarrow \infty$. So there always exist values of $(\delta, |N|)$ such that \bar{c} can be made arbitrarily large (namely, large enough to support an HOS) as long as:

$$\lim_{\alpha \rightarrow \bar{\alpha}} \Delta_n(\rho_n = 1|\alpha_m) - \lim_{\alpha \rightarrow \bar{\alpha}} \Delta_n(\rho_n = 0|\alpha_m) > 0 \quad (6)$$

Note that:

$$\begin{aligned} \lim_{\alpha \rightarrow \bar{\alpha}} \Delta_n(\rho_n = 0 | \alpha_m) &= \lim_{\alpha \rightarrow \bar{\alpha}} \frac{1}{2} \left[\int \int_{J(0,1|i=n)} [(p-1)x_{i=n}^B v_i - k] dF(v_i) dF(v_j) \right. \\ &\quad \left. + \int \int_{I(1,0|i=m)} [-px_{i=n}^B v_j - k] dF(v_i) dF(v_j) \right] \end{aligned}$$

Since $\lim_{\alpha \rightarrow \bar{\alpha}} x_{i=n}^B = \frac{1}{2}$, the integrands above are always negative. So $\lim_{\alpha \rightarrow \bar{\alpha}} \Delta_n(\rho_n = 0 | \alpha_m) \leq 0$, which implies that eqn (6) holds. This means that there exist parameters $(\delta, |N|)$ such that an HOS can be supported by equilibrium enforcement behavior. ■

Equilibrium Selection Definitions for Propositions 4 and 5. Let NJ denote the no jurisdiction eqm, PJ denote the partial jurisdiction eqm, and UJ denote the universal jurisdiction eqm. Since above results establish that players who accept jurisdiction always preserve their reputation as providers, we suppress the conditioning of V_n and Δ_n terms on ρ .

Proof of Proposition 4. Note that:

$$\begin{aligned} EU_n(NJ) &= EU_{n \in \mathbf{Y}_{PJ}}(PJ) = \frac{1}{1-\delta} \frac{2}{|N|} B_n(N \setminus \{n\}) \\ EU_{n \in \mathbf{X}_{PJ}}(PJ) &= \frac{1}{1-\delta} \frac{2}{|N|} \left[\frac{|\mathbf{X}_{PJ}| - 1}{|N| - 1} V_n(\mathbf{X}_{PJ} \setminus \{n\}) + \frac{|\mathbf{Y}_{PJ}|}{|N| - 1} B_n(\mathbf{Y}_{PJ}) \right] \\ EU_n(UJ) &= \frac{1}{1-\delta} \frac{2}{|N|} V_n(N \setminus \{n\}) \end{aligned}$$

Note that existence of the UJ ensures that $\Delta_n(N \setminus \{n\}) \geq 0 \Leftrightarrow V_n(N \setminus \{n\}) \geq B_n(N \setminus \{n\})$ for all $n \in N$, so $UJ \succeq_{n \in \mathbf{Y}_{PJ}} PJ \sim_{n \in \mathbf{Y}_{PJ}} NJ$. Similarly, $UJ \succeq_{n \in \mathbf{X}_{PJ}} PJ$ iff:

$$\begin{aligned} V_n(N \setminus \{n\}) &\geq \frac{|\mathbf{X}_{PJ}| - 1}{|N| - 1} V_n(\mathbf{X}_{PJ} \setminus \{n\}) + \frac{|\mathbf{Y}_{PJ}|}{|N| - 1} B_n(\mathbf{Y}_{PJ}) \\ \Leftrightarrow \Delta_n(\mathbf{Y}_{PJ}) &= V_n(\mathbf{Y}_{PJ}) - B_n(\mathbf{Y}_{PJ}) \geq 0 \end{aligned}$$

which is assured by the fact that $\Delta_n(\alpha_m)$ is increasing in α_m and the monotonicity of PJ . Finally, $PJ \succeq_{n \in \mathbf{X}_{PJ}} NJ$ by the existence of PJ . ■

Proof of Proposition 5. (1) Suppose that the NJ is in effect. As shown in the Proof of

Proposition 4, $PJ \sim_{n \in \mathbf{Y}(PJ)} NJ$. Also $EU_{n \in \mathbf{X}_{PJ}}(PJ) - EU_n(NJ)$ is:

$$\begin{aligned} & \frac{1}{1-\delta} \frac{2}{|N|} \left[\frac{|\mathbf{X}_{PJ}| - 1}{|N| - 1} V_n(\mathbf{X}_{PJ} \setminus \{n\}) + \frac{|\mathbf{Y}_{PJ}|}{|N| - 1} B_n(\mathbf{Y}_{PJ}) - B_n(N \setminus \{n\}) \right] \\ = & \frac{1}{1-\delta} \frac{2}{|N|} \frac{|\mathbf{X}_{PJ}| - 1}{|N| - 1} \Delta_n(\mathbf{X}_{PJ} \setminus \{n\}) \end{aligned}$$

is decreasing in α_n , and $EU_n(UJ) - EU_n(NJ) \propto \Delta_n(N \setminus \{n\})$ is decreasing in α_n .

(2) Suppose that the PJ is in effect. Then $EU_n(UJ) - EU_{n \in \mathbf{Y}_{PJ}}(PJ) \propto \Delta_n(N \setminus \{n\})$ is decreasing in α_n for all $n \in \mathbf{Y}_{PJ}$. Also $EU_n(UJ) - EU_{n \in \mathbf{X}_{PJ}}(PJ)$ is:

$$\begin{aligned} & \frac{1}{1-\delta} \frac{2}{|N|} \left[V_n(N \setminus \{n\}) - \left[\frac{|\mathbf{X}_{PJ}| - 1}{|N| - 1} V_n(\mathbf{X}_{PJ} \setminus \{n\}) + \frac{|\mathbf{Y}_{PJ}|}{|N| - 1} B_n(\mathbf{Y}_{PJ}) \right] \right] \\ = & \frac{1}{1-\delta} \frac{2}{|N|} \frac{|\mathbf{Y}_{PJ}|}{|N| - 1} \Delta_n(\mathbf{Y}_{PJ}) \end{aligned}$$

which is decreasing in α_n for all $n \in \mathbf{X}_{PJ}$.

WLOG index players s.t. higher players have larger values of α_n . Let \hat{n} denote the strongest player who accepts jurisdiction; i.e. $\alpha_{\hat{n}} = \max_{n \in \mathbf{X}_{PJ}} \{\alpha_n\}$. Then $\hat{n} + 1$ is the weakest player who does not accept jurisdiction; i.e. $\alpha_{\hat{n}+1} = \min_{n \in \mathbf{Y}_{PJ}} \{\alpha_n\}$. The final step is to demonstrate that $EU_{\hat{n}}(UJ) - EU_{\hat{n} \in \mathbf{X}_{PJ}}(PJ) > EU_{\hat{n}+1}(UJ) - EU_{\hat{n}+1 \in \mathbf{Y}_{PJ}}(PJ)$. This holds iff:

$$\begin{aligned} & \frac{|\mathbf{Y}_{PJ}|}{|N| - 1} \Delta_{\hat{n}}(\mathbf{Y}_{PJ}) > \Delta_{\hat{n}+1}(N \setminus \{\hat{n} + 1\}) \Leftrightarrow \sum_{j \in \mathbf{Y}_{PJ}} \Delta_{\hat{n}}(\alpha_j) > \sum_{j \in N \setminus \{\hat{n}+1\}} \Delta_{\hat{n}+1}(\alpha_j) \\ & \Leftrightarrow \sum_{j \in \mathbf{Y}_{PJ}} \{\Delta_{\hat{n}+1}(\alpha_j) + [\Delta_{\hat{n}}(\alpha_j) - \Delta_{\hat{n}+1}(\alpha_j)]\} > \sum_{j \in N \setminus \{\hat{n}+1\}} \Delta_{\hat{n}+1}(\alpha_j) \\ & \Leftrightarrow \sum_{j \in \mathbf{Y}_{PJ}} [\Delta_{\hat{n}}(\alpha_j) - \Delta_{\hat{n}+1}(\alpha_j)] + \Delta_{\hat{n}+1}(\alpha_{\hat{n}+1}) > \sum_{j \in \mathbf{X}_{PJ}} \Delta_{\hat{n}+1}(\alpha_j) \\ & \Leftrightarrow \sum_{j \in \mathbf{Y}_{PJ} \setminus \{\hat{n}+1\}} [\Delta_{\hat{n}}(\alpha_j) - \Delta_{\hat{n}+1}(\alpha_j)] + \Delta_{\hat{n}}(\alpha_{\hat{n}+1}) > \sum_{j \in \mathbf{X}_{PJ}} \Delta_{\hat{n}+1}(\alpha_j) \end{aligned}$$

Note that the existence of the PJ ensures that the RHS is negative. And the fact that $\Delta_n(\alpha_j)$ is decreasing in α_n ensures that the first-term of the LHS is positive. Suppose $\Delta_{\hat{n}}(\alpha_{\hat{n}+1}) \leq 0$. Then $\Delta_{\hat{n}}(\alpha_j) < 0$ for all $\alpha_j < \alpha_{\hat{n}+1}$, which implies that $\Delta_{\hat{n}}(\mathbf{X} \setminus \{\hat{n}\}) < 0$, which contradicts the existence of the PJ . So $\Delta_{\hat{n}}(\alpha_{\hat{n}+1}) > 0$ and the inequality above holds. ■

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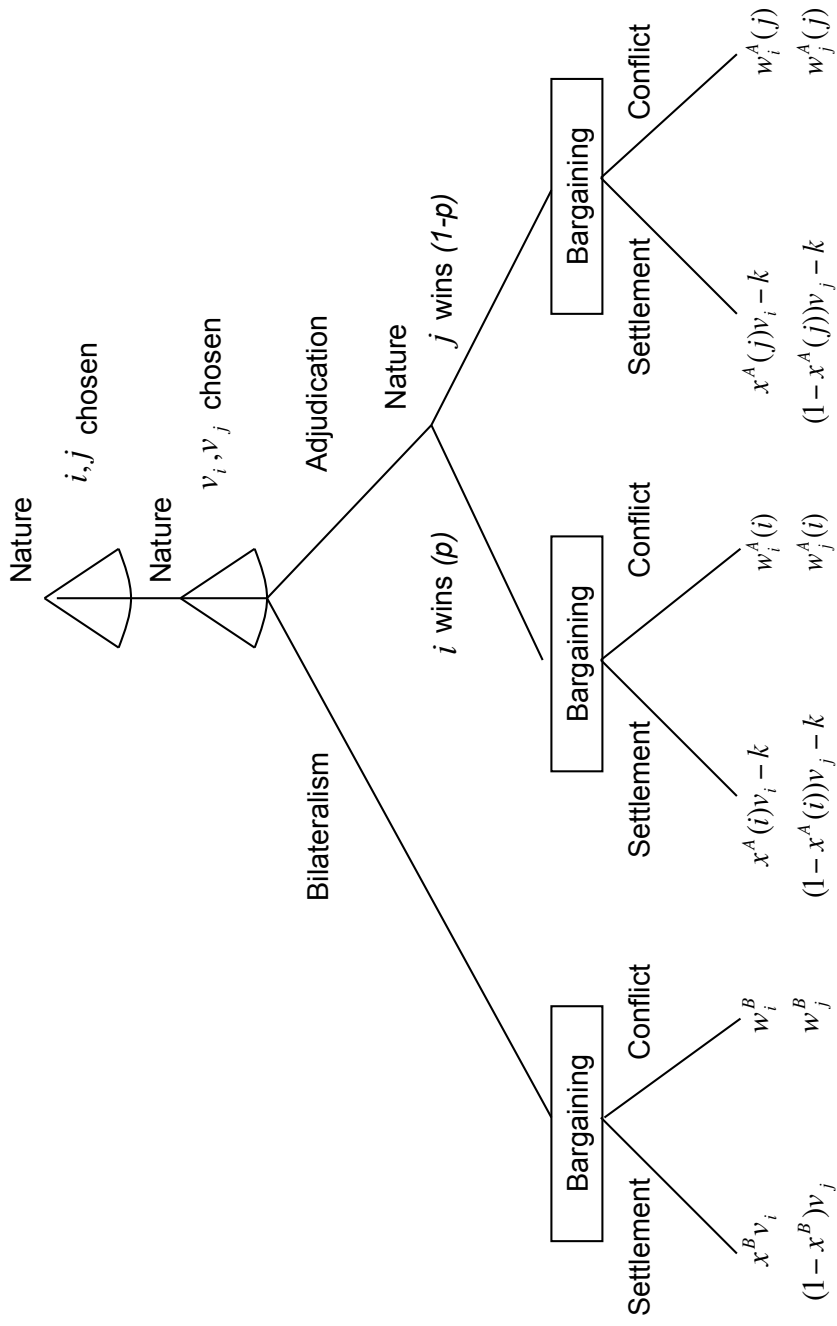


Figure 1: Structure of the Dispute Stage Game when i and j Accept Jurisdiction