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On the Evolution of Collective Enforcement Institutions: Communities and Courts

Scott E. Masten
University of Michigan – Stephen M. Ross School of Business

Jens Prufer
TILEC and CentER, Department of Economics – Tilburg University

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On the Evolution of Collective Enforcement Institutions: Communities and Courts*

Scott E. Masten[a] Jens Prüfer[b]

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ABSTRACT

Impersonal exchange has been a major driver of economic development. But transactors with no stake in maintaining an ongoing relationship have little incentive to honor deals. Therefore, all economies have developed institutions to support honest trade and realize the gains of impersonal exchange. We analyze the relative capacities of communities (or social networks) and courts to secure cooperation among heterogeneous, impersonal transactors. We find that communities and courts are complementary in the sense that they tend to support cooperation for different sets of transactions but that the existence of courts weakens the effectiveness of community enforcement. By relating the effectiveness of enforcement institutions to changes in the cost and risks of long-distance trade, driven in part by improvement in shipbuilding methods, our analysis also provides an explanation for the emergence of the medieval Law Merchant and its subsequent supersession by state courts.

JEL classification: D02, D71, N43, P48

Keywords: Institutions, Contract Enforcement, Communities, Courts, Social Networks, Law Merchant, Lex Mercatoria, Commercial Revolution

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[a] Stephen M. Ross School of Business, University of Michigan, 701 Tappan St., Ann Arbor, MI. semasten@umich.edu

[b] Department of Economics, CentER, TILEC, Tilburg University, P.O. Box 90153, 5000 LE Tilburg, The Netherlands. j.prufer@uvt.nl

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I. Introduction

The enormous improvements in wealth and wellbeing of the last millennium — as well as the more sporadic advances of earlier ages — could not have occurred without the existence of institutions and organizational arrangements supporting impersonal exchange: The progressive realization of scale economies and gains from specialization that underlay economic development requires both the expansion of trade beyond an individual's immediate circle of acquaintances and the flexibility to take advantage of newly discovered opportunities. But trade between individuals who have only a transitory association is hazardous; with no stake in maintaining an ongoing relationship, transactors have little incentive to honor deals or respect property rights. Without institutions that can instill reasonable confidence in the security of bargains and property, the range of transactions that prospective traders will be willing to undertake will be reduced and the realization of scale and specialization economies correspondingly attenuated.

The role of governments in protecting property rights and enforcing contracts has long been recognized. But significant opportunities for gainful trade sometimes lie outside the boundaries of effective governmental authority. Such was arguably the case during the late-medieval Commercial Revolution (roughly the 11th to 14th centuries (Lopez, 1971)) when long-distance trade blossomed in an environment of small and fragmented political units. A series of recent papers has sought to explain how a variety of non-governmental, self-enforcing institutions could have sustained the dramatic commercial development of the period without state enforcement.[1] Among these were the *lex mercatoria*, or Law

[1] Prominent contributions to this literature include Milgrom, North, and Weingast (1990); Greif (1993, 2006); and Greif, Milgrom, and Weingast (1994).

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Merchant, commonly described as a spontaneously arising system of customary rules governing trade among merchants that was administered by private judges chosen for their familiarity with commercial practices (Berman, 1983: 333-56). Descriptions and analyses of the medieval Law Merchant ascribe to it a host of positive attributes, including "its universal character, its flexibility and dynamic ability to grow, its informality and speed, and its reliance on commercial custom and practice" (Benson, 1989: 654). Despite its many desirable qualities, however, "[t]he Law Merchant system of judges and reputations was eventually replaced by a system of state enforcement" (Milgrom, North, and Weingast, 1990: 20; Mitchell, 1904: 157).

The supersession of the Law Merchant by state courts — a system notably deficient in most of the qualities attributed to the Law Merchant — highlights a shortcoming of much of the literature on institutions: its "system-specific" nature (Dixit, 2003b: 1294), that is, its tendency to offer explanations for the existence or emergence of a particular institutional outcome at a particular time and place, when what we (ultimately) want is a theory that can explain variations in institutional arrangements and the dynamics of institutional evolution: Why do particular institutions, out of the set of potential arrangements, appear (and fade) when and where they do? Williamson has raised this criticism with specific reference to the Law Merchant: "The subset of products and organizations that satisfy the parameter values for the Law Merchant System strategy as a sequential equilibrium strategy is never described….What were the characteristics of these transactions and what explains the breakdowns?" (1991: 169). Put another way, research on institutions stands to benefit, as did research on economic organization earlier, from "operationalization" of the theory through a program of (i) describing the critical features of the economy (including the attributes of transactors and transactions), (ii) identifying the distinguishing features and capabilities of alternative institutions, and (iii) relating the features of the economy to the differential capabilities of governance structures in a way that yields testable hypotheses (*cf*. Williamson, 1985: 41; 2010: 674).

In this paper, we seek to advance this program by drawing on a framework introduced by Dixit (2003b, 2009) to analyze the relative capacities of communities (or social networks) and courts to secure cooperation among heterogeneous, impersonal transactors.[2] Specifically, we adopt Dixit's device of a circle economy to capture differences in the knowledge and abilities (trading attributes) of transactors who (periodically) face opportunities to transact with new and unfamiliar trading partners. We then consider the range of potential trading partners for which collective enforcement by communities and courts can sustain cooperation and relate these to the value of trade, the degree of shared knowledge ("connectedness") of transactors, and the competence of courts to verify performance.[3]

Our main findings highlight the role of the value of trade in relation to the heterogeneity of transactors, who may differ in their knowledge, ability, resources, location, or any other economically relevant dimension. In contexts in which expected gains from trade increase with the dissimilarity or "distance" of transactors — Dixit's primary focus — we find, like Dixit, that communities or social networks can sustain cooperation only for transactions with relatively "nearby" trading partners. In contrast to Dixit's results, however, courts in our model tend to be complementary to communities in the sense that they function most effectively for relatively "distant," high-value transactions. Where gains from trade are negatively related to distance — a case that Dixit dismisses as uninteresting on the grounds that "trades will unambiguously best be carried out using automatic self-governance in small communities each of which has homogeneous membership" (2003b: 1297) — we find instead that increases in the gains to reneging (defection) that accompany increases in the value of "local" trade may outweigh the

[2] See also, Tabellini (2008) and Baron (2010), who exploit Dixit's framework to analyze the capacity of guilt and altruism to sustain cooperation.

[3] We use the term *collective* or *multilateral enforcement institutions* to describe institutions for the enforcement of agreements involving others than the just parties to the transaction themselves. These institutions encompass both Dixit's *external governance* (enforcement by courts or other organizations) and *self governance* (enforcement by communities or social networks). Greif uses the term *contract enforcement institutions* for both types of enforcement. Consistent with the legal definition of contract, we reserve the term *contract* only for agreements that would be legally binding in a public court of law.

greater likelihood that nearby transactors learn about previous defections, causing community enforcement to break down. Courts, on the other hand, are likely to be effective in sustaining cooperation in such settings. Among the implications of our results is that, as the value of long-distance trade increases, community enforcement will tend initially to become more effective but will eventually be undermined and displaced by court enforcement.

Drawing on insights from our model, we then revisit the history of the medieval Law Merchant. Whereas most accounts associate the Law Merchant's dominance and demise with (exogenous) changes in the quality of state enforcement institutions — emerging of necessity when governments were weak and withering as the state power and interests in commercial activity made community enforcement obsolete — our analysis suggests an explanation in which the relative effectiveness of community and court enforcement is endogenously determined: Progressive reductions in the risks and costs of transportation over long distances, driven in part by improvements in shipbuilding methods, altered the value and composition of long-distance trade in ways that initially favored and later undermined community enforcement institutions.

The next section provides an overview of the issues, including a brief description of the Law Merchant. Section 3 introduces the basic model and then characterizes behavior under, and compares the effectiveness of, community and court enforcement. Section 4 interprets the history of the Law Merchant in light of our results. Section 5 offers conclusions and suggests additional applications. Proofs and a model extension appear in appendices.

2. Courts, Communities, and Commitment

The obstacle to trade and cooperation posed by opportunistic behavior is a central theme of the literatures on both institutions and organization: Two (or more) parties stand to gain from transacting, but differences in the timing of actions and the accrual of benefits leave one or both exposed to the risk that

the other will not uphold his end of the bargain.[4] Unless institutions or organizational arrangements capable of sustaining cooperation exist or can be devised, individuals may find it better not to transact at all. Despite this concurrence, analyses of institutions and organizations differ in important respects. First, the analysis of institutions involves a shift in orientation to reflect, among other things, the generally broader scope and greater durability of institutions compared to organizations. Whereas organizational arrangements are chosen by the parties themselves for the transaction at hand, institutions operate over an array of transactions comprising an economy (or possibly industry). As a result, the distribution of heterogeneous skills, knowledge, and locations of transactors in an economy, and not just the attributes of a particular transaction, become relevant. The greater durability of institutions, in turn, means that analyses of institutions entail time frames that exceed the duration of most transactions and must therefore account for the dissolution of old relationships and emergence of new trading opportunities.[5] At the same time, the operation and merits of institutions and of transaction-level organizational arrangements are interdependent. On the one hand, the institutional environment determines in part the organizational choices available to transactors. On the other, the quality and limitations of private governance affects the demand for, and possibly the performance of, political and legal institutions.[6]

Figure 1 portrays several sources of or supports for commitment and the properties that distinguish them. In the far left of the diagram, the category "internal value systems" allows for the

[4] Examples of research examining political institutions as responses to commitment problems include North and Weingast (1989) and Weingast and Marshall (1988). For a discussion of the parallels between political and commercial commitment problems and additional citations, see Masten (2006).

[5] In Williamson's characterization of the levels of social analysis, level-3 (private) governance choices operate on a one-to-ten year horizon while level-2 institutional environment adjustments occur on a ten-to-one-hundred year horizon (Williamson, 2000: 596-9). Exceptions exist, of course: Corporations exist, in part, to divorce survival of the organization from that of its members, and the duration of some contracts exceeds the endurance of many constitutions (see Lutz, 1994: 367; Elkins et al., 2009).

[6] For an analysis emphasizing the interactions of organization and political and legal institutions in the context of public utility procurement, see Levy and Spiller (1994).

possibility that some people may pass up opportunities to take advantage of a trading partner because of altruism or morals (see Tabellini, 2008; Baron, 2010). Someone who knows that he is dealing with such a person can undertake transactions with confidence in the other's cooperation. Such knowledge is particularly unlikely in impersonal exchange, however, and the existence of even a subset of opportunists in a population of potential trading partners dictates caution.[7] Cooperation may also be sustained between transactors who expect to be engaged in indefinitely repeated exchange with each other. Such repeated bilateral transactions occur in all economies and may dominate in small subsistence economies, but restricting trade to only those with whom one has such an ongoing relationship would require the sacrifice of many otherwise productive undertakings. As opportunities for advantageous trade beyond the clan or village to the region and beyond increase, and the capacity of bilateral interactions to sustain cooperation correspondingly decreases, the need for some form of multilateral enforcement mechanism rises.

Among the multilateral mechanisms, Figure 1 draws a distinction between two fundamental types: communities and courts. Our conception of a community is similar to Cooter's (1996: 1646): "A community of people is a social network whose members develop relationships with each other through repeated interactions. The modern economy creates many specialized business communities. These communities may form around a technology such as computer software, a body of knowledge such as accounting, or a particular product such as credit cards. Wherever there are communities, norms arise to coordinate the interaction of people." Communities may be informal (e.g., the jazz community (Phillips, 2009)) or formal (e.g., the New York Diamond Dealers Club (Bernstein, 1992)). The important defining

[7] Recognition that not all parties are prone to opportunism but that bounded rationality makes it difficult to distinguish the trustworthy from the unscrupulous is a feature of transaction cost analyses; see Williamson (1985: 48). Dixit (2003b) explicitly assumes two types of traders, Normal and Machiavellian, the latter, characterized as "especially skillful cheaters," assumed to represent only a small proportion of traders (1299).

characteristics of a community — (i) frequency of interactions[8] and (ii) shared knowledge or interests of members — introduce the possibility that opportunistic behavior by or toward one member will be learned of by others who may respond by refusing to transact with transgressors.[9] To the extent this occurs, the existence of communities can deter defection from cooperation.

Courts, or more generally, governments differ from communities in two respects. First, whereas the severity of sanctions that a community can impose on defectors is constrained by the value of ongoing future cooperation, courts can invoke governmental powers to coerce behavior and therefore may be able to impose larger sanctions.[10] Second, public officials usually are not members of the communities of disputants, or at least cannot be members of every community, and are therefore at a disadvantage relative to community members in determining whether an infraction has occurred and the nature of the infraction.

The period of commercial development as Europe emerged from the Dark Ages (roughly 5th to 9th centuries) illustrates the problems of sustaining cooperation among impersonal transactors needed to realize the benefits of expanding trade. The economic decline and stagnation precipitated by the fall of

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[8] The relationships constituting membership in a community should be understood in terms of the frequency of interaction with *any* member of the community as distinct from relationships developed through repeated interactions with particular *individuals*.

[9] The assumption that community sanctions are limited to expulsion or ostracism excludes well-known examples of organizations that use violence to enforce cooperation. Less drastically, associations may "fine" members for misbehavior. In voluntary communities at least, the size of such punishments is limited, in expected terms, by the value of continued membership in the community.

[10] Mobility — of individuals generally and traders in particular — constrains the effective power of governments as well as of communities. The desire to attract merchants, for example, induced rulers in the Middle Ages to adopt laws and policies favorable to merchants, including "safe-conducts, trading right and protections, and extraordinary remissions of normal laws" (Kadens, 2004: 48). Marketplaces that failed to provide an attractive legal environment "perished, because no traders attended the market" (Bindseil and Feil, 1999: 745, quoting Feger, 1958:12). This parallel raises a general caveat about the relation between our stylized model and actual institutions: Although our model draws a stark distinction between court and community enforcement, differences between the two are much blurrier in the commercial world, especially, as will become evident in section 4 below, in the period of the medieval Law Merchant. Implications of the model should thus be thought of as favoring more "court-like" or "community-like" enforcement, the distinguishing properties of real world institutions being matters of degree.

the Roman Empire was followed, beginning in the 11th century, by a period of increasing agricultural productivity, urbanization and, eventually, intercity and overseas trade. Merchants wishing to engage in such trade faced numerous obstacles, however: "[T]he merchants of Medieval Europe…were separated from one another by geographic barriers, by cultural diversities and by dissimilar profit goals….[T]he sanctions applied by local communities in subsistence economies no longer represented a realistic control over transregional trade…. Medieval merchants could avoid their creditors by transacting within new markets, by moving their wares to distant fairs and impersonal guilds. The risk of 'evil men…entering the realm of the trusted' evolved as a realistic threat to inter-community trade in medieval society" (Trakman, 1983: 17).

Merchants responded to these challenges by developing an array of private institutions that served to secure agreements and facilitate trade, one of which, according to the prevailing view, was the system of mercantile courts known as the Law Merchant. Standard accounts portray the operation of the Law Merchant in decidedly complimentary terms. Because merchant courts were typically administered by merchant judges chosen "on the basis of their commercial experience, their objectivity and their seniority within the community of merchants," rather than by professional jurists (Trakman, 1983: 15; see also, Berman, 1983: 346), decisions were sensitive to the needs and understandings of the merchants.[11] Regardless of the forum, the "law" of the *lex mercatoria* reflected the customs of the merchants, rather than local, or later, centralized state law (*id*.). Most important, Law Merchant hearings were free of formalistic procedures. Most disputes were resolved within a day or two (Gross, 1906: 243-4; Sachs, 2006: 685) and appeals were often forbidden (Berman, 1983: 347; Gross, 1906: 236): "In all types of

[11] These tribunals took various forms, including courts operated at markets and fairs, borough courts in market towns, maritime courts in seaports, and courts of Merchant Guilds (Berman, 1983: 346-7; and Trakman, 1983: 16-17). In what Baker (1979) describes as the "orthodox story," the law merchant in England "was confined to its own special courts, the borough and piepowder courts and the Court of Admiralty" until the sixteenth century (296). Piepowder courts were "the humble court of the market or fair in which the disputes of wayfaring merchants, the dusty-footed men, were settled" (Gross, 1906: 231), although some such courts came to operate without a fair or market (*id*., 237).

commercial courts the procedure was marked by speed and informality" (Berman, 1983: 347; see also Baker, 1979: 300-4). Finally, the Law Merchant offered a solution to the problem of weak and ineffective state enforcement: Merchants who failed to comply with merchant court decisions risked ostracism from the merchant community (Benson, 1989: 649; Trakman, 1983: 10; Milgrom et al., 1990: 5).

As rendered in these accounts, the medieval Law Merchant represented a community-based enforcement institution that permitted the expansion of intraregional trade during a period of fragmented and often weak states. According to Trakman, the Law Merchant "offered the medieval merchant an ideal solution" to the many challenges posed by international commerce (1983: 11). Founded on commercial customs and operated by the merchant community itself, the Law Merchant closely mirrored merchant needs. "Justice and fairness, speed and informality, low cost and amicability all prevailed as interdependent variables, reflective of the commercial environment under investigation. These attributes together emphasized that the primary source of the Law Merchant lay in mercantile values and practices as incorporated into law" (*id*.: 13).[12]

Even if the Law Merchant did not operate as adroitly as its most ardent proponents suggest, the system seems to have operated well enough for interregional trade to prosper for much of the 11th and 12th centuries. Gradually, however, the functions of the merchant courts began to be taken over by public courts.[13] Although state courts initially sought to retain the Law Merchant's most desirable properties — particularly its speed, informality, and reliance on commercial customs — over time the rigid procedures and strict adherence to uniform substantive doctrines associated with modern courts came to dominate.[14]

[12] Some descriptions of the Law Merchant border on utopian. See, for example, Benson (2002: 127-131).

[13] Despite its "ideal" nature, "the Medieval Law Merchant failed to prevail entirely in its original form" (Trakman, 1983: 17). "Toward the end of the medieval period the local mercantile courts suffered a decline" (Baker, 1979: 306).

[14] In England, local maritime courts were superseded by centralized courts of Admiralty appointed by the Crown, the first references to which occurred in the mid-14th century (Plucknett, 1956: 661). The procedure of these courts, which dealt with both commercial and maritime matters, "was of the slower civilian type" and were subject to

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The challenge posed by the history of the Law Merchant is to identify what conditions may have contributed, first, to the emergence of the Law Merchant and, later, to its absorption and supersession by state courts.

3. The Model

Our analysis of the capacities of communities and courts to sustain cooperation draws on Dixit (2003b), who introduces a model of enforcement institutions that compactly incorporates several dimensions of economies relevant to the performance of institutions: heterogeneity in the value of trade among transactors, stochastic opportunities for impersonal trade, conflicting incentives within transactions, and localized information. Specifically, transactor heterogeneity is represented by the location of transactors around a circle, distances along which can be interpreted as representing differences in any relevant economic or social variables such as technological or resource endowments, knowledge or expertise, or kinship or other social or cultural affinities, as well as geographic location.

Like Dixit, we also limit our formal analysis to two types of enforcement institutions: community enforcement, the equivalent of self-governance in Dixit's terminology, and court enforcement, our analog to Dixit's external enforcement. In our characterization, courts have the ability to investigate claims of defection but, rather than merely reporting incidents of cheating as in Dixit's model, we ascribe to courts the power to impose damages on defecting parties. Finally, because courts in our model are "generalist," that is, they lack the "local" expertise and knowledge of transactors in the economy, courts may not always be able to determine fault as accurately as would members of a community.[15]

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criticism (*id.*: 661-2). During the 16th century local admiralty courts largely succumbed to the central Admiralty, which, in turn, increasingly surrendered jurisdiction over commercial matters to the common law courts (*id.*: 663-4). See also, Trakman (2003: 276-81).

[15] Our model also differs from Dixit's in several technical respects described in more detail below. We discuss, but do not model, specialized or "quasi-" courts (see Figure 1) in section 4.2. Formal analysis of this hybrid enforcement mechanism is the subject of work in progress.

3.1. Trade and Communication in a Circle Economy

As in Dixit (2003b), we posit an economy consisting of a continuum of transactors uniformly distributed around a circle. As depicted in Figure 2, the circle has a circumference of 2, with the mass of transactors per unit arc length normalized to one, implying a mass 2 population in the economy.[16] "Distance" between two transactors, X, measured by the shorter of the two arc lengths between them (hence, $X \leq 1$), affects three considerations in the model: (i) the probability of meeting a given transactor, (ii) the potential gains from trade, and (iii) the probability of receiving information about the previous behavior of other transactors. We define (i) and (ii) here, and define (iii) in section 3.2.

Matching. First, we assume that individuals are more likely to meet and discover an opportunity for gainful cooperation the closer they are in attribute space. Specifically, the probability that any two players i and x are matched in any given period is

$$\mu \equiv \frac{e^{-X}}{2(1-e^{-1})}. \tag{1}$$

In words, the probability of a match between two players decreases exponentially with their distance X.[17] Consistent with our emphasis on impersonal trade, matching is independent across periods.[18]

[16] Dixit specifies a circumference of $2L$, but as he notes, his model has an extra degree of freedom such that an increase in the size of the world, L, is equivalent to a decrease in the unit in which distance is measured (2003b: 1299). Consistent with this, distance in our model should be understood as being relative to the size of the relevant trading space.

[17] Like Dixit (2003b: 1296), we occasionally sacrifice a bit of precision for the sake of facility of expression in referring in the text to a trader at a location rather than the density at a point.

[18] In a more general model, traders might affect the probability of matching through efforts or investments. For our (as for Dixit's) purposes, however, all that is necessary is that there remains some stochastic element of matching.

Gains from trade. Like Dixit, we also assume that distance affects potential gains from trade, where the potential payoff to a given transactor i from trading with a transactor at distance X is $he^{\theta X}$. In contrast to Dixit, however, we consider the possibility that gains from trade may increase or decrease with distance. Specifically, we allow the parameter θ to take negative as well as positive values: For $\theta > 0$, potential gains from trade increase with distance, and for $\theta < 0$, trade is more valuable between closer transactors. Gains from trade increasing with distance might occur because of the benefits accruing to specialization, while gains decreasing with distance could result from high transportation costs or because dissimilarity in, say, language or knowledge impedes communication or the understanding necessary to recognize gainful opportunities (see Dixit, 2003b: 1297).

Conflict in exchange. As noted earlier, the existence of gains from trade does not guarantee their realization. We capture the possibility of opportunistic behavior with the assumption that, in each period, matched transactors play a noncooperative trade game as follows:

> Stage 1: Transactors decide simultaneously whether or not to transact. If either chooses not to transact, their payoffs are zero and the period ends for these transactors.
>
> Stage 2: If the matched transactors agree to transact, each decides whether to cooperate (perform) or defect (renege). The payoff to each transactor is $ae^{\theta X}$, where a is determined for each transactor from the following reduced-form payoff matrix:

i / x	Cooperate	Defect
Cooperate	h, h	l, w
Defect	w, l	d, d

and

$$w > h > 0 > d > l \text{ and } 2h > w + l. \tag{2}$$

> Stage 3: Transactors proceed to the enforcement stage corresponding to the relevant institution as described in the following sections.[19]

[19] As described below, community enforcement technically takes place in stage 1 of the next period when each transactor decides whether or not to transact with his new trading partner.

Finally, we assume that time (between periods) proceeds in discrete intervals, $t \in \{0,1,...,\infty\}$, and that transactors are risk-neutral, have infinite horizons, and have a uniform per-period discount factor $\delta \in (0,1)$.

3.2. Community Enforcement

Consistent with our emphasis on impersonal exchange, the probability that any particular pair of transactors will actually encounter each other again is zero in our model.[20] Consequently, in the absence of courts (or other third-party enforcement institutions), the only punishment that a transactor can impose on a partner who defected is to report the partner's misbehavior with the aim of affecting the behavior of future transactors. Such reports can be effective, however, only to the extent that a future transactor matching with the offending transactor has learned of the partner's prior defection and responds in a way that "punishes" the defector for his earlier misbehavior.

We model the dissemination of information through a transactor's "community" as a function of the transactor's location. Specifically, we assume that (i) following each transaction, every transactor reports the identity of his partner and the partner's behavior chosen from the message space {*cooperated, defected, did not interact*}; and that (ii) the probability that transactor y "hears" transactor x's announcement is

$$\eta_{x,y} \equiv \kappa e^{-|Y-X|} , \tag{3}$$

where $|Y-X|$ is the distance between transactors y and x, and $\kappa \in [0,1]$ is a parameter reflecting transactors' overall "connectedness" to other transactors on the circle.[21] Given these assumptions, we

[20] This feature of the model is a crucial difference with the literature on relational contracting (e.g., Baker et al., 2002).

[21] Our specification of the communication probability differs from Dixit's (2003) by the inclusion the parameter κ, which is assumed to be the same for all transactors. It is straightforward to show that, if transactors have different κ's, cooperation is dependent on the κ of the less well-connected transactor (smaller κ_i) but results remain

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define $s_{y,t}$ to be transactor y's state variable before he chooses an action in stage 1 of period t, where $s_{y,t}$ = 0 if player y has received news that his current match i defected in period $t - 1$ or if player y himself defected in period $t - 1$ and his match i learned about it.[22] Otherwise, $s_{y,t} = 1$.

To summarize, the community enforcement game proceeds as follows: In each period, players are matched according to (1) and, before deciding whether to transact (stage 1), receive, with probability $\eta_{x,y}$, a report on their new partner's prior-period behavior. If both choose to transact, the central transaction (stage 2) takes place. Finally, every player reports the outcome of his current transaction as described above.

We proceed next to identify a strategy combination for all transactors that constitutes a perfect Markov equilibrium.[23]

Community Enforcement (CE) Strategy. Let $V(w,h,\theta,X,\delta,\kappa)$ represent the present discounted value to transactor i of cooperating in period t relative to defecting in period t (defined more explicitly below). Define the following Markov strategy for player i matched with partner x:

- In period t = 1, player i transacts and cooperates with partner x if $V(w,h,\theta,X,\delta,\kappa) \geq 0$, and does not transact otherwise.
- In every subsequent period, player i transacts and cooperates with partner x if $V(w,h,\theta,X,\delta,\kappa) \geq 0$ and $s_{i,t} = 1$, and does not transact otherwise.

In effect, the CE strategy calls for a transactor to transact with his current match if cooperation is profitable ($V(\cdot) \geq 0$) unless he has received a report that his current partner deviated from the CE strategy in the preceding period or he defected himself and his partner learned about it. The CE strategy has

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qualitatively unchanged. As is common in the literature (see, e.g., Kandori, 1992; Kali, 1999; and Dixit, 2003b), we also assume that reporting is truthful. A model in which detecting the veracity of reports is easier the closer the source of the report to the recipient would yield qualitatively similar results.

[22] For purposes of the model, we assume that transactors who defected in a previous period know whether their new trading partners learned of that defection.

[23] As in any infinitely repeated game, other equilibria also exist. Our aim is to show that a simple strategy exists in our model that supports cooperative exchange under community enforcement.

several features. First, it implies that the function $V(\cdot)$ must be nonnegative to generate cooperative behavior in the current period regardless of behavior in previous periods. If in period t player i does not receive news about the previous behavior of his partner x, and if i himself did not defect in the previous period, or he defected but his partner did not learn about it, then $s_{i,t} = 1$, and i's behavior under the CE strategy is to cooperate if $V(\cdot) \geq 0$ and not interact if $V(\cdot) < 0$.[24] However, if i does receive news from player y on the behavior of x in $t-1$, then the CE strategy further conditions i's behavior on previous period behavior: If i learns that x defected last period, he should punish the defector by not interacting with him. Moreover, not interacting is (weakly) incentive compatible for i because the CE strategy requires a defector who knows that his partner knows about his defection to participate in his own punishment by not interacting as well; if i deviated from the CE strategy by agreeing to transact with x (and either cooperating or defecting), i would not gain from this deviation because x's choice not to interact leads to a period payoff of zero for both partners, independent of i's action. Hence, adhering to the CE strategy is a (weak) equilibrium action for i.[25]

It remains to show that a perfect Markov equilibrium exists in which all players play the CE strategy. We denote an individual transactor's expected gain from mutual cooperation, before the identity

[24] By making trading decisions (stage 1) of previous defectors dependent on whether their new partner learned about their prior defection, we "harmonize" the partners' state variables: Either both players' state variables take the value 1 or they both take the value 0. This assures that deviation from the CE Strategy is not incentive compatible and, at the same time, makes the expected loss from defection depend on the community information transmission technology.

[25] Our assumption that a player who is supposed to punish another player has no incentive to deviate from punishment is a common structure in repeated games of collective enforcement institutions; see Greif (2006, Appendix C) for details. It can be rationalized by supposing that a slight probability ε exists that not participating in one's own punishment will be detected by other players, who would then be entitled to punish the uncooperative defector by not interacting until eternity. Another interpretation is that, if the CE Strategy allowed a player who received information about his partner's defection in period $t-1$ not to punish that partner in period t, both players would know that the same would hold for their respective matches in $t+1$. Consequently, they would not fear losing future trading opportunities by defecting in the current period, and mutual defection would become the unique Nash equilibrium in stage 2 of period t. In order to avoid the losses associated with this outcome ($d < 0$ in the central (stage 2) transaction), the unique subgame-perfect action in stage 1 of period t would be not to transact. Hence, all trade would break down.

of his partner is known, by G. Now consider player i's tradeoff at stage 2 if he is matched to x. Transactor i knows that if he defects, his next period match y will learn about it with a certain probability, $\eta_{x,y}$. If y plays the CE strategy and learns about i's defection, he will not interact with i. This gives i a payoff of zero in period $t + 1$, which means that he loses $he^{\theta Y}$ compared to mutual cooperation. Given that in period t player i does not yet know the type of his next match in period $t + 1$, we have to consider foregone payoffs over four ranges of X, which are depicted in Figure 2. Specifically, the expected loss to player i from not transacting in period $t + 1$ is the forgone value of transacting weighted by (i) the probability that i is matched to y in $t + 1$ and (ii) the probability that y received news from x that i defected in t, or

$$\begin{aligned} L \equiv \delta[&\int_0^X \frac{e^{-Y_1}}{2(1-e^{-1})}\kappa e^{-(X-Y_1)} he^{\theta Y_1} dY_1 + \int_X^1 \frac{e^{-Y_2}}{2(1-e^{-1})}\kappa e^{-(Y_2-X)} he^{\theta Y_2} dY_2 \\ &+\int_{1-X}^1 \frac{e^{-Y_3}}{2(1-e^{-1})}\kappa e^{-(2-X-Y_3)} he^{\theta Y_3} dY_3 + \int_0^{1-X} \frac{e^{-Y_4}}{2(1-e^{-1})}\kappa e^{-(X+Y_1)} he^{\theta Y_4} dY_4]. \end{aligned} \tag{4}$$

By the one-stage deviation principle, if player i assumes that player y plays the CE strategy, i will cooperate in the central transaction of period t if and only if the following incentive constraint holds:

$$he^{\theta X} + \delta G + \frac{\delta^2}{1-\delta} G \;\geq\; we^{\theta X} + (\delta G - L) + \frac{\delta^2}{1-\delta} G \tag{5}$$

$$\Leftrightarrow \;\; L \;\geq\; (w-h)e^{\theta X}. \tag{6}$$

The left and right sides of (5) are i's expected net present value of current and future trade from cooperating and from defecting in period t, respectively. The first term on each side of (5) is the present period payoff, which is larger for defection than cooperation. The second term is the payoff in the next period ($t + 1$), which is smaller for defection because i's next match might not interact with a defector. The third term, the expected present value of trade from $t + 2$ forward, is equal for both sides because, under the concept of Markov strategies, actions in one period have an impact only on one subsequent

period. Manipulation of (5) yields equation (6), which states that i will only cooperate if the next period loss that he incurs if he defects now, L, is larger than the immediate additional gain from defection, $(w-h)e^{\theta X}$. We can now define more explicitly the present value of cooperation relative to defection, $V(w,h,\theta,X,\delta,\kappa)$, as

$$V\left(w,h,\theta,X,\delta,\kappa\right) \equiv L-(w-h)e^{\theta X}. \tag{7}$$

Interpretation. We note first that, given that $L(\kappa=0) = 0$ and $(w-h)e^{\theta X} > 0$, no transactors are willing to transact with another transactor who is not "connected" (i.e., who has $\kappa = 0$). This result underscores the importance of communities or networks in environments of impersonal exchange where, despite infinitely repeated exchange, the likelihood of any two transactors meeting again is too low (in our case, zero) for bilateral sanctions to sustain cooperation.

For $\kappa > 0$, the definition of V yields the following proposition.

Proposition 1 (Cooperation under social network enforcement). If all other actors $-i$ use the CE strategy, there exists a perfect Markov equilibrium, in which player i also plays the CE strategy if and only if the relative gains from cooperation are non-negative, that is, if $V \geq 0$.

It is straightforward to show, given the definitions of V and L in equations (7) and (4), that $\partial V/\partial(w-h) < 0$, $\partial V/\partial\delta > 0$, and $\partial V/\partial\kappa > 0$. In words, the relative value of cooperation decreases in the gains from defecting and increases with the discount factor (time horizon) and transactors' "connectedness."

Our particular interest, however, is in the range of transactions for which community enforcement can be expected to sustain cooperation and, thus, in the relationship between "distance" and transactors' incentives to cooperate or, in terms of the model, in how X affects V. The latter, in turn, depends on the parameter θ, which captures how potential gains from trade vary with distance. The analysis involves several cases. We first consider two unambiguous cases, $\theta > 0$ and $\theta < \theta^* < 0$, where θ^* is defined below.

We begin by refining the Markov strategy of player i at stage 2 in period t, which we denote the CEX strategy:

- In $t = 1$, if $\theta > 0$ [$\theta < \theta^*$], transactor i transacts and cooperates with partner x if the distance between i and x, $X \leq X^*$ [$X \geq X^*$], and does not transact otherwise.

- In every subsequent period t, if transactor i is matched to player x and either the distance $X > X^*$ [$X < X^*$] or $s_{i,t} = 0$, then transactor i does not interact with x. Otherwise, i transacts and cooperates with x.

This refinement has no effect on V (as defined in (7)). The definition of the state variable also remains unchanged, that is, $s_{i,t} = 1$ unless transactor i has received news that his current match x defected in period $t - 1$ or i defected in period $t - 1$ himself and his match x learned about it, in which case $s_{i,t} = 0$. The refinement allows us, however, to state the following proposition, which we prove in Appendix A, as a refined version of Proposition 1.

Proposition 2 (The scope of cooperation under community enforcement). If all other actors $-i$ use the CEX strategy, there exists a perfect Markov equilibrium, in which player i also plays the CEX strategy if and only if $X \leq X^*$, for $\theta > 0$, and if and only if $X \geq X^*$ for $\theta < \theta^*$.

Proposition 2 implies that, for $\theta > 0$, there exists an upper bound, X^*, on the distance between partners up to which it is rational for i to cooperate. For larger distances, expected future punishment for defection is too small to overcome the short-term gain. This occurs because (i) future punishment depends on the transmission of information, captured by $\eta_{x,y}$, and the probability of being matched to a community member of x in the next period, captured by μ, both of which are decreasing in distance; and (ii) gains from defecting in a current transaction are a function on potential gains from trade, which increase with distance when $\theta > 0$.

For $\theta < \theta^* < 0$, that is, if larger distances between matched transactors sufficiently decrease the value of the transaction, there is a lower bound X^* above which it is rational for the players to cooperate. This implies that, despite the localization of matches and information transmission, the connectedness of x may not be able to induce i to cooperate if the partners are located sufficiently close to each other. This result can be understood by referring to the base value of a transaction, proxied by θX, which drives the payoff of defecting. Independent of the sign of θ, i only has an incentive to cooperate if the base value of the transaction is sufficiently low.

Figure 3 illustrates this result using a numerical example. In the illustration, community enforcement is effective — transactors have an incentive to cooperate with each other ($V > 0$) — in the southwest and northeast corners of the graph but not in the other regions. As shown in the figure, community-supported cooperation has an upper bound in X-space (distance) in the southwestern region whereas it has a lower bound in the northeastern region. In words, community enforcement is able to sustain cooperation for transactions between "nearby" partners when θ is positive and for transactions with "distant" partners for (sufficiently) negative transactions. Finally, Figure 3 illustrates the ambiguous region, $\theta \in [\theta^*, 0]$, where community enforcement may generate an upper or lower bound (or both) on cooperation, the cause of which is conflicting effects on V of the three parameters, $\eta_{x,y}$, μ, and θ, that enter as coefficients on X, making V nonmonotonic in X.

3.3. Court Enforcement

The capacity of courts to adjudicate disputes is related to the characteristics and complexity of transactions (relative to the court's inherent ability) but not to the location of the transactors: Transactors' locations have no differential effects on the effectiveness of courts. We capture differences in the difficulty of adjudicating a dispute through a single parameter $\tau \in [0,1]$, which can be thought of as the probability that a plaintiff with a valid claim is able to satisfy the burden of proof necessary to win its case.[26]

If a court rules for the plaintiff, the court requires the defendant to pay the plaintiff damages, D. If the plaintiff fails to prove its case, the court finds for the defendant and no damages are rewarded. In the event that both parties sue, the court evaluates each party's claim and assesses damages

[26] Our model allows only for "type-2" (false negative) judicial errors. We assume that courts are able to compel payment through, for example, the threat of imprisonment for failing to obey a court order. We also assume that courts are impartial and nonstrategic: Their decisions are rule-based and not dependent on the identities of the parties or on inferences from the strategies of the litigants. See our discussion of quasi-courts in section 4.2 below, however.

independently, so that each party's payoff is the sum of outcomes of each suit. Finally, both filing and defending suits are costly: Plaintiffs incur costs c and defendants g.[27]

Given these assumptions, the expected payoff to a transactor from filing suit depends on both his behavior and that of his partner in the central transaction. Specifically, a transactor's expected payoffs from filing suit as a function of his own and his trading partner's behavior in the central transaction are as follows: A transactor who cooperated while his partner defected would expect $\tau D - c$ from filing suit and have a payoff of $-g$ if sued by his (defecting) partner. A transactor who defected while his partner cooperated would expect $-\tau D - g$ from being sued and have a payoff of $-c$ were he to sue his (cooperating) partner. If both transactors cooperate or both defect, the plaintiff would get $-c$ and the defendant $-g$, and thus each would receive $-c-g$ if both filed suit. Based on the above, we first establish the following lemma.

Lemma: Minimum effective damage payment. The existence of courts sustains cooperation if and only if damages D satisfy:

$$D \geq \max\left\{\frac{c}{\tau}, \frac{(w-h)e^{\theta X} - g}{\tau}\right\}. \tag{8}$$

Proof. It is evident from the expected payoffs specified that filing a suit is not profitable if both transactors cooperated or if a transactor had defected himself.[28] For a transactor who cooperated and whose partner defected, filing suit is profitable only if

[27] We assume that litigants bear their own costs regardless of who wins the case, the so-called "American rule." Results would not be materially affected under the requirement that the loser pay the prevailing party's litigation costs — sometimes referred to as the "English rule" — which is common outside of the United States.

[28] The unprofitability of filing suit when both partners have defected is peculiar to the symmetry in our model. If harms from breach are asymmetric or the difficulty of proving breach differs between transactors, suits would be profitable if expected net damages exceeded litigation costs.

Note that a court that acted "strategically" and sought to infer liability from the filing decisions of transactors — by, for example, always finding for the plaintiff on the grounds that only plaintiffs with valid claims would find it profitable to sue — would alter transactors' incentives so that the profitability of suing was no longer dependent on behavior in the central transaction, thereby undermining the value of the signal previously contained in the act of

(continued on next page)

$$D \geq \frac{c}{\tau}. \tag{9}$$

In the central transaction (stage 2), assume that player i's partner, x, cooperates. If i cooperates, his payoff is $he^{\theta X}$. If i defects and is sued by x, i's expected period payoff is $we^{\theta X}$ from defecting and $-(\tau D + g)$ from the suit. It is therefore rational for i to cooperate if and only if

$$he^{\theta X} \geq we^{\theta X} - (\tau D + g). \tag{10}$$

Solving (9) and (10) for D proves the Lemma. ■

The main implication of this lemma is that, for cooperation to be sustained through court enforcement (as part of a subgame-perfect equilibrium), two conditions must be satisfied. First, the damage payment a transactor expects to receive must be large enough to justify the cost of filing suit. Second, the damage payment a defector expects to have to pay has to be sufficiently large relative to the gain from defection to deter defection. If either condition is violated, court enforcement will fail to support cooperation, and the unique Nash equilibrium at stage 1 is for the parties not to transact.

It is straightforward to show that, holding distance (X) constant, cooperation is more likely to be sustained by court enforcement the lower plaintiff costs, c; the higher defendant costs, g; the more verifiable the transaction (or more effective the courts), τ; and the lower the gain from defection, $(w-h)e^{\theta X}$.

Special case: Expectation damages. A standard remedy for contract breach in many contexts is expectation damages, under which a transactor found liable for breach must compensate the other party

filing suit. This feature of the model is consistent with legal procedure prescribing that judgments be based solely on facts relevant to the substance of the case as presented at evidence at trial.

for its loss relative to what it would have earned had the contract been performed.[29] In our model, these damages would equal $D_{\exp} = (h-l)e^{\theta X}$. Substituting this into (9) and (10) and solving for the values of X for which (9) and (10) hold with equality yields

$$\Phi \equiv \frac{\ln\left[\frac{c}{(h-l)\tau}\right]}{\theta}, \quad \text{and} \quad \Gamma \equiv \frac{\ln\left[\frac{g}{(w-h)-\tau(h-l)}\right]}{\theta}, \tag{11}$$

which we use in the following proposition (proved in Appendix A).

Proposition 3 (The scope of cooperation under court enforcement). It is part of a subgame perfect equilibrium for transactors to cooperate if and only if the distance between them, X, satisfies the following conditions:

Case $\theta > 0$:

$$X \geq \Phi \text{ if } \tau \geq \frac{w-h}{h-l} - \frac{g}{(h-l)e^{\theta}}, \tag{12}$$

$$X \in [\Phi, \Gamma] \text{ if } \frac{w-h}{h-l} - \frac{g}{(h-l)e^{\theta}} > \tau \geq \frac{w-h-g}{h-l}. \tag{13}$$

Case $\theta < 0$:

$$X \leq \Phi \text{ if } \tau \geq \frac{w-h-g}{h-l}, \tag{14}$$

$$X \in [\Gamma, \Phi] \text{ if } \frac{w-h}{h-l} - \frac{g}{(h-l)e^{\theta}} \leq \tau < \frac{w-h-g}{h-l}. \tag{15}$$

Figure 4 illustrates the relationships characterized by Proposition 3. For high values of τ, as defined by equations (12) and (14) above, the range of transactions for which court enforcement supports

[29] In the model, cooperation increases with the size of damages, D, implying that courts could guarantee cooperation simply by setting very large damages or, equivalently, requiring specific performance of contractual obligations backed by imprisonment for failure to perform. In practice, courts infrequently employ such punitive damages or specific performance and, in many jurisdictions, courts prohibit transactors from agreeing to "penalties," that is, liquidated damages that exceed the other party's reasonable expectations. A large literature exists on contract damages. For an overview of the law and economics literature on contract enforcement, see Hermalin et al. (2007, 99-126). The size of damages would also be constrained by state competition for traders; see note 10 above.

cooperation is delimited only by Φ. For $\theta > 0$ (the left-hand panel in Figure 4), Φ represents a *lower* bound on the distance at which the partner x may be located from player i for mutual cooperation to be rational. For distances, X, less than Φ, transactors defect knowing that prospective damages are too low to justify the expense of filing suit. For $\theta < 0$, the threshold for filing suit is satisfied for transactions with closer (and therefore more valuable) trading partners. In this case (illustrated in the right-hand panel of Figure 4), Φ represents an *upper* bound on distance for cooperation instead. Provided that courts are sufficiently proficient at determining liability (τ is sufficiently high), court enforcement has no upper bound because a defendant's expected cost of being sued will be high enough to deter defection even for high value transactions. Court enforcement has a lower interior bound, however, because the cost to plaintiffs of filing suit may exceed the expected damage payment if the value of the underlying transaction is too low.[30]

For lower levels of τ, however, transactors' maximization behavior in the central transaction yields an upper bound on cooperation defined by Γ (equation (11)): If the distance X is too high (in the case of $\theta > 0$) or too low (for $\theta < 0$), the gains to defection will be too large relative to the expected damages to sustain cooperation. In this event, cooperation fails, not because courts are too expensive, but because they are insufficiently effective in assessing liability to deter defection. Whereas Φ represents the boundary of distances for which the stakes are too small to justify use of court enforcement, Γ characterizes the boundary on distances for which the stakes outstrip the capacity of courts to detect and deter opportunism. In Figure 4, cooperation can be sustained only for transactions at a distance from i of less than Γ for $\theta > 0$ and beyond Γ in the case of $\theta < 0$.[31] For low enough values of τ, cooperation cannot

[30] In the model, suits are never actually filed in equilibrium. Appendix B provides an extension that accommodates suits on the equilibrium path.

[31] Note that Φ also increases as τ falls (for $\theta > 0$), reducing the range of transaction over which courts sustain cooperation.

be sustained for transactors at any distance, and the unique stage 1 Nash equilibrium is that no trade takes place.

3.4. Comparing the Scope of Community and Court Enforcement

Our models of community and court enforcement contain several institution-specific parameters that influence the effectiveness of community and court enforcement in largely transparent ways: Greater transactor connectedness (κ) and more accurate adjudication (τ), for example, increase the range of transactions for which community and court enforcement, respectively, sustain cooperation. Our primary interest, however, is in the effects of the underlying economic variables common to both models, in particular, dissimilarity or "distance," X; and the relationship between distance and the value of cooperative trade captured by the parameter θ, with respect to which the analysis of the preceding sections yields a number of novel insights. First, contrary to Dixit's speculation that, for negative values of θ, "trades will unambiguously best be carried out using automatic self-governance in small communities each of which has homogeneous membership" (2003b: 1297), we find that increases in the gains to reneging (defection) that accompany increases in the value of "local" (low-X) trade when $\theta < 0$ may outweigh the greater likelihood that nearby transactors learn about previous defections, resulting in the breakdown of cooperation. This finding is illustrated in Figure 3, which shows community enforcement sustaining cooperation for negative θ only for the relatively low-value (high-X) transactions in the northeast corner.

Second, in contrast to Dixit's model, in which external governance substitutes for self governance (community enforcement), and expands the "scope of honest trade" (cooperation) only for large enough economies, courts and communities in our model are complementary in the sense that they tend to support cooperation for different sets of transactions: Community enforcement works best for relatively low-value

transactions, and court enforcement for relatively high-value transactions.[32] This complementarity appears in Figure 3 for positive values of θ (the left-hand side of the figure), where community enforcement supports cooperation with relatively nearby (low-X) transactors in the southwest corner while court enforcement sustains cooperation between more distant (high-X) transactors in the northwest corner.[33] As seen in the figure, an implication of the complementarity of communities and courts is the possibility that a range of distances exists for which neither communities nor courts alone can sustain cooperation.[34]

The analysis to this point has examined the range of transactions for which courts and communities are capable of sustaining cooperation individually, that is, without considering whether the existence of one enforcement institution affects the performance of the other. Typically, however, transactors will have access to both communities and courts, and defectors may be subject both to community sanctions, L, and to damages plus litigation costs, $\tau(h - l)e^{\theta X} + g$ (see (6) and (A5)). The consequences of the simultaneous availability of both institutions for cooperation depends on the distance between transactors in their current match, X, and can be divided into three cases or regions corresponding to whether cooperation is (i) supported by courts alone, (ii) supported by communities

[32] The contrast with Dixit's results derives from his conception of external governance, which functions as a "rating agency" in our classification (Figure 1), providing information on traders' previous behavior (Dixit, 2003b: 1309). Whereas the effectiveness of self governance (community enforcement) is limited by the size of the economy in his model, his external governance sustains cooperation universally for any size economy, but at an administrative cost proportional to the size of the economy (*id*.).

[33] An artifact of Dixit's exponential gains from trade specification, which we also adopt, is that, holding other parameters constant, the gains from trade for $\theta < 0$ (the maximum of which occurs at $X = 0$) are always less than or equal to the gains from trade for $\theta > 0$ (the minimum of which also occurs at $X = 0$). Balancing potential gains from trade for positive and negative θ's (by, for example, varying h appropriately) would show court enforcement to be effective in sustaining cooperation for low-X transactions when $\theta < 0$ (for sufficiently high τ), as depicted in the right-hand panel of Figure 4. The overall increase in expected gains from trade in the model as θ rises is broadly consistent with the expansion of wealth that accrues to decreasing costs of and barriers to trade associated with "globalization."

[34] Also possible, but not illustrated in Figure 3 (except at a point for $\theta = 1$), is that the ranges covered by communities and courts overlap.

alone, or (iii) not supported by either institution alone. For transactions in the interval $X \in [\Phi,\Gamma]$ ($X \in [\Gamma,\Phi]$ for $\theta < 0$), for which courts in isolation sustain cooperation, the additional availability of community sanctions has no effect: Under the conditions set out in Proposition 3, filing suit is individually rational in this region, and the threat of court enforcement is sufficient to support cooperation without the addition of community enforcement. Outside this interval, however, the co-existence of communities and courts will support cooperation for some transactions that could not be sustained by either institution individually. Specifically, for $X > \Gamma > X^*$ ($X < \Gamma < X^*$ for $\theta < 0$), the expected punishment for defecting is the sum of L and $\tau(h - l)e^{\theta X} + g$: In this region, filing suit against a defecting trading partner is individually rational but enforcement is insufficiently accurate (τ is too low) and, therefore, the expected court sanction too small, to deter cheating for high-value transactions. For distances outside but close to Γ, however, the addition of community sanction L will be enough to make defection unprofitable.[35]

Finally, whereas the existence of communities supplements court enforcement, the existence of courts diminishes the effectiveness of community enforcement.[36] Recall that L, the punishment to transactor i for defection in the current period (t) under community enforcement, is the loss associated with the possibility that transactor i's next-period match, y, will refuse to trade with i (as defined by equation (4)). With the existence of courts, however, a next-period match y in the interval $Y \in [\Phi,\Gamma]$ ($Y \in [\Gamma, \Phi]$ for $\theta > 0$) will find it profitable to trade with i even if y received a message that i defected in the

[35] Because the upper bound on effective court enforcement, Γ, does not occur for the parameter values used in Figure 3, the expansion of the range of court-supported cooperation with the introduction of communities does not appear in that figure. This region is visible, however, in Figure 4 along the circle south of Γ for $\theta > 0$ and north of Γ for $\theta < 0$.

For parallel reasons, the combination of court and community sanctions would also be large enough to deter defection for some transactions outside but close to Φ. Filing suit is not rational in this area, however, because expected damages are too low to justify litigation costs, and consequently, only community sanctions are operative.

[36] We thank Robert Gibbons for pointing out this "crowding out" effect, which is similar in spirit to the effect of improving spot-market outside options on the incentive constraint in relational contracts found in Baker et al. (2002).

previous period because y knows that the threat of court enforcement will induce i to cooperate in the new (t + 1) transaction. The fact that trade will occur with next-period matches on the interval [Φ,Γ] regardless of a transactor's current behavior implies that the community punishment for defection when courts are available will be less than it would have been if court enforcement were nonexistent. Accordingly, the range of transactions for which community enforcement can sustain cooperation when court enforcement is also available will be smaller than if courts did not exist. In Figure 3, the effect of the existence of effective court enforcement on scope of community enforcement is depicted by the dashed curve extending down from X* at θ = 0.4 to the horizontal axis; for the parameters in the illustration, the existence of courts causes the region for which communities can sustain cooperation to contract by the area below X* and to the left of this dashed curve.

In sum, communities and courts in our model tend to be effective for different transactions, implying that, in general, cooperation can be supported over a broader range of transactions when both institutions exist than with either alone. But whereas the availability of community sanctions supplements the effectiveness of weak (low τ) court enforcement, the effectiveness of community enforcement decreases as the range of transactions for which courts are effective, [Φ,Γ], increases. We also found that, holding the institution-specific attributes of communities and courts constant, the ranges of transactions over which community and courts are effective, as well as the overall range of cooperative trade, depends on how the value of trading opportunities vary with "distance." In environments where trade within one's community tends to be more profitable ($\theta < 0$), community enforcement will be adequate for relatively low-value transactions on the periphery but will tend to break down for the most valuable transactions, for which court (or other means of) enforcement will be needed. In contexts where the value of trade is greatest for transactors furthest from a transactor's community ($\theta > 0$), by contrast, community enforcement will tend to be sufficient to sustain cooperation with "nearby" transactors but not with more distant ones, transactions for which courts, however, are relatively well suited. Finally, a side effect of the expansion of the range of effective court enforcement as the value of more distant trade

grows (θ gets larger) is to diminish the range of effective community enforcement. Of particular note, these changes in the effectiveness of enforcement institutions derive from changes in the relation between distance and the value of trade and not because of changes in the inherent qualities of the institutions themselves (such as τ or κ).

4. Communities, Courts, and the Commercial Revolution

As Richman (2004: 2335) has remarked, private enforcement systems may arise for either of two broad reasons: "because reliable state-sponsored contract enforcement is unavailable" or because "public courts are available but…private law is preferable." Richman, like most prevailing treatments, places the medieval Law Merchant in the former category, that is, among the set of "commercial networks [that] resort to self-enforcement because state contractual enforcement is not a reliable option" (*id*.: 2335-6). Milgrom, North, and Weingast similarly portray the Law Merchant as a solution to the problem of securing merchant bargains "prior to the rise of large-scale third-party enforcement of legal codes by the nation-state" (1990: 4; *cf*., Benson, 1989: 647).

If the absence of effective state enforcement occasioned the rise of the Law Merchant, it stands to reason that the growth and extension of state authority would lead to its decline[37] Over time, it is argued, states acquired both an interest in shaping commercial law and the coercive power to enforce state court judgments.[38] Such coercive power gave state courts an advantage over private tribunals: "Rather than depend for punishment upon the decentralized behavior of merchants, state enforcement could seize the

[37] See, e.g., Cooter (1996: 1648): "as the English legal system became stronger and more unified, English judges increasingly assumed jurisdiction over disputes among merchants."

[38] As this statement suggests, the state ascension hypothesis has two versions. One holds that states' wresting of control of courts from merchants was hegemonic: Although merchant courts were more efficient, states were intent of centralizing authority (e.g., Benson 1989: 651-3; Mitchell, 1904: 157). The other, more benign, version is that, as state court administration and enforcement capacity improved, merchants gravitated from merchant courts to the now superior state courts. This second explanation corresponds to an improvement in τ (and possibly an increase in the size of damages, D) in our model.

property of individuals who resisted paying judgments, or put them into jail. If judgments could be enforced this way, then, in principle, the costs of keeping the merchants well informed about one another's past behavior could be saved" (Milgrom et al., 1990: 20-1).[39] At the same time, states were showing an increasing interest in commercial trade, so that, by the 16th century, "great and powerful kingdoms with definite commercial policies of their own, began freely to declare and to modify the law" (Mitchell, 1904: 157).

States undoubtedly gained power and expanded their reach over the course of the second millennium. Far less clear, however, is whether state *courts* became significantly more effective or less costly over time, or what interest states had in using contract enforcement as a vehicle for regulating commercial transactions. Indeed, rather than imposing state authority over contract disputes on resistant merchants, states appear to have taken on the function of contract enforcement reluctantly. Twelfth-century royal courts in England, for example, exercised jurisdiction over property, tort, and criminal matters but deliberately eschewed enforcement of contracts: "it is not the custom of the court of the lord king to protect private agreements, nor does it even concern itself with such contracts as can be considered like private agreements."[40] Before the 15th century, "[t]he King's court was not very fond of

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[39] Despite emphasizing the absence of effective state enforcement in the rise of the Law Merchant, Milgrom et al. ultimately attribute its demise to increasing information costs of running the system as the volume of trade increased (1990: 21):

> To the extent that the costs of running state adjudication and enforcement were roughly similar to the costs of running the private system and to the extent that taxes can be efficiently collected, a comprehensive state-run system would have the advantage that it eliminates the need for each individual to pay [the cost of using the centralized information system] each period. As the volume of trade increased in the late middle ages, the cost saving from that source would have been substantial. Thus our approach suggests that the importance of the role of the state enforcement of contracts was not that it provided a means of enforcing contracts where one previously did not exist. Rather, it was to reduce the transaction costs of policing exchange.

Their argument differs from ours in that theirs emphasizes the volume of trade whereas ours turns on the composition of trade.

[40] *Tractatus de Legibus et Consuetudinibus Regni Angliae* (circa 1188), as quoted in Simpson (1987: 4). See also, Baker (1979: 296-97).

contract." (Plucknett, 1956: 637; 636). States clearly had the capacity to enforce merchant contracts long before they assumed that role.[41]

4.1. The Evolution of Trade and Enforcement Institutions in Medieval Europe

As described above, an implication of our theoretical analysis is that the effectiveness of enforcement institutions varies with the value of trading with "distant" transactors: In settings where the most valuable trade is local, community enforcement is effective for a range of relatively low-value transactions, but voluntary trade either cannot be sustained or, for the highest-value projects, requires enforcement by a third party with coercive power. When, by contrast, the relationship between the profitability of trading opportunities and the distance (or dissimilarity) of transactors turns positive and increases, community enforcement initially suffices for transactors with sufficiently similar attributes and knowledge but is eventually undermined as the range of transactions for which court enforcement is effective expands.

Economic conditions in Europe in the Middle Ages largely conformed to this progression. By all accounts, the period preceding the Commercial Revolution in Europe was one of general economic contraction, leaving Europe with "little room for investment over and above the preservation of life" (Lopez, 1971: 59). The collapse of the Roman Empire, barbarian invasions, and coastal piracy combined

[41] Several authors have noted that judges in medieval England received part of their compensation from litigants and suggest that this led to competition among courts and tribunals for cases (e.g., Landes and Posner, 1979: 257-58; Benson, 1989; and Zywicki, 2003: 1582-1589). Whether or not such competition actually took place (for a contrary view, see Simpson, 1975), several points are worth noting. First, fees from litigants constituted only part of a judge's compensation (Landes and Posner: 256), implying that running a court system was costly to the state. Second, judges were, in effect, agents of the state, and the state's choice of a compensation scheme that encouraged judges to compete for cases presumably reflected a policy choice; states could have chosen instead to pay judges out of general tax revenue or a duty specifically on merchants but not tied to cases. Finally, compensating judges through fees paid by litigants may have made the use of state courts more appealing to judges but would have made them more expensive and therefore less appealing to litigants (relative to a system of free access to courts). Overall, these factors suggest that the state, or the merchants themselves, must have perceived some advantage of state courts over merchant tribunals. As Berman suggests, competition between medieval courts might be better thought of as analogous to modern disputes over jurisdictional boundaries between U.S. federal and state courts (1983: 268-9).

to make travel and transportation, already hazardous, even more dangerous. With the Muslim conquest of the north coast of Africa shipping between the southern and northern Mediterranean effectively ended (McCormick, 2001: 110, 118-19); in the rest of the Mediterranean trade was "absolutely marginal" (*id*.: 574).

The factors contributing to the reinvigoration of European trade are numerous (and disputed) but among them were (i) increased agricultural productivity and associated population growth, and (ii) the attenuation of the barbarian threat and strengthening of states, which improved security for both persons and possessions. Gradually, trade routes began to reopen and opportunities for profitable long-distance trade reemerged. The limitations of ships and general risks of sea travel limited the volume and range of goods suitable for interregional trade, however. To be profitable to transport, goods had to be valuable enough to justify the cost of transportation (high value to weight) but not so valuable that their loss would be ruinous.[42] In the Mediterranean, goods meeting these criteria included incense, spices, and silk from the Near East and furs, swords, and slaves from Europe (McCormick, 2001: 662, 729-735; Williamson, 2010: 11); in Northern Europe, interregional trade before the 13th century consisted primarily of such high-value-to-transport-costs products as wax, furs, wine, and cloth (Hybel, 2002: *xviii*; Campbell, 2002: 6).[43]

The growth in long-distance trade accelerated further with a series of innovations in shipbuilding technology beginning in the late 12th century that significantly lowered transportation costs and expanded the types and volumes of goods that could be economically traded. Historical and archeological studies estimate that the largest, early-medieval commercial ships had had maximum capacities under 75 tons (Bill, 2002: 102-3; McCormick, 2001: 95-6, 415-6). Around 1180-1200, however, shipbuilders began to

[42] McCormick (2001: 407) notes that, under Rhodian Sea Law, "Merchants who freighted heavy or expensive cargoes aboard old ships were not entitled to indemnification."

[43] Verlinden (1965: 127) lists products regularly traded at fairs in Flanders and Champagne in the early 12th century as including cloth, silk, leather, fur, linens, spices, wax, sugar, alum, lacquer, and dye-woods.

adopt a new method of construction involving the insertion of horizontal beams that protruded through the planking of the ship's sides (Bill, 2002: 105). Such "through-beam" construction along with other contemporaneous innovations allowed shipbuilders to construct cargo ships that were not only significantly larger but sturdier, safer, and cheaper than their predecessors (*id*.: 105-112). Maximum cargo capacities, which had been essentially static before 1150, roughly doubled at the end of the 12th century and continued to rise throughout the late Middle Ages and beyond (*id*.: 102, 112).

The reduction in transportation costs that accompanied larger and safer ships increased the volume but also changed the nature of commerce. First, whereas ship capacities and risks limited early trade to relatively high-value-to-transport cost products, later trade also included heavier and lower value cargoes, with bulk commodities such as stone, pottery, timber, and grain "develop[ing] from an incidental activity to regular trade during the two and half centuries from 1150 to 1400" (Hybel, 2002: *xvii*). Tariff lists and other records attest that "the supply of goods in the period 1200-1350 became quite differentiated" (Poulsen, 2002: 35). Second, as the volume and variety of traded goods grew, so did the number of markets serving that trade.[44] Initially, a few prominent cities and ports and a relatively small number of organized fairs served as the principal venues for long-distance trade. The expansion of trading opportunities for merchants, however, also created profit opportunities for rulers and landlords, who stood to gain from the collection of rental fees, customs, and tolls as well as from increased business for their tenants (Britnell, 1981: 221; Kadens, 2004: 49). In England, for example, the crown granted over 300 licenses for new markets between 1200 and 1349 in twenty-one counties alone (Britnell, 1981: 209-10).[45] Although most of these new markets were inland and not directly related to long-distance

[44] Berman (1983: 335) cites estimates that the number of merchants in western Europe also increase dramatically, from "the thousands" in 1050 to the "hundreds of thousands" by 1200.

[45] These twenty-one counties represented 55% the land area of England (Britnell: 209). Two-thirds (219 of 329) of the markets licensed in this period survived into the 16th century (Britnell: 210, 219). On the increase in medieval market towns in Normandy, see Hilton (1985), and in Germany, see Bindseil and Pfeil (1999). On the proliferation of fairs in the late Middle Ages, see Epstein (1994).

trade (*id*.: 215), coastal and riparian markets also proliferated: "The growth of long-distance trade … accounts for the exceptionally rapid growth of markets on advantageous sites," especially along rivers and the sea coast, which became "colonized as never before with markets…." (*id*.: 213-14).

The decline in transportation costs and expansion of long-distance trade opportunities during the Commercial Revolution and thereafter corresponds to an increase in θ in our model, from negative during the early Middle Ages, when limited opportunities and high risks depreciated the value of trade over long distances, to progressively more positive values as shipping technology and the safety and security of merchants and their cargoes improved.[46] In the earliest period, "agriculture was paramount, commerce and industry were adequate but marginal, security and stability rather than growth were the supreme ideal of the ruling classes" (Lopez, 1971: 57). What did trade take place was necessarily local and of modest value, for which community enforcement was likely to have been sufficient, with the most valuable investments — fortifications, water mills, and churches, for example — undertaken under the direction and control of the local lord.[47] Improving conditions resulted in trade over increasing geographic distances but, because the range of traded products and the number of markets remained limited, transactions tended to occur within relatively stable communities of merchants, whose "proximity" (low X) in terms of knowledge, experience, and acquaintances were conducive to community enforcement. Gradually, however, the proliferation of markets and products accompanying the continued decline in transportation costs (and increase in θ) after 1200 increased opportunities for, and the value of, trade in diverse goods in disparate markets, transactions for which community enforcement would have been less effective but for which court enforcement was relatively well-suited.

[46] We do not mean to suggest that this progression was monotonic; wars and plagues, among other factors, interrupted and not infrequently reversed the general trends. But the long-term direction was toward expanding opportunities for long-distance trade.

[47] On the conditions of pre-Commercial Revolution Europe generally, see Volckart and Mangels (1999: 435-6).

4.2. Did the Law Merchant Really Rely on Community Enforcement?

The correspondence between evolution of enforcement institutions in our model and the Law Merchant's historical ascendance and later displacement by state enforcement turns on the premise that the medieval Law Merchant operated as a community enforcement institution, a characterization that is widespread in the literature. For example, Milgrom, North and Weingast, addressing the question of what made Law Merchant judgments credible if not backed up by the state, observe, "Ostracism played an important role here, for merchants that failed to abide by the decisions of the judges would not be merchants for long" (1990: 5). Benson (1989), on whom Milgrom, North, and Weingast and others rely, similarly avers, "The Law Merchant 'governed' without the coercive power of a state…. These courts' decisions were accepted by winners and losers alike because they were backed by the threat of ostracism by the merchant community at large — a very effective sanction" (1989: 649). State enforcement was unnecessary because "[r]eciprocity and the threat of business sanctions compelled performance" (Trakman, 1983: 10).

Reputation and community sanctions undoubtedly played an important role in sustaining cooperation in medieval Europe, as they do in modern business transactions (e.g, Macaulay, 1963). The historical record suggests, however, that merchant courts depended on the enforcement tools of the state to a much greater degree than often portrayed in the literature.[48] Kadens, for example, characterizes as

[48] Our review of the literature reveals surprisingly thin documentary support for the claim that the threat of ostracism sustained merchant court decisions. Milgrom, North, and Weingast (1990) cite De Roover (1965), Trakman (1983), and Benson (1989). De Roover contains only a passing reference to the Law Merchant (1965: 100) and no discussion of ostracism or similar punishments of individual merchants (although boycotts of specific ports or countries are mentioned). Trakman (1983: 10) provides no documentary support for his reciprocity claim (see text above). Benson (1989; also 1990, 2002), in turn, cites Trakman (1983) and includes a reference Wooldridge (1970), a book principally concerned with U.S. government monopolies, that its own author describes as "lighthearted rather than severely scholastic" in which "technicalities have been minimized" so as not to interfere with "a good story" (1970: 9). Elsewhere, Greif, Milgrom and Weingast (1994) do provide an example of an agreement among a group of Flemish merchants not to trade with any merchant "anywhere in England who deals with sales of wool [who] deals falsely with any merchant in this alliance" (1994: 756). But other examples of multilateral actions they provide involve embargoes and boycotts against entire (usually) cities, or expulsions from a

(continued on next page)

"largely inaccurate" the assumption that the enforcement mechanisms of merchant courts "were so weak that the merchants had to rely heavily on reputation networks to convince each other to live up to contracts" (2004: 51). Far from arising spontaneously, setting up a marketplace was a privilege granted by a king or lord and accompanied by the right to raise taxes and mint coins as well as to create market law and enforcement institutions independent of the regular courts: "An element of practically all market documents of the 9th to 11th centuries is the removal of the competence of normal courts for the market place and the assignment of the right to establish a court (which practically included the right to specify the law) to the owner of the market" (Bindseil and Pfeil, 1999: 741).[49] With those grants, merchant courts acquired the same powers as other courts to fine, seize property, and impose other types of punishments (e.g., pillorying) to enforce their rulings (Sachs, 2006: 685; Gross, 1906: 234). Merchants who were unable or refused to pay damages or repay debts, or who refused to stand trial, could be forced to "pledge their bodies" — "a euphemism for imprisonment"[50] — while a cheating merchant "'stood in peril of death' at the hands of a foreign tribunal."[51] At the Champagne Fairs — Milgrom, et al.'s primary

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merchant guild of members who violated an embargo, rather than sanctions against individual merchants for ignoring merchant court rulings.

Weak documentary evidence of ostracism in support of Law Merchant decisions could simply reflect the success of the Law Merchant in securing merchant compliance: Ostracism could have been rarely observed because it was so effective; no merchant would risk the loss of business by ignoring merchant court rulings. Merchant reputations undoubtedly mattered in other ways as well. The willingness of fellow merchants to testify on behalf of a litigant, and the credibility of that testimony, would likely have depended on the litigant's and witnesses' reputations and standing in the merchant community, for example. See, generally, Goldberg (2011).

[49] Compare Sachs (2006: 700), noting that the fair at St. Ives was established by a royal grant in 1110 that included the right of the abbot to hold a court to govern the fair.

[50] Sachs (2006: 704). Reviewing surviving annual plea rolls for the English fair court at St. Ives for the period 1270 to 1324, Sachs concludes that "the St. Ives documents show that such coercive power — to enforce decisions, to collect damages, and to assess fines — was exercised routinely" (2006: 699) and contain no evidence that "ostracism was ever institutionalized" (*id*.: 706). Sachs also notes that "given that some defendants appear repeatedly in the rolls, one infers that they lived to trade again" (*id*.: 706), an observation in tension with the effectiveness of ostracism but consistent with the implication of our model that court enforcement allows transactors who had previously cheated to transact again.

[51] Kadens (2004: 60), quoting Hubert Hall, *2 Select Cases concerning the Law Merchant, A.D. 1239- 1633* (1930).

illustration — "the lord appointed wardens to act upon administrative and judicial matters in his name and serjeants, essentially policemen, to *enforce the orders of the court*, guard the merchandise at night, keep the peace, and deliver summonses" (Kadens, 2004: 53; emphasis added).

Law Merchant courts did differ from state courts in other dimensions, however, most significantly, in their use of expeditious procedures and application of good faith standards for adjudicating disputes (*e.g.*, Kerr, 1929: 355; Berman, 1983: 348, 353-4). For merchants who could not wait for the formal procedures of state courts for justice, merchant courts offered "expeditious procedure especially adapted for the needs of men who could not tarry for the common law…[,] an exemption from, or a short circuit through, the delays of due process" (Baker, 1979: 301-02). "Most importantly, merchant procedure was equitable procedure. It relied not on the rigor of the law but on judging '*ex aequo et bono*,' according to that which is fair and best for the parties and doing so in the simplest possible fashion. By this standard, the particular needs of the parties governed a given dispute rather than strict adherence to established law or precedent"[52]

In this revised characterization, the Law Merchant retains the desirable features of speed and conformity with merchant practice but acquires the coercive power to enforce judgments enjoyed by state courts, representing, in effect, a hybrid institution exhibiting the "best" properties of communities and courts. In terms of the taxonomy of Figure 1, this version of the Law Merchant constituted a specialized or "quasi-" court, exercising the enforcement power of regular, generalist courts while exploiting the specialized knowledge of particular communities. If correct, then why did the Law Merchant decline? The answer likely lies in two properties of equitable procedure. First, assessing good faith performance in

[52] Kadens (2004: 57); *cf.,* Berman (1983: 347). *Ex aequo et bono* "means what is just and fair or according to equity and good conscience. Something to be decided *ex aequo et bono* is something that is to be decided by principles of what is fair and just. A decision-maker who is authorized to decide *ex aequo et bono* is not bound by legal rules but may take account of what is just and fair. Most legal cases are decided on the strict rule of law. For example, a contract will be enforced by the legal system no matter how unfair it may prove to be. But a case to be decided *ex aequo et bono*, overrides the strict rule of law and requires instead a decision based on what is fair and just under the given circumstances" (http://definitions.uslegal.com/e/ex-aequo-et-bono/).

light of "the particular needs of the parties" is fact intensive, requiring familiarity with merchant customs and practices as well as knowledge of the parties and their circumstances, attributes that adjudicators who are themselves community members are more likely to possess. Second, compared to formal legal rules and procedures, equitable standards leave judges considerable discretion (Smith, 2010). Whether because they associate themselves with fellow community members or are more familiar with the customs or circumstances of members than non-members, judges "residing" in a given community may be more inclined to exercise that discretion discriminatorily or arbitrarily when confronted with complex issues or heterogeneous litigants.[53] As that prospect grows, the discretion-constraining property of formal legal rules and procedures become more attractive.[54]

The transactor and transaction attributes that undermine community enforcement in our model, and that we argue characterized late-Medieval European trade, appear to have had a corresponding effect on merchant-run courts. Although often described as a "universal law of trade" (e.g., Trakman, 1983: 11; Benson, 1982: 1), the merchant customs that comprised the medieval Law Merchant tended, in fact, to be location- and trade-specific.[55] As long as the number of traded products and market centers were few, as in the early period of trade revival, merchant adjudicators were likely to be sufficiently well-informed about merchant practices and trade usages in a given community to provide accurate and unbiased

[53] See, for instance, Landes and Posner (2003: 335), who argue that interest groups play a larger role in the appointment of judges to specialized and semi-specialized courts than to generalist courts and that, consistent with this, the U.S. Federal Circuit, which handles patent appeals, "turned out to be a pro-patent court in comparison to the average of the regional courts that it displaced in the patent domain."

[54] See, for example, Smith (2010: 52; 2003: 1112), who characterizes formality in relation to the extent to which a law or system is invariant to context.

[55] Referring to mercantile codes in medieval cities and towns, Baker (1979: 300) observes that "far from there having been a universal law throughout the world, the local variations seem as numerous as the coincidences." See also, Ibbetson (2007: 159-60) and Kadens (2004: 62).

decisions.[56] As the heterogeneity of merchants and customs increased with the proliferation or products and markets after 1200, however, the likelihood of disputes involving unfamiliar customs and between member and non-member merchants rose, increasing the scope for opportunistic or ill-informed rulings. "[A]t the time of the formal homologation of customs in the sixteenth century" in France and Flanders, for example, "still many dozens of different sets of customs" existed (Ibbetson, 2007: 160). Increasingly, "the group interests of the [local] merchants led to systematic discrimination of foreign traders" and to "rent-seeking … directed against merchants from other towns" (Volckart and Mangels, 1999: 444). As a consequence, when adjudication of merchant disputes began to shift to state (as opposed to local) courts, it was often at the urging of merchants and with the aim of harmonizing disparate customs that resisted simple reconciliation (Kadens, 2010: 23-5, 32-3). Illustrative is Ibbetson's description of the transition from merchant panels to state court enforcement of insurance contracts in 16th-century England, in which "a series of complaints by foreign merchants," who saw themselves as "unfairly disadvantaged in the proceedings," sought to have their cases moved out of the Mayor's Court, in which "the power of adjudication was retained firmly in the hands of the merchants themselves" (2008: 293, 298). As cases became more complex and customs more diverse, it made little sense to leave resolution of disputes "where there was no settled practice … to the perhaps capricious decision of a group of merchants" (*id*.: 293-4). The increasing heterogeneity of merchants thus appears to have undermined the qualities that made merchant courts attractive, which, like community enforcement, depended on shared knowledge and information for their effectiveness.

[56] *Cf*. Williamson (2010: 11), who notes that, at the end of the 12th century, Venetian merchants operated in a "stationary environment," trading commodities, "principally pepper," in Egypt and the Levant.

5. Conclusion

Recent research has illuminated the ways in which a variety of self-enforcing institutions can support cooperation among impersonal transactors but has been criticized for failing to explore more systematically the conditions under which particular institutions arise and fade. In this paper, we have sought to address that criticism by relating the effectiveness of two collective enforcement institutions — communities (social networks) and courts — to characteristics of economies. Specifically, drawing on a framework introduced by Dixit (2003b), we model the ability of communities and courts to sustain cooperation among transactors for whom differences in location, knowledge, or other economically relevant attributes affect the likelihood and value of trading and their ability to communicate. Despite its highly stylized representation of court and community enforcement institutions, the model provides a number of new insights into the factors influencing the relative effectiveness of these institutions that does not depend on exogenous changes in the strengths or properties of institutions. In addition to showing that courts and communities tend to be effective for different types of transactions, and that the existence of effective court enforcement undermines community enforcement, our analysis predicts an initial expansion in the range of transactions for which community enforcement can sustain cooperation followed by gradual displacement of communities by court enforcement as the value of trade between distant or dissimilar transactors increases, a pattern that parallels the historical emergence and erosion of the medieval Law Merchant as improvements in the security of travel and innovations in shipbuilding progressively reduced the cost and risks of transporting goods over long distances.

Although we emphasize a particular setting, we believe that the model has broader application. Dean Williamson (2010), for example, describes an analogous shift in the structure of the contracts used to finance long-distance trade contemporaneous with our analysis. When trade involved repeated transactions in a limited number of widely traded products at a regular location (though not necessarily with the same merchants), as was the case with Venetian trade with Egypt in the 13th century, merchants were likely to have access to enough information to allow *commenda* (sharing) contracts to operate

satisfactorily despite their susceptibility to agent cheating. Where trade was more episodic and diverse, as with the Turkish emirates and with Egypt after 1291, the absence of significant regular trade made reliance on *commenda* too hazardous, and merchants shifted to debt contracts that were relatively easy to enforce in court and thus less reliant on informal, reputational sanctions. Parallels can also be found in Ellickson's (1989) description of the operation and demise of 19th-century whaling communities, and in Bernstein's (1999) discussion of trade association efforts late 19th and early 20th centuries, "a period during which many merchant industries had already become significantly national in scope" (717), to harmonize and codify the customs and practices of their members, which varied by region within the same industry. The analysis also has potential policy implications for the introduction or strengthening of commercial court systems in developing economies.

Our formal analysis considers just two of the variety of institutions potentially available to support impersonal trade. Other institutions with origins in the Middle Ages include merchant guilds (Greif, Milgrom, and Weingast, 1994) and the "community responsibility system" (Greif, 2006), both of which, among other things, helped to secure property right protections beyond local jurisdictions. Our focus on institutions supporting voluntary exchange also led us to ignore institutions and organizations sustaining authority relationships. We know, for instance, that Rome shipped large volumes of grains, oil, and other products from Egypt and other Mediterranean ports. But such transfers were mainly the product of conquest and confiscation — vertical integration, if you will — rather than voluntary trade.[57]

Finally, in both our formal analysis and our discussion of medieval trade and institutions, we have abstracted away from much important detail to focus on general forces and trends. The patterns we discuss were neither uniform nor universal through Europe, proceeding at different rates, and sometimes

[57] *Cf*., McCormick (2001: 83, 85): "Recent studies have emphasized that, in volume, the greatest shipments [in late antiquity] were non-commercial transports of state supplies… [T]he importance of state-imposed fiscal transports means that we must speak sometimes of exchange rather than commerce." See generally, Richman (2004) on the need to consider vertical integration, in addition to courts and private ordering, when analyzing alternative enforcement mechanisms.

directions, at different locations and times. General agreement exists, however, that mercantile courts facilitated trade during the early Commercial Revolution and that over time much of the adjudication of merchant disputes shifted to conventional state courts. The Law Merchant did not entirely disappear, however. A modern version, for example, continues to govern many international transactions (see, e.g., Trakman, 1983: chapters 2 and 3). Like its predecessor, however, efforts have been made to bring enforcement of international law merchant arbitration decisions under the domain of national courts through treaties such as the 1958 United Nations New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards (see Leeson, 2008). Signed by six countries in the first year, the Convention has gradually been adopted by 142 of the 192 UN Member States in the ensuing four decades. A better understanding of the considerations that make state versus community enforcement more or less attractive may shed light on such questions as why and when countries choose to ratify such agreements. This paper takes a step in that direction by analyzing, albeit in a highly stylized model, some of the factors likely to affect the relative effectiveness of community and court enforcement.

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Appendix A. Proofs

A.1. Proof of Proposition 2

To prove Proposition 1, we have to show two characteristics of V, (i) monotonicity in X, and (ii) the conditions under which $V \geq 0$.

For (i): Differentiating V with respect to X shows that

$$\frac{\partial V}{\partial X} = \frac{((e-1)e^{1+X+2X\theta}(w-h)(2-\theta)\theta^2 + (e^{\theta X}-1)(e^{2X+\theta}-e^{2+X\theta})(\theta-1)\delta\kappa h)}{e^{1+X+\theta X}(e-1)(\theta-2)\theta}. \tag{A1}$$

Define $\hat{\theta}(X) \equiv \{\theta \mid \partial V/\partial X = 0\}$. Evaluating (A1), we get $\partial V/\partial X > 0$, $\forall\ \theta < \hat{\theta}(X)$, and $\partial V/\partial X < 0$, $\forall\ \theta > \hat{\theta}(X)$. Substituting $X = 0$ and $X = 1$ into $\hat{\theta}(X)$ yields $\hat{\theta}(X = 0) = \hat{\theta}(X = 1) = 0$. However, $\hat{\theta}(X \in (0,1)) < 0$; see Figure 5.

Define $\theta^* \equiv argmin\{\hat{\theta}(X)\}$. It follows that, $\forall\ \theta > 0$, $\partial V/\partial X < 0$, that is, V is monotonically decreasing in X for positive θ. It also follows that, $\forall\ \theta < \theta^*$, $\partial V/\partial X > 0$, that is, V is monotonically increasing in X for sufficiently negative θ. For $\theta \in [\theta^*,0]$, however, V is non-monotonic in X. This area is illustrated in Figure 5 by the region between the bold vertical lines at $\theta = 0$ and $\theta = \theta^*$. Henceforth, we focus on the two monotonic cases, $\theta = 0$ and $\theta < \theta^*$.

For (ii): Substituting values in (7) shows that $V \geq 0$ if:

$$\frac{h}{w-h}\delta\kappa \geq \frac{(e-1)e(\theta-2)}{e^{\theta}-e^{2}} \quad \text{for} \quad X = 0, \tag{A2}$$

$$\frac{h}{w-h}\delta\kappa \geq \frac{(e-1)e^{\theta}(e-1)}{e^{\theta}-1} \quad \text{for} \quad X = 1. \tag{A3}$$

Define $X^* = \{X \mid V = 0\}$. For $\theta > 0$, $\partial V/\partial X < 0$ and X^* therefore characterizes an upper bound on cooperation in X-space. Three subcases must be distinguished. First, if (A2) does not hold, $V < 0$ for all X, and the players have no incentive to cooperate, implying $X^* = 0$. Second, if (A2) and (A3) hold, $V \geq 0$ for all X, and the players have an incentive always to cooperate, implying $X^* = 1$. Finally, if (A2) holds but (A3) does not, a unique $X^* \in (0,1]$ exists such that $V(X \leq X^*;\cdot) \geq 0 > V(X > X^*;\cdot)$. Hence, the players have an incentive to cooperate for $X \leq X^*$ but not for $X > X^*$.

By contrast, for $\theta < \theta^*$, $\partial V/\partial X > 0$, and X^* is a lower bound on cooperation in X-space. Again, we have three subcases. First, if (A3) does not hold, $V < 0$ for all X and the players have no incentive to cooperate, implying $X^* = 1$. Second, if (A2) and (A3) hold, $V \geq 0$ for all X, and the players have an incentive always to cooperate, implying $X^* = 0$. Finally, if (A3) holds but (A2) does not hold, there is a unique $X^* \in (0,1]$ such that $V(X < X^*;\cdot) < 0 \leq V(X \geq X^*;\cdot)$. Hence, i has an incentive to cooperate for $X \geq X^*$but not for $X < X^*$. ■

A.2. Proof of Proposition 3

Assuming that player i's partner, x, cooperates, it is also individually rational for i to cooperate if (9) and (10) hold. Substituting $D_{\exp} = (h - l)e^{\theta X}$ into these equations, it follows:

$$(h-l)e^{\theta X} \geq \frac{c}{\tau} \tag{A4}$$

$$(h-l)e^{\theta X} \geq \frac{(w-h)e^{\theta X} - g}{\tau}. \tag{A5}$$

Solving (A4) for X shows that, given that i defected, it is rational for x to file suit at stage 3 if $X > \Phi$ for $\theta > 0$ and if $X \leq \Phi$ for $\theta < 0$. At stage 2, consider first $\theta > 0$. (A5) holds if:

$$\tau \geq \frac{w-h-g}{h-l} \quad \text{at} \quad X = 0, \tag{A6}$$

$$\tau \geq \frac{w-h}{h-l} - \frac{g}{(h-l)e^{\theta}} \quad \text{at} \quad X = 1. \tag{A7}$$

Both sides of (A5) are monotonic in X. Thus, if both (A6) and (A7) hold, it is rational to cooperate at stage 2, $\forall X > \Phi$. Note that the RHS of (A7) is larger than the RHS of (A6). Hence, (A7) is the binding constraint, which proves (12). If (A7) does not hold but (A6) holds, there is an interior solution in X-space, Γ, which is found by solving (A5) with equality for X. This proves (13).

The proof for $\theta < 0$ is identical to the proof for $\theta > 0$ with three exceptions. First, Φ defines an upper bound, not a lower bound in X-space. Second, the RHS of (A7) is smaller than the RHS of (A6).

Hence, (A6) is the binding constraint, which proves (14). Finally, if (A7) does hold but (A6) does not, there is an interior solution, Γ, which is a lower bound, not an upper bound, in *X*-space. This proves (15).

■

Appendix B. Suits Filed in Equilibrium

In our models of courts, suits are never filed in equilibrium no court suits are ever filed, which is different in practice. The following model extension accommodates court suits on the equilibrium path.

Without loss of generality, we only consider the case where $\theta > 0$ in this extension. Assume that only two types of courts exist: competent courts, for which $\tau = 1$, and incompetent courts, for which $\tau = 0$. Let the probability for each court type be .5. Hence, the prior expectation on court competence level is .5. Assume that each player, after being matched to his partner but before the central transaction in period t, gets a private signal about the quality of the specific court *j* that would deal with the case in *t*, given he or his partner filed a suit. Player *i*'s private signal is $\hat{\tau}_i \in \{0,1\}$ and player *x*'s signal is $\hat{\tau}_x$. Let signals be *i.i.d.* and the probability that *i*'s signal is correct about court *j*'s level of competence be φ. Applying Bayes' rule yields that the probability that the court's competence level is high given that *i* received a high signal is φ, whereas the probability that the court's competence level is high given that *i* received a low signal is $(1-\varphi)$. Technically, $P(\tau=1|\hat{\tau}_i=1) = \varphi$, $P(\tau=0|\hat{\tau}_i=1) = (1-\varphi)$, $P(\tau=1|\hat{\tau}_i=0) = (1-\varphi)$, and $P(\tau=0|\hat{\tau}_i=0) = \varphi$. It follows that *i*'s posterior belief about the quality of court *j*, which we denote by τ_i, is $\tau_i(\hat{\tau}_x = 1) = \varphi$ and $\tau_i(\hat{\tau}_i = 0) = (1-\varphi)$. To observe court suits on the equilibrium path, the following strategy combination must be a subgame-perfect equilibrium in period *t*.

Stage 1: Both players, *i* and *x*, choose to interact. Stage 2: One player, *i*, defects; the other player, *x*, cooperates.[58] Stage 3: *x* files a suit; *i* does not file a suit.

[58] Considering the case where *x* defects and *i* cooperates would be analogous.

We solve the game by backward induction. Assume, for simplicity, that the realizations of the players' signals about court quality are $\hat{\tau}_i = 0$ and $\hat{\tau}_x = 1$. Consequently, $\tau_i = (1 - \varphi)$ and $\tau_x = \varphi$.

At stage 3, given that *i* defected and *x* cooperated, *x* files a suit *iff* (A4) holds for τ_x (see the proof of Proposition 3), i.e. if:

$$\tau_x \geq \frac{c}{(h-l)e^{\theta X}} . \tag{B1}$$

Given that *i* defected, *i* expects negative payoff from a court suit — see (11) and (12) — and thus does not file a suit in equilibrium, independent of τ_i.

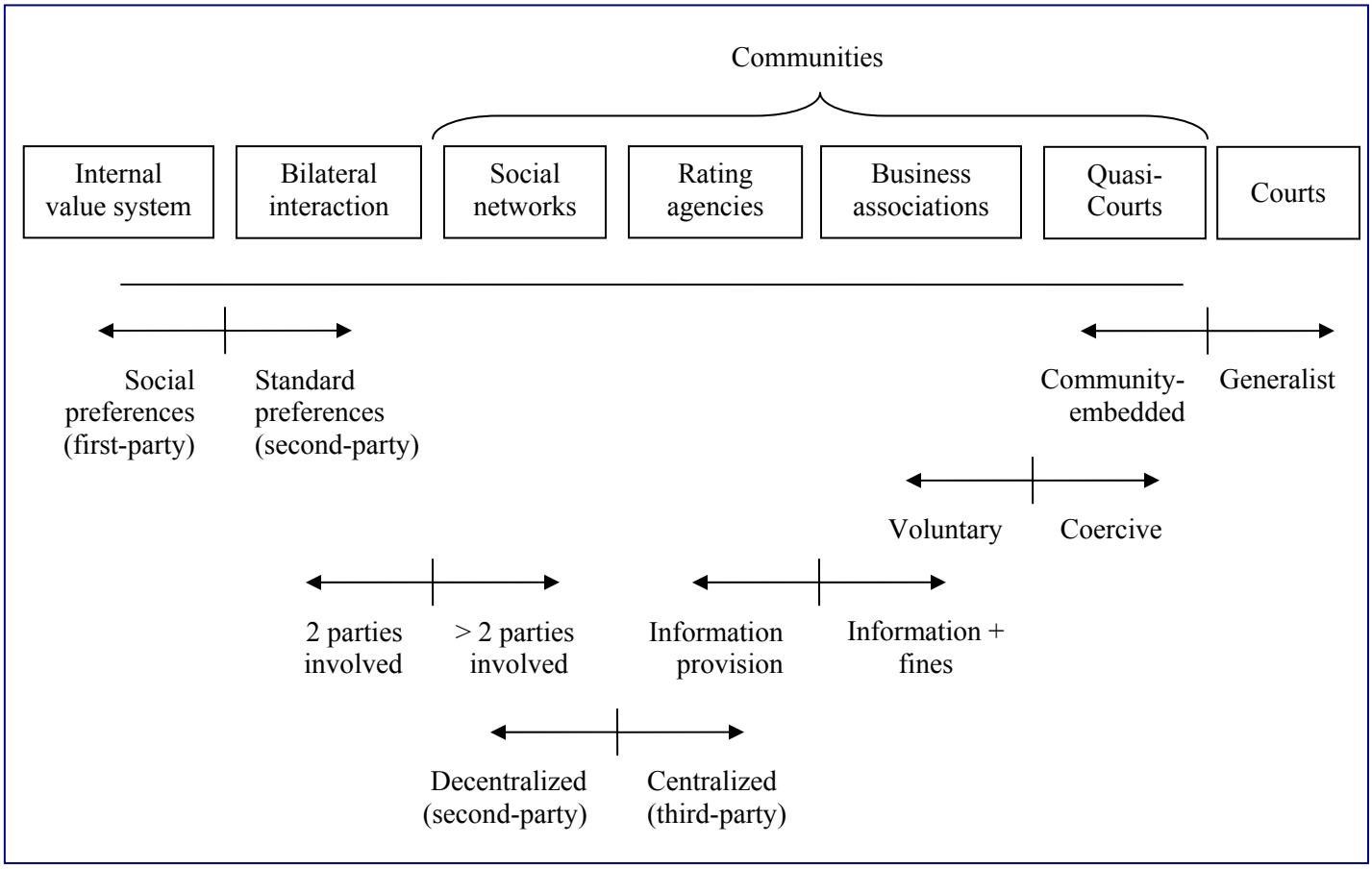
At stage 2, *i* defects iff (A5) does not hold for τ_i and *x* cooperates *iff* (A5) holds for τ_x

$$\tau_x \geq \frac{(w-h)e^{\theta X} - g}{(h-l)e^{\theta X}} > \tau_i . \tag{B2}$$

At stage 1, both players choose to transact with each other if they believe that the court can effectively protect them from their partner's opportunism. This condition is satisfied if they would both file a suit at stage 3 if their partner defected at stage 2. This is given if (B1) also holds for τ_i.

Summarizing, if τ_i and τ_x both satisfy (B1) and (B2), the strategy combination described above is a subgame-perfect equilibrium. This holds, for instance, for $(h-l)e^{\theta X} = 1$; $(w-h)\, e^{\theta X} - g = 0.5$; $c = 0.1$; $\varphi = 2/3$. With these parameter values, a suit will be filed in equilibrium whenever i and x get different signals, i.e., if $\hat{\tau}_i = 0$ and $\hat{\tau}_x = 1$, or vice versa.

Figure 1. Seven Commitment Mechanisms



Bilateral (repeated relationship): No external parties involved; can enforce cooperation via repetition of trade. Advantage: Observability of partner's behavior is sufficient (no verifiability needed).

Social networks: Other players, who are known by one or both trading partners, are involved. If one partner defects, he loses future trade with partner but also with all potential trading partners in social network.

Rating agencies: Formal organization with centralized management (rules, some formal authority), membership may require a fee. Collects reports of members about the behavior of their trading partners and distributes them among the other members.

Business associations: Formal organization with centralized management (rules, some formal authority); membership may require a fee. May be authorized to punish defectors directly (e.g., fines) or by directing boycotts of offending actor.

Quasi-courts: Formal organization that possesses the right to use coercion to enforce its judgments but is embedded in community.

Courts: Encompasses all legal powers of the state (judiciary, executive) to enforce contracts. Verifiability of claims necessary by definition. Lack of community embeddedness implies relatively high objectivity and expense.

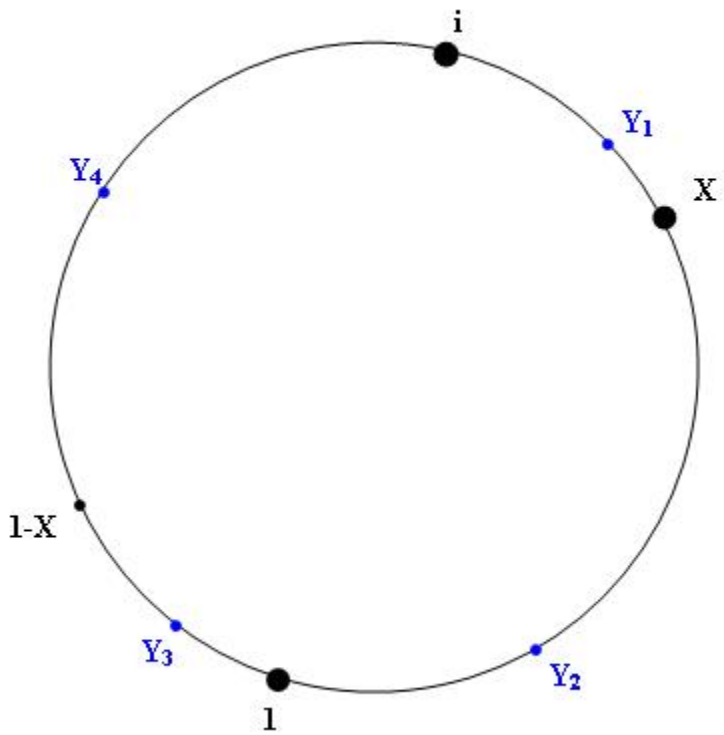


Figure 2. Possible Locations of *y*, Player *i*'s Next-Period Match, Relative to x, *i*'s Current Match.

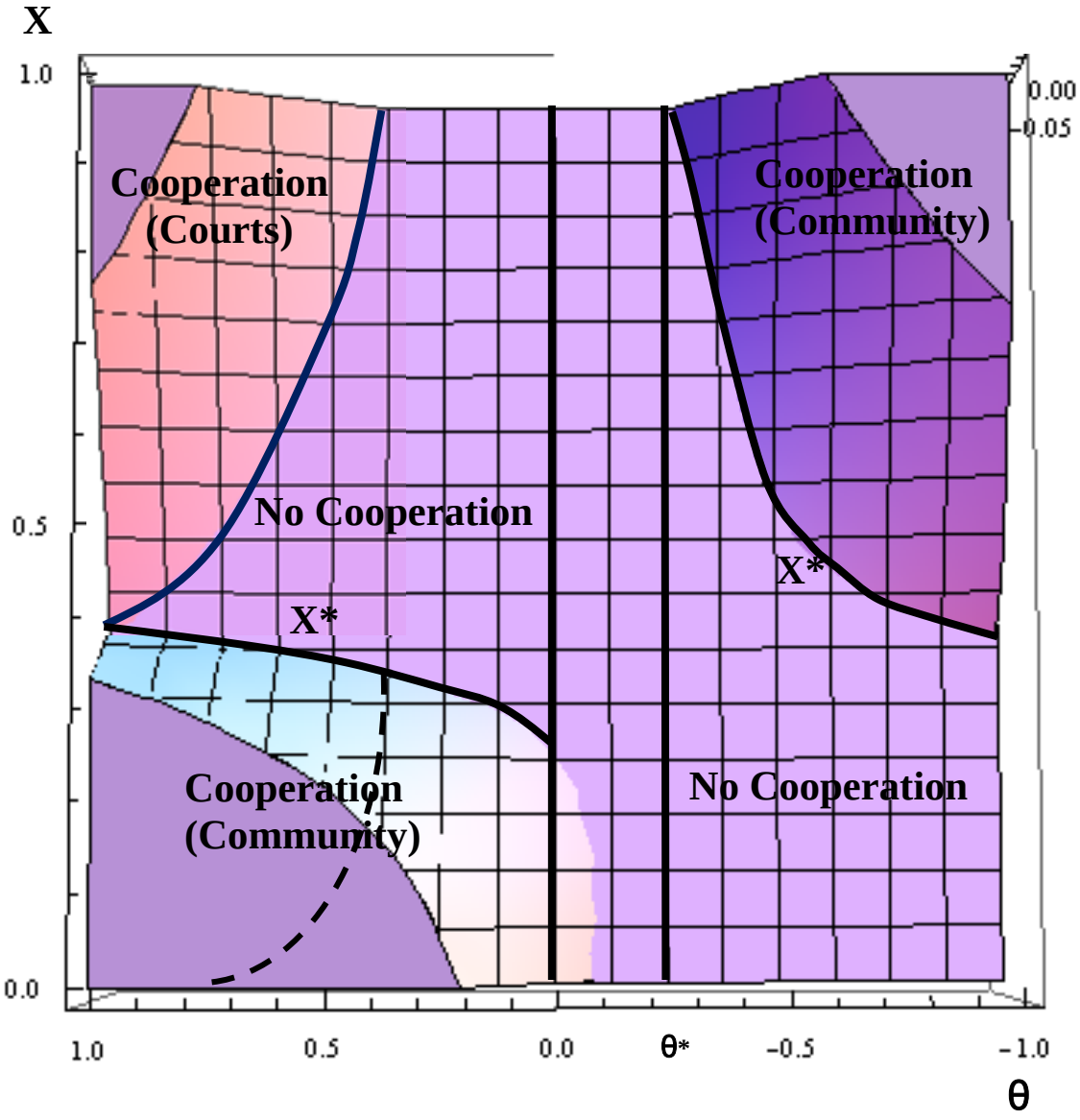


Figure 3. Cooperation under Community And Count Enforcement
(Numerical example for $w = 1.4$, $h = \kappa = c = 1$, $l = -0.5$, $\delta = 0.6$, $\tau = 0.45$)

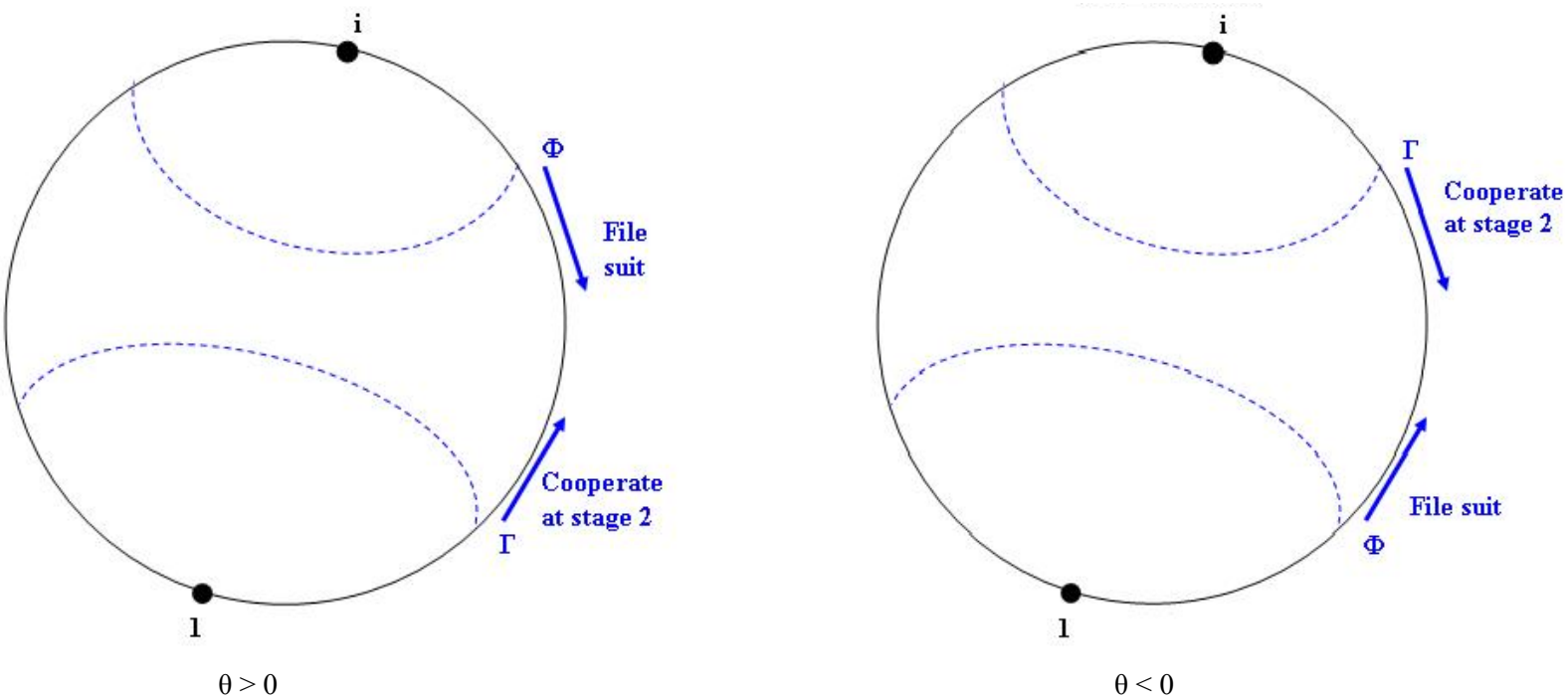


Figure 4. The Scope of Cooperation under Court Enforcement

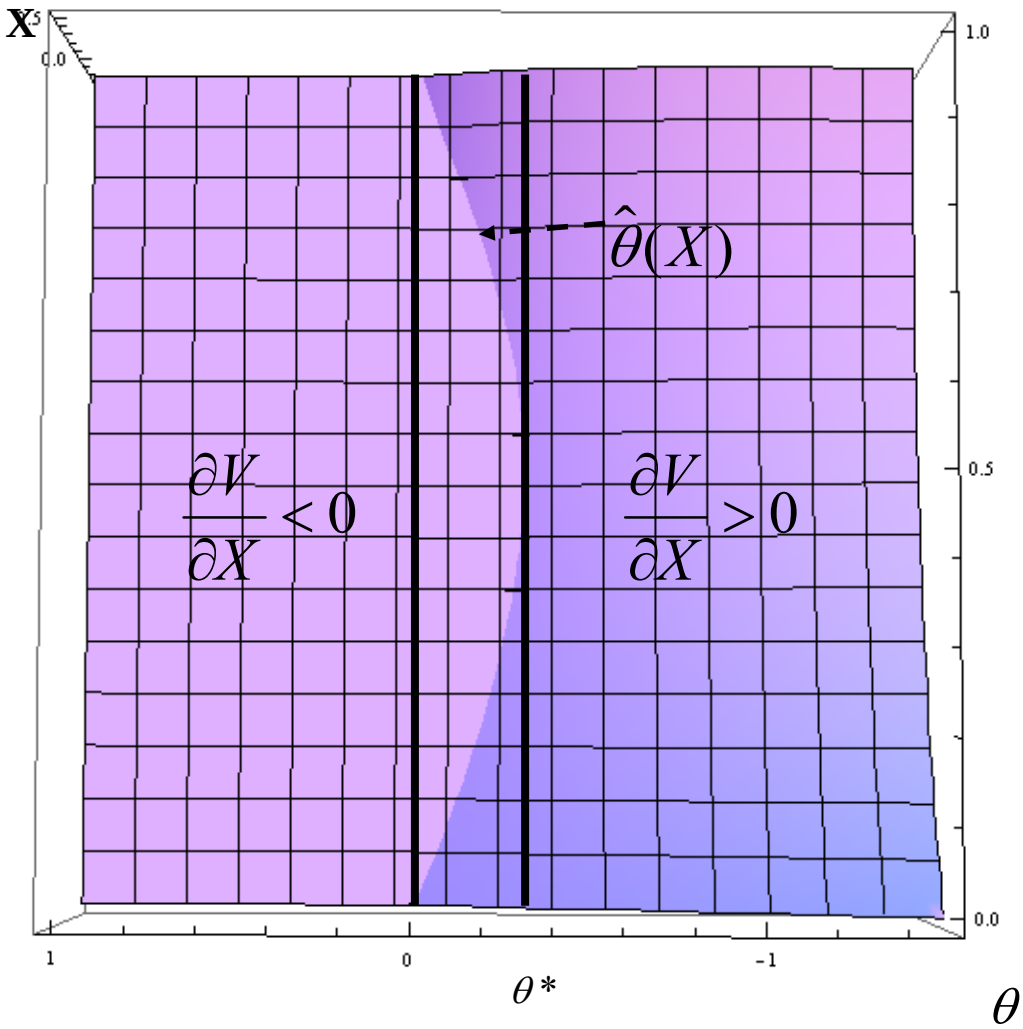


Figure 5 (for Proof of Proposition 1): Numerical Example for w = 1.4, $h = \kappa = 1$, $\delta = 0.6$. In the bright (dark) region on the left (right), $\partial V/\partial X < 0$ ($\partial V/\partial X > 0$), $\hat{\theta}(X)$ separates these regions. For $\theta \notin [\theta^*, 0]$, V is monotonic in X.