THE ROLE OF INSTITUTIONS IN THE REVIVAL OF TRADE: THE LAW MERCHANT, PRIVATE JUDGES, AND THE CHAMPAGNE FAIRS

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A good reputation can be an effective bond for honest behavior in a community
of traders if members of the community know how others have behaved in
the past − even if any particular pair of traders meets only infrequently.
In a large community, it would be impossibly costly for traders to be perfectly
informed about each other's behavior, but there exist institutions that can
restore the effectiveness of a reputation system using much less extensive
information. The system of judges used to enforce commercial law before
the rise of the state was such an institution, and it successfully encouraged
merchants (1) to behave honestly, (2) to impose sanctions on violators, (3)
to become adequately informed about how others had behaved, (4) to provide
evidence against violators of the code, and (5) to pay any judgments assessed
against them, even though each of these behaviors might be personally costly.

How can people promote the trust necessary for efficient exchange when individuals have short run temptations to cheat? The same question arises whether the traders are legislators swapping votes, medieval merchants exchanging goods, or modern businesspeople trading promises about future deliveries. In each of these situations, one of the important ways in which individuals ensure one another's honest behavior is by establishing a continuing relationship. In the language of economics, if the relationship itself is a valuable asset that a party could lose by dishonest behavior, then the relationship serves as a *bond*: a trader would be unwilling to surrender this bond unless the gain from dishonest behavior was large.

Variants on this basic idea are found throughout the literatures of economics (Klein and Leffler, 1981; Shapiro, 1983; Shapiro and Stiglitz, 1984), politics (Axelrod, 1984, 1986; Calvert, 1986) and game theory (Abreu, 1988; Aumann, 1985; and Fudenberg and Maskin, 1986). Even in a community in which any particular pair of people meet rarely, it is still possible (as we show) for an individual's reputation in the group as a whole to serve as a bond for his good and honest behavior toward each individual member. This illustrates the important fact that a reputation system may sometimes work only when it encompasses

sufficiently many traders and trades, that is, there are economies of scale and scope in reputation systems.

These conclusions about the potential effectiveness of a reputation system, however, leave us with a puzzle: If informal arrangements based on reputations can effectively bond good behavior, then what is the role of formal institutions in helping to support honest exchange? The legal apparatus for enforcing business contracts in many ages and many parts of the world, the suppliers' organizations that negotiate contracting patterns among modern Japanese firms, the complex institutional structure that facilitates agreements among US Congressmen,[1] the notaries that recorded agreements in the Italian city-states in the middle ages, and the organization of international trade via the Champagne fairs are all examples of institutionalized arrangements to support trade and contracting. All involve the creation of specialized roles which would not be necessary if reputations alone could be an adequate bond for trade. But, why can't a simple system of reputations motivate honest trade in these various settings? And, what role do formal institutions play when simple reputational mechanisms fail?

We embed our study of these questions in the time of the revival of trade in Europe during the early middle ages. At that time, without the benefit of state enforcement of contracts or an established body of commercial law, merchants evolved their own private code of laws (the *Law Merchant*) with disputes adjudicated by a judge who might be a local official or a private merchant. While hearings were held to resolve disputes under the code, the judges had only limited powers to enforce judgments against merchants from distant places. For example, if a dispute arose after the conclusion of the Champagne Fair about the quality of the goods delivered or if agreements made at the Fair for future delivery or for acceptance of future delivery were not honored, no physical sanction or seizure of goods could then be applied.

The evolution and survival for a considerable period of a system of private adjudication raises both particular versions of our general questions and new questions about the details of the mechanism. What was the purpose of the private adjudication system? Was it a substitute for the reputation mechanism that had worked effectively in earlier periods (Greif, 1989)? Also, if there was no state to enforce judgments, how did they have any effect? How could a system of adjudication function without substantial police powers?

The practice and evolution of the Law Merchant in medieval Europe was so rich and varied that no single model can hope to capture all the relevant variations and details. Our simple model is intended to represent certain universal incentive problems that any successful system would have to solve. It abstracts from many of the interesting variations that are found across time and space as well as from other general problems, such as the spatial diversion of traders and trading centers and the interactions among competing trading systems.

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[1] Either by facilitating coordination (Banks and Calvert, 1989) or by preventing reneging on agreements (Weingast and Marshall, 1988).

We begin in section 1 with a discussion of the medieval Law Merchant and related institutions. We set the theoretical context for our analysis in section 2. It is well known, as we have explained above, that in long-term, frequent bilateral exchange, the value of the relationship itself may serve as an adequate bond to ensure honest behavior and promote trust between the parties. We argue in section 2 that even if no pair of traders come together frequently, if each individual trades frequently enough within the community of traders, then transferable reputations for honesty can serve as an adequate bond for honest behavior *if members of the trading community can be kept informed about each other's past behavior.* Well informed traders could boycott those who have violated community norms of honesty, if only they knew who the violators were. It is the costliness of generating and communicating information − rather than the infrequency of trade in any particular bilateral relationship − that, we argue, is the problem that the system of private enforcement was designed to overcome.

In section 3, we introduce our basic model of a system of private enforcement and develop our core thesis that the role of the judges in the system, far from being substitutes for the reputation mechanism, is to make the reputation system more effective as a means of promoting honest trade. The formal system is more complex than the simple informal system of reputations that preceded it, but that was a natural outcome of the growing extent of trade. In a large community, we argue, it would be too costly to keep everyone informed about what transpires in all trading relationships, as a simple reputation system might require. So the system of private judges is designed to promote private resolution of disputes and otherwise to transmit *just enough* information to the right people in the right circumstances to enable the reputation mechanism to function effectively for enforcement. In order to succeed, such a system must solve a number of inter-connected incentive problems: Individual members of the community must be induced to behave honestly, to boycott those who have behaved dishonestly, to keep informed about who has been dishonest, to provide evidence against those who have cheated, and to honor the decisions of the judges. All of these problems can be resolved by the system if certain institutional constraints are satisfied, as we show in section 3. Briefly, the costs of making queries, providing evidence, adjudicating disputes, and making transfer payments must not be too high relative to the frequency and profitability of trade if the system is to function successfully.

Intuitively, the system of private judges accomplishes its objectives by *bundling* the services which are valuable to the individual trader with services that are valuable to the community, so that a trader pursuing his individual interest serves the community's interest as well. Unless a trader makes appropriate queries, he cannot use the system to resolve disputes. The requirement that the traders make queries provides an opportunity for the judge to collect payments for his services even if no actual disputes arise. As applied to the Champagne Fairs, the local lord or his agents could appoint honest judges, register transactions, and tax them.

In section 4, we make a brief digression to assess how *efficiently* the system of private judges accomplishes its task. We argue that no system can restore the

effectiveness of the community reputation mechanism without incurring costs that are qualitatively similar to those incurred by the system of private judges, and moreover that the latter system seems to have been designed in a way that kept these transaction costs low.

Our analysis in section 3 gives the judge a passive role only. In section 5, we study the possibility that the judge may threaten to sully the reputations of honest traders unless they pay bribes. We show how the system can survive some such threats, though we do not attempt a comprehensive evaluation of all the kinds of bribes and extortion that might be tried in such a system.

Concluding remarks, relating our model to a broader institutional perspective, are given in section 6.

1. THE MEDIEVAL LAW MERCHANT

The history of long-distance trade in medieval and early modern Europe is the story of sequentially more complex organization that eventually led to the "Rise of the Western World." In order to capture the gains associated with geographic specialization, a system had to be established that lowered information costs and provided for the enforcement of agreements across space and time. Prior to the revival of trade in the early middle ages, few institutions underpinned commercial activity; there was no state to enforce contracts, let alone to protect merchants from pirates and brigands. In contrast, modern Western economies possess highly specialized systems of enforcing contracts and protecting merchants, resulting in widespread geographic specialization and impersonal exchange. The story of this evolution has been told elsewhere (e.g., Lopez, 1976; North and Thomas, 1973). Our purpose in this section is to suggest the outlines of an important step in this evolution, namely the early development of commercial law prior to the rise of large-scale third-party enforcement of legal codes by the nation-state.

A large number of problems had to be resolved in order to support the expansion of trade. First, as trading communities grew larger, it became harder within each community for merchants to monitor one another's behavior. New institutions were required to mitigate the types of cheating afforded by the new situation. Second, as trade grew among different regions, institutions were needed to prevent reneging by merchants who might cheat in one location, never to be seen again.

In response to these problems, a host of institutions arose and evolved over time. Towns with their own governments became homes for merchants who developed their own law separate from the traditional feudal order (Pirenne, 1925; Rorig, 1967). Merchant gilds arose to provide protection to foreign merchants away from their homes, but also protection to local merchants against fly-by-night foreign merchants who might never be seen again (DeRoover, 1963; Thrupp, 1948). Key to understanding the ability of merchants from widely varying regions to enforce contracts was the evolution of the *Lex Mercatoria* or Law Merchant — the legal codes governing commercial transactions and administered by private judges drawn from the commercial ranks. While practice varied across time and

space, by the end of the 11th century, the Law Merchant came to govern most commercial transactions in Europe, providing a uniform set of standards across large numbers of locations (Benson, 1989). It thereby provided a means for reducing the uncertainty associated with variations in local practices and limited the ability of localities to discriminate against alien merchants (Berman, 1983; Trakman, 1983). Thus, "commercial law can be conceived of as coordinating the self-interested actions of merchants, but perhaps an equally valuable insight is gained by *viewing it as coordinating the actions of people with limited knowledge and trust*" (Benson, 1989, p. 648, emphasis added).

While the governments of towns supported the development of markets and were intimately involved in developing merchant law (Pirenne, 1925; Rorig, 1967), they often could not provide merchants protection outside their immediate area.[2] Nor could they enforce judgments against foreign merchants who had left town prior to a case being heard. Thus, merchant law developed prior to the rise of a geographically extensive nation-state. But this raises a key problem in the theory of enforcement, for what made these judgments credible if they were not backed up by the state? Ostracism played an important role here, for merchants that failed to abide by the decisions of the judges would not be merchants for long (Benson, 1989; DeRoover, 1963; Trakman, 1983).

The Law Merchant and related legal codes evolved considerably over time. In addition to providing a court of law especially suited for merchants, it fostered significant legal developments that reduced the transaction costs of exchange (North, 1989, ch. 13). As agency relationships became common — whether between partners in different locations or between a sedentary merchant who financed a traveling one — a new set of rules governing these agreements was required. The same also held for the new practices of credit agreements and insurance. Here, we note the development of law covering agency relations (DeRoover, 1963; Greif, 1989), bills of exchange, and insurance (North, 1989, ch. 13).

The benefits of all these developments, however, could only be enjoyed as long as merchants obeyed the Law Merchant. Moreover, since disputes arise even among honest merchants, there needed to be a system for hearing and settling these disputes. To see how these feats of coordination might have been accomplished, we develop a game theoretic model of the judicial enforcement system — a model inspired by the Law Merchant and by the Champagne Fairs. The latter played a central role in trade in the 12th and 13th centuries (DeRoover, 1963; North and Thomas, 1973; Verlinden, 1963), and included a legal system in which merchants could bring grievances against their trading partners. However, it is not clear why such a system would be effective. What prevents a merchant from cheating by supplying lower quality goods than promised, and then leaving the

[2]Of course, considerable variation existed across locations, especially between northern and southern Europe. In the latter area, city-states arose, providing law and protection beyond the immediate area of the city. Further, over time, as the nature of governments changed, so too did their involvement in the legal and enforcement process.

Fairs before being detected? In these circumstances the cheated merchant might be able to get a judgment against his supplier, but what good would it do if the supplier never returned to the Fairs? Perhaps ostracism by the other merchants might be an effective way to enforce the payment of judgments. However, if that is so, why was a legal system needed at all?

Another part of the inspiration for our formal model is the system of notaries that was widely used to register the existence of certain types of contracts and obligations. Typically, notaries were used for long-term contracts such as those for apprenticeships, sales of land, and partnerships (Lopez and Raymond, 1955). The extensive use of notaries in certain areas to register agreements suggests that reputation via word of mouth alone was insufficient to support honest behavior and that a third party without any binding authority to enforce obligations was nonetheless quite valuable for promoting honest exchange.

2. COMMUNITY ENFORCEMENT WITHOUT INSTITUTIONS

With the exception of barter transactions, in which physical commodities are exchanged on the spot, virtually all economic transactions leave open the possibility of cheating. In the Champagne Fairs, where merchants brought samples of their goods to trade, the quantities they brought were not always sufficient to supply all the potential demand. Then, the merchants sometimes exchanged promises − to deliver goods of like quality at a particular time and place, or to make payment in a certain form. Promises, however, can be broken.

To represent the idea that cheating may be profitable in a simple exchange, we use the Prisoners' Dilemma (PD) game as our model of a single exchange transaction. Although this PD model is too simple to portray the richness of even simple contracts, it has the advantage that it is very well known and its characteristics in the absence of institutions have been thoroughly studied, so that the incremental contribution made by the Law Merchant system will be quite clear. Moreover, the PD game represents in an uncluttered way the basic facts that traders have opportunities and temptations to cheat and that there are gains possible if the traders can suppress these temptations and find a way to cooperate.

The Prisoners' Dilemma game that we employ is shown below, where $\alpha > 1$ and $\alpha - \beta < 2$.

	Honest	Cheat
Honest	1, 1	$-\beta, \alpha$
Cheat	$\alpha, -\beta$	0, 0

Each player can choose to play one of two strategies: Honest or Cheat. As is well known, Honest behavior maximizes the total profits of the two parties. However, a trader profits by cheating an honest partner ($\alpha > 1$) even though

cheating imposes a still larger loss on his honest partner $(1 - (-\beta) > \alpha - 1)$.

It is clear that if this game is played only once, it is in each player's separate interest to play Cheat, since that play maximizes the player's individual utility regardless of the play chosen by the competitor. Consequently, the only *Nash equilibrium* of the game is for both to play Cheat. Then both are worse off than if they could somehow agree to play Honest.

Now suppose that the players trade repeatedly. Let a_{it} represent the action taken by player i in period t; let $\pi_i(a_{1t}, a_{2t})$ represent the resulting payoff earned by player i in period t; and let δ be the discount factor applied to compute the present value of a stream of payoffs. If trade is frequent, then δ is close to one; if trade occurs only once (or is quite infrequent), then δ is (close to) zero. A player's time weighted average payoff over the whole sequence of trades is given by:

$$\bar{\pi}_i = (1 - \delta) \sum_{t=0}^{\infty} \delta^t \pi_i(a_{1t}, a_{2t}) \tag{1}$$

In this repeated trading relationship, if the players can condition their actions in each period on what has transpired in the past, then they have an instrument to reward past honest behavior and to punish cheating. For the PD game, Axelrod (1984) has shown that for δ close enough to 1 there is a Nash equilibrium in which each player adopts the Tit-for-Tat (TFT) strategy — according to which the player chooses honest play at $t = 0$ and for any later t plays whatever his partner played in the immediately preceding period (that is, at $t - 1$).

The central idea that frequent trading with the same partner, or "clientization," makes it possible to find an equilibrium with efficient trading applies even for more refined solution concepts, such as subgame perfect equilibrium. It has been shown to hold for virtually all repeated games, regardless of the number of players, the number of strategies available to each, or the magnitudes of the payoffs (Fudenberg and Maskin, 1986). What is less fully appreciated is that the same conclusion holds in a community of traders in which players change partners often and cheaters may never again have to face the cheated partner — provided that information about the behavior of the traders is widely shared in the community.

To see this, suppose that there are N traders and that there is some rule M that matches them at each stage. Let h_t be the history of trade through date t and let $M(h_t, i)$ be the identity of the trader who is matched with trader i at date $t + 1$ at history h_t. Consider the Adjusted Tit-for-Tat (ATFT) strategy according to which player i plays Honest at date 0 and then plays Cheat at date $t + 1$ if two conditions hold: (1) i made the play at date t that was specified by his equilibrium strategy and (2) $M(h_t, i)$ did not make the play at date t that was specified by his equilibrium strategy. If either condition fails, then the ATFT strategy calls for i to play Honest. The ATFT strategy formalizes the idea that a trader who cheats will be punished by the next merchant he meets if that merchant is honest, even if that merchant is not the one who was cheated.

One might wonder what reason the merchant who was not cheated has to carry

out the punishment. Within the PD model, the answer is twofold: First, punishing the cheater is directly profitable, because the punishment is delivered by playing Cheat. Second − and this is the reason that applies even in more general models − a merchant who fails to deliver a punishment, say by participating in a boycott, when he is supposed to do so is himself subject to punishment by the community of merchants. The community, in its turn, will carry out the punishment, for the very same reasons. Theorem 1 below verifies that this system is in fact sometimes an equilibrium, that is, no merchant could gain at any time by deviating from its rules provided he expects other merchants to adhere to the rules in all future play.

Theorem 1. For δ near enough to one − specifically if

$$\delta \geq \text{Max}[\beta/(1 + \beta), (\alpha - 1)/(1 + \beta)] \tag{2}$$

− the Adjusted Tit-for-Tat strategies are a subgame perfect equilibrium in the community trading game for *any* matching rule M.

Proof. By the Optimality Principle of dynamic programming, it suffices to show that there is no point at which player i can make a one-time play different from the equilibrium play that raises his total payoff. By inspection of the strategies, it is clear that the player may face one of four decision situations according to whether condition (1) only is satisfied, condition (2) only is satisfied, or both or neither of (1) and (2) are satisfied. If just condition (1) or condition (2) (not both) is satisfied, then a current period deviation by player i is unprofitable if:

$$(1 - \delta)[\alpha - \delta\beta] + \delta^2 \cdot 1 \leq (1 - \delta) \cdot 1 + \delta \cdot 1 \tag{3}$$

which holds if and only if $\delta \geq (\alpha - 1)/(1 + \beta)$. If (1) and (2) are both satisfied, deviation is unprofitable if:

$$(1 - \delta)[0 - \delta\beta] + \delta^2 \cdot 1 \leq (1 - \delta) \cdot \alpha + \delta \cdot 1 \tag{4}$$

and this is satisfied for all $\delta \geq 0$. If neither (1) nor (2) is satisfied, then deviation is unprofitable if:

$$(1 - \delta)[0 - \delta\beta] + \delta^2 \cdot 1 \leq -(1 - \delta) \cdot \beta + \delta \cdot 1 \tag{5}$$

which holds if and only if $\delta \geq \beta/(1 + \beta)$.   ∎

Our formal analysis verifies that it is not necessary for any pair of traders to interact frequently − that is, for traders to establish client relationships − in order for the boycott mechanism to be effective. However, that simple conclusion relies on the condition that the members of the community are well enough informed to know whom to boycott. This condition is probably satisfied in some communities, but it is more problematical in others. For example, merchants engaged in long-distance trade could not be expected to know, of their own knowledge, whether another pair of merchants had honored their mutual obligations. Unless social and economic institutions developed to fill in the knowledge gap or unless other means of enforcement were established, honest behavior in

a community of self-interested traders could not be maintained. Our model in the next section shows how a particular institution could have resolved this problem.

3. THE LAW MERCHANT ENFORCEMENT SYSTEM

We now consider in more detail a model of trade in which outsiders cannot readily observe what has transpired in a given bilateral trade. While "disputes" may arise in which one party accuses the other of cheating, none of the other players have a method of freely verifying the parties' claims. Even if the dispute itself can be observed by others, they cannot costlessly determine whether cheating by one has actually occurred or whether the other is opportunistically claiming that it did.

In our model, we suppose that choices in each bilateral exchange are known only to the trading pair, so that each individual possesses direct information *solely about his own past trading experiences*.[3] To capture the idea that traders know little of their partners' past trading behavior, we use an extreme model of matching due to Townsend (1981). In Townsend's matching model, there is an infinity of traders indexed by ij where $i = 1$ or 2 and j is an integer which may be positive or negative. At period t, trader $1j$ is matched with trader $2, j + t$.[4] In particular, no two traders ever meet twice and no trader's behavior can directly or indirectly influence the behavior of his future trading partners. In the absence of institutions, players possess *no information* about their current partner's past behavior.

Under these conditions, the opportunities available to a player in any period cannot depend in any way on his past behavior. Strategies such as TFT and ATFT become ineffective. So, in our Prisoners' Dilemma game, it can never be in the players' interest to be honest. We have established the following:

Theorem 2. In the incomplete information Prisoners' Dilemma with the Townsend matching rule, the outcome at any Nash equilibrium is that each trader plays Cheat at every opportunity.[5]

With limited information about the past behavior of trading partners and no institution to compensate, there are no incentives for honest behavior. It is evident that incentives could be restored by introducing an institution that provides full information to each trader about how each other has behaved. Such an institution, however, would be costly to operate. Moreover, efficient trade does not require that every trader know the full history of the behavior of each other trader. For

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[3]This is also the premise of the game-theoretic analysis of Kandori (1989).

[4]This matching rule is often called the "Townsend Turnpike," for Townsend suggested that one way to think of it is as two infinitely long sets of traders moving in opposite directions.

[5]Kandori (1989) has shown that there exist other matching rules for which, despite the absence of sufficient bilateral trade and each player's ignorance about what has happened in trades among other players, there may nevertheless be a code of behavior that supports efficient exchange. However, as Kandori argues, the resulting system is "brittle" and leads to a breakdown of honest trade when there are even minor disturbances to the system. Both Kandori (1989) and Okuno and Postlewaite (1989) consider other institutional solutions to this problem.

example, in the ATFT strategy considered in the preceding section, a trader need only know his own history of behavior and whether his partner has defected in the immediately preceding period to determine his own current behavior. One part of the problem is to arrange that the traders are *adequately* well informed so that they can sanction a Cheater when that is required.

However, there is a second problem that the institutions must overcome: Traders may not find it in their individual interests to participate in punishing those who cheat. As one simple example, if trade is expected to be profitable, a trader will be reluctant to engage in a trade boycott. The institutions must be designed both to keep the traders adequately informed of their responsibilities and to motivate them to do their duties.

In the model we develop below, this second problem has multiple aspects. First, traders must be motivated to execute sanctions against Cheaters when that is a personally costly activity. Second, traders must be motivated to keep well enough informed to know when sanctions are required, even though information gathering activities may be personally costly and difficult to monitor. In effect, one who keeps informed about who should be punished for past transgressions is supplying a public good; he deters the traders from cheating against *others*. Moreover, in our model, no other trader except his current partner will ever know if a trader does not check his partner's past history, so the trader could avoid supplying the public good without facing any sanction from future traders. Third, traders who are cheated must be motivated to document the episode, even though providing documentation may be personally costly. After all, from the cheated trader's perspective, what's lost is lost, and there may be little point in "throwing good money after bad." But if players who are cheated are unwilling to invest in informing their neighbors, then, just as surely as if the neighbors are unwilling to invest in being informed, the Cheater will profit from his action and Honest trade will suffer. These are the problems that the trading institution in our model must solve.

The institution that we model as the resolution of these problems is based on the presence of a specialized actor − a "judge" or "law merchant" (LM) who serves both as a repository of information and as an adjudicator of disputes. The core version of our model is based on the following assumptions. After any exchange, each party can accuse the other of cheating and appeal to the LM. Any dispute appealed to the LM is perfectly and honestly adjudicated at cost C to the plaintiff. (We consider the case of a dishonest LM later.) The LM's pronouncements include the ability to award damages if the defendant is found to have cheated the plaintiff. However, payment of the damage award is *voluntary* in the sense that there is no state to enforce payment. Finally, we assume that any party can visit the LM prior to finalizing a contract. At that time, for a cost of Q, the party can *query* the LM for the records of previous judgments about any other player. Without querying the LM, players have *no* information about their current partners' trading history.

By structuring this sequence of events around the basic trade transaction, we

create an "extended" stage game called the *LM system stage game* with the following sequence of play:

(a) Players may query the LM about their current partner at utility cost $Q > 0$. In response to a query, the LM reports to the traders whether a party has any "unpaid judgments." Whatever transpires at this stage becomes common knowledge among the LM and the two partners.
(b) The two traders play the (Prisoners' Dilemma) game and learn the outcome.
(c) Either may appeal to the LM at personal cost $C > 0$, but only if he has queried the LM.
(d) If either party makes an appeal, then the LM awards a judgment, J, to the plaintiff if he has been Honest and his trading partner has Cheated (we call this a *valid appeal*); otherwise, no award is made.
(e) If a judgment J is awarded, the defendant may pay it, at personal cost $f(J)$, or he may refuse to pay, at cost zero.
(f) Any unpaid judgments are recorded by the LM and become part of the LM's permanent record.

The players' utilities for the extended stage game are determined as the sum of the payments received less those made. For example, a player who queries, plays Honest, is Cheated, and appeals, receives $-Q - \beta + -CJ$ if the other party pays the judgment and $-Q - \beta - C$ if he does not.

The function $f: \Re^+ \to \Re^+$ represents the utility cost of paying a given judgment. We naturally assume that f is increasing and continuous. Thus, the greater the size of the judgment, the greater the cost to the defendant. We also assume that $f(x) \geq x$: The cost of paying a judgment is never less than the judgment itself. This excludes the possibility that the payment of judgments adds to the total utility of the players.

The desired behavior of the parties in various contingencies under the Law Merchant system is fully described by the *Law Merchant System Strategy* (LMSS) as follows.

At substage (a), a trader queries the Law Merchant if he has no unpaid judgments on record, but not otherwise.

At substage (b), if either player has failed to query the Law Merchant or if the query establishes that at least one player has an outstanding judgment, then both traders play Cheat (which we may interpret as a refusal by the honest trader to trade); otherwise, both play Honest.

At substage (c), if both parties queried at substage (a) and exactly one of the two players Cheated at substage (b), then the victim appeals to the LM; otherwise, no appeal is filed.

At substage (d), if a valid appeal was filed, the LM awards damages of J to the aggrieved party.

At substage (e), the defendant pays the judgment J if and only if he has no other outstanding judgments.

Theorem 3. The Law Merchant System Strategy is a symmetric sequential equilibrium strategy of the LM system game if and only if the following inequality holds.

$$(1 - Q)\delta/(1 - \delta) \geq f(J) \geq \max[(\alpha - 1), f(C)] \tag{6}$$

If this condition is satisfied, then the average payoff per period for each player (at the equilibrium) is $1 - Q$.

Remark. The condition in Theorem 3 can be satisfied only if $1 - Q$ is positive (because the right-hand-side is at least $\alpha - 1 > 0$).

Proof. To establish that the LMSS is a symmetric sequential equilibrium strategy, we again appeal to the Optimality Principle of Dynamic Programming. If we show that there is no point at which a single change in the trader's current action only (followed by later adherence to the LMSS) can raise the trader's expected payoff at that point, then there is no point at which some more complicated deviation can be profitable, either.

In evaluating his expected payoffs, the player must make certain conjectures about what other players have done in the past in order to forecast what they will do in the future. To verify the equilibrium, we may assume that the trader believes that all other traders have played according to the LMSS in all past plays except those where the trader has actually observed a deviation. We may also assume that the trader believes that all others will adhere to the LMSS in all future plays. To derive the conditions under which the LMSS is an equilibrium strategy, we work backward through a typical extended stage game.

First, we check when it "pays to pay judgments," that is, under what conditions a player will find it more profitable to pay any judgment rendered against him than to refuse to pay. (We ignore the sunk portion of the payoff which is unaffected by later behavior.) Paying the judgment J yields an additional payoff of $-f(J)$ in the current period. In future periods, the player will spend Q to query the LM and earn a trading payoff of 1, for a total of $1 - Q$. In terms of lifetime average payoff, paying the judgment leads to $-(1 - \delta)f(J) + \delta(1 - Q)$. If the trader refuses to pay the judgment, then his current period payoff is zero and, given the system, his payoff is also zero in every subsequent period. Therefore, it "pays to pay judgments" if and only if $-(1 - \delta)f(J) + \delta(1 - Q) \geq 0$, or equivalently,

$$f(J) \leq (1 - Q)\delta/(1 - \delta). \tag{7}$$

Second, does it pay the victim to appeal at substage (c), incurring personal cost C? Given the strategies, the trader expects the judgment to be paid. So he will appeal if and only if $J \geq C$. It is convenient to write this condition as:

$$f(J) \geq f(C). \tag{8}$$

If there are no unpaid judgments and the LM has been queried, does it pay the trader to play Honest? If he does, then his current period payoff will be $1 - Q$. If he Cheats and later adheres to the strategy (which entails paying the

judgment), then his payoff will be $-Q + \alpha - f(J)$. Equilibrium requires that the former is larger, that is:

$$f(J) \geq \alpha - 1. \tag{9}$$

Does it pay the trader otherwise to play Cheat? With the given strategy, his future opportunities do not depend on his play in this case, and Cheat always maximizes the payoffs for the current period, so the answer is that it does pay, regardless of parameter values.

Does it pay the players to query the LM if neither has an outstanding judgment? If a player does so, his current period payoff is expected to be $1 - Q$. If not, it will be zero. In both cases, his payoffs per period for subsequent periods are expected to be $1 - Q$. So, it pays if and only if

$$Q \leq 1. \tag{10}$$

However, condition (10) is redundant in view of conditions (7) and (9).

Does it pay a party with an outstanding judgment to query? No, because the party's expected payoff is $-Q$ if he queries and 0 if he does not.

Thus, regardless of the circumstances wrought by past play, there is no situation in which a one-time deviation from the Law Merchant System Strategy that is profitable for a trader provided that conditions (7)–(9) hold. These are the conditions summarized in formula (6). ∎

Corollary. There is a judgment amount *J* which makes the LMSS a symmetric sequential equilibrium strategy (that is, satisfying formula (6)) if and only if

$$(1 - Q)\delta/(1 - \delta) \geq \max[(\alpha - 1), f(C)]. \tag{11}$$

Conditions (7)–(10) show the relationship among the various parameters for the LM system to support the efficient cooperation. Each corresponds to one of the problems we described in introducing the model. Condition (7) requires that Cheating and then paying a judgment not be profitable; put simply, the judgment must be large enough to deter Cheating. Condition (8) requires that judgments exceed the cost of an appeal, that is, the judgment must also be large enough to encourage the injured party to appeal. Otherwise, information about Cheating will never reach the LM and Cheating will go unpunished. The two previous conditions require that the judgment be large enough, but condition (9) requires that it not be so large that the Cheater would refuse to pay, for then the injured party would not expect to collect, and so would find it unprofitable to appeal. Notice that the feasibility of satisfying all these conditions simultaneously depends on the technology of wealth transfer summarized by *f*. If the traders live at great distances from one another and if their principal asset holdings are illiquid (such as land and fixed capital, or reputation and family connections), then wealth transfers may be quite costly ($f(J)/J$ may be large) and the fines required by the LM system then will not work.

Finally, condition (10) requires that it be worthwhile for the traders to query

the LM. In our model, this condition is implied by the others, but that need not be true for extensions of the model. If traders do not query the LM, then they will have insufficient information to administer punishments, so once again Cheating will go unpunished. The LM institution encourages queries by making them a condition for appealing to the LM, and, as we have seen, querying deters Cheating. At equilibrium, traders who fail to query are constantly Cheated by their trading partners.

If condition (6) fails, then the LMSS is not an equilibrium strategy. However, the condition is satisfied for a wide range of plausible parameter values. Table 1 below gives some acceptable values for the parameters. In it, we assume that $f(x) = x/(1 - p)$ where p is the percentage of value that is lost when assets are transferred. The LMSS is an equilibrium strategy for some J with the given combinations of parameters and for any other combination with lower transaction costs (lower p, Q, and C), less temptation to cheat (lower α), and more frequent trade (higher δ). In the table, $J = C/(1 - p) = \alpha - 1$ is the judgment which is just sufficient to provide the incentives for not cheating and for complaining about being cheated.

For example, in the last line of Table 1, Cheating is seven times more profitable than playing Honest at each current round, the cost of querying the LM consumes one-third of the profits of Honest venturers, the cost of complaining is three times the profits of the venture, and half of any assets transferred in settlement of a judgment are lost. The judgment itself is six times what the Cheater could expect to earn from Honest trade with his next partner (nine times net of transaction costs). Nevertheless, if the inter-trade discount factor is at least 0.9, the LM system is in equilibrium and supports honest behavior, filing of valid complaints, and payment of judgments.

4. MINIMIZING TRANSACTION COSTS

Theorem 3 shows that the LM system restores cooperation even when the players know little about their partners' histories. There are transaction costs necessary to maintain this system, however: That the average payoff per period is $1 - Q$ reflects the transaction cost of Q per period incurred by each trader to support the Law Merchant system.

TABLE 1   SAMPLE PARAMETERS FOR WHICH THE LAW MERCHANT STRATEGY IS A SEQUENTIAL EQUILIBRIUM STRATEGY

Transaction Costs Parameters			Temptation to Cheat	Discount Factor	Penalty or Judgment
Q	C	p	α	δ	J
0.50	0.5	50%	2.0	0.67	1.0
0.50	1.0	50%	3.0	0.80	2.0
0.33	3.0	50%	7.0	0.90	6.0

Notice that the cost, C, of making and investigating a claim and the cost $f(J) - J$ of making the transfer do not appear in the expression for the average payoff. These costs do appear in condition (6): The Law Merchant system is not viable if the cost of making and investigating a claim or the cost of paying a judgment is too high, for then the traders cannot reasonably expect that the others will make claims and pay judgments when they should. However, once these costs are low enough that the threat to file claims with the Law Merchant is credible, they act only as a deterrent: These costs are never actually incurred at equilibrium in our model of the Law Merchant system.

Is the Law Merchant system the least expensive way to induce Honest behavior from rational traders at every stage? Theoretically, any institution that restores incentives for Honest trading by restoring the effectiveness of decentralized enforcement must inform a player when his partner has cheated in the past. If the temptation to Cheat is small and the value of continued trading is high, then this information need not be perfect, as in our model. So it may be possible to induce honest behavior using a less costly information system — one that costs only $q < Q$ to inform a trader adequately well — and correspondingly to increase the traders' average payoffs from $1 - Q$ to $1 - q$.[6] However, using imperfect information to economize on information costs calls merely for a refinement of the Law Merchant system — not for something fundamentally different. It is not possible to provide correct incentives without incurring some information cost of this kind and, as we have seen, the LM system avoids the unnecessary costs of dispute resolution and loss on transfers.

In operation, the Law Merchant system would appear to be a low cost way to disseminate information, for two reasons. First, the LM system centralizes the information system so that, for information about any partner, a player need only go to one place. He need not incur costs trying (i) to establish who was his current partner's previous partner, and (ii) to find the partner to make the relevant inquiry. Second, for the Prisoners' Dilemma, it is not sufficient to know only one period's history, but several.[7] The LM system not only centralizes this information but provides it in a very simple form: all that needs to be communicated is whether there are any outstanding judgments. For large communities, locating each of one's partner's previous partners and asking them for information is likely to be more expensive than the centralized record-keeping system of the Law Merchant.

Given the lack of quantitative evidence about the full costs of running different kinds of institutions, it is not possible to write down a convincing formal model to establish that the LM system minimizes costs in the class of feasible institutions.

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[6]And, given that our model has a fixed starting date, there is really nothing to be learned from the initial query, so that could be eliminated with some small cost savings. However, this is just an artifact of our desire for modeling simplicity and not an inherent extra cost of the system.

[7]Kandori (1989) shows that in the repeated Prisoners' Dilemma, players must know at least two periods of history for each partner to sustain an equilibrium with Honest behavior.

What we can say confidently is that the *kind* of costs incurred by the LM system are inevitable if Honest trade is to be sustained in the face of self-interested behavior and that the system seems well designed to keep those costs as low as possible.

5. DISHONEST LAW MERCHANTS

Our analysis in section 2 proceeded on the assumption that the Law Merchant has no independent interest in the outcome of his decision. In addition, he is diligent, honest, and fair.

One need not look far in history (or, for that matter, in the modern world) to see that judges are not always so perfect. Within our model, there are many small amendments that could be made to insert opportunities for bribery and extortion. Although we do not provide a systematic treatment of these, we shall give a brief development of one of them to emphasize the simple idea that the Law Merchant business is itself valuable and that LMs may wish to maintain their reputation for honesty and diligence in order to keep the business active.

The most obvious problem with this reputation based account is that it seems to presume that a trader who is extorted by the Law Merchant can somehow make his injury widely known to the community of traders. It might be that the Law Merchant is a more sedentary merchant than the long-distance traders whom he serves, so that idea is perhaps not so far-fetched. Nevertheless, we shall argue that even if, in the spirit of our earlier analysis, there is no way for the trader to inform others about his injury, it may still be an equilibrium for the LM to behave honestly, due to the "client" incentives in the long-term relationship between the LM and each individual trader. More precisely, we will show that there is an equilibrium of the system in which every trader expects that if he pays a bribe he will be subjected to repeated attempts at extortion in the future; this dissuades the trader from paying any bribe. Then, a Law Merchant who commits to his threat to damage the reputation of a trader succeeds only in losing business, so he does not profit from making the threat.

To set the context for the formal extension, we modify the Law Merchant system stage game to regard the Law Merchant as a player. In the original version, the LM was allowed no choices, but let us nevertheless suppose that the LM earned a payoff of $2\epsilon > 0$ per contract, which is paid for as part of the $2Q$ that the parties spend to query the LM.

Next, we create a Modified Law Merchant System game in which our basic model is altered to allow the LM to solicit bribes. Initially, we consider only one kind of bribe — that extorted from a trader with no unpaid judgments by an LM who threatens to report falsely that there *are* unpaid judgments. Thus, we assume that before the traders make their queries, the LM may demand that one of the traders who has no unpaid judgment pay a bribe, $B \geq 0$. The amount B demanded is chosen by the LM. If the bribe is not paid and a query is made,

the LM is committed to report falsely that the trader has an unpaid judgment.[8] The trader next decides whether to pay the bribe. The stage game then continues as previously described. When a bribe of B is paid, the LM's payoff is increased by B and the victim's payoff is reduced by an equal amount.[9]

Now consider the following variation of the Law Merchant System Strategy for the traders. If a player has no unpaid judgments and no bribe is solicited from him at the current stage, then he plays the LMSS as previously described. If the player has never before paid a bribe and a bribe is solicited, then he refuses to pay the bribe and does not query the LM in the current period. If the player has ever before paid a bribe, then he pays any bribe up to $\alpha - Q$ that is demanded of him. A player who has paid a bribe at the current round plays Cheat at that round and refuses to pay any judgment made against him. We call this specification the Extended Law Merchant System Strategy (ELMSS).

The Law Merchant's expected behavior is specified by the LM's Bribe Solicitation Strategy (BSS). If one of the present traders has no unpaid judgment but has previously paid a bribe, then the LM demands a payment of $\alpha - Q$. Otherwise, the LM does not demand any payment.

Theorem 4. If condition (6) holds and, in addition,

$$\alpha \leq 1 + (1 - Q)(2\delta - 1)/(1 - \delta), \tag{12}$$

then there is a sequential equilibrium of the Modified Law Merchant System game in which each trader adopts the strategy ELMSS and the Law Merchant adopts the strategy BSS.

Proof. Once again, we check that there is no contingency after which a one-time deviation by any player is profitable, when each player expects that the others have adhered to the strategy except where deviations have been explicitly observed, and each expects that all will adhere to it in the future. As before, we begin again from the last stage and work forward.

Consider a trader who has paid a bribe and cheated, and been assessed a judgment of $J > 0$. He expects a zero future payoff in each future period if he pays the judgment (because he will be extorted again and again). He expects the same zero payoff if he does not pay, since he will then have an unpaid judgment on his record. Since $-f(J) < 0$, he will find it most profitable to refuse to pay the judgment.

Having paid a bribe B, a trader expects to earn α this period and zero in the

future if he cheats today, or 1 this period and zero in the future if he does not. Since $\alpha > 1$, cheating is most profitable.

Given that a player has paid a bribe before, if a bribe B is demanded today, then the profits from paying the bribe, querying, and cheating are expected to be $\alpha - Q - B$; not paying leads to profits of zero. Hence, it is at least as profitable to pay the bribe whenever $B \leq \alpha - Q$.

If a trader has paid a bribe before, the strategy specifies that he will pay any bribe up to $\alpha - Q$ in the current period. In this case, according to the strategies, no trader's play in future periods will depend on whether the LM demands a bribe or on the amount of the bribe, so his most profitable play is to demand $\alpha - Q$.

Suppose a trader has not paid a bribe before and a bribe, B, is demanded currently. If the trader pays the bribe then, according to the strategy, he will cheat and refuse to pay the judgment. The resulting payoff is $\alpha - B - Q$ in the current period and, as a trader with an unpaid judgment, zero in future periods. If he refuses to pay the bribe, then his expected payoff is zero in the current period and $1 - Q$ in subsequent periods. So, it is most profitable for him to refuse to pay if

$$(1 - \delta)(\alpha - B - Q) + \delta \cdot 0 \leq (1 - \delta) \cdot 0 + \delta \cdot (1 - Q),$$

which is equivalent to condition (12).

Finally, when facing a trader who has never before paid a bribe, the LM expects that any demand for a bribe will be refused and that the trader will also not query in the current period, leading to a loss of revenues of ϵ, with no effect on play in future periods. Hence, it is most profitable for the LM not to demand any bribe in this case.   ∎

Theorem 4 pertains to a model in which only one kind of dishonest behavior by the LM is possible. The problem of discouraging other kinds of dishonest behavior may require other strategies. From our preliminary analysis, it appears that the most difficult problem is to deter the LM from soliciting or accepting bribes from traders who have an unpaid judgment but wish to conceal that fact. By concealing the judgment, cheating, and refusing to pay the new judgment, the trader could "earn" $\alpha - Q$ and a portion of that might be offered as a bribe to the LM. As we add richness to the possibilities for cheating, it is natural to expect that the necessary institutions and strategies must respond in a correspondingly rich way.

6. CONCLUSION

We began our analysis by studying an environment in which private information about behavior in exchanges is a potential impediment to trade. Under complete information, even if meetings among particular pairs of traders are infrequent, informal norms of behavior are theoretically sufficient to police deviations. But when information is costly, the equilibrium may potentially break down and informal means may not be sufficient to police deviations.

The Law Merchant enforcement system that we have studied restores the equilibrium status of Honest behavior. It succeeds even though there is no state with police power and authority over a wide geographical realm to enforce contracts. Instead, the system works by making the reputation system of enforcement work better. The institutions we have studied provide people with the information they need to recognize those who have cheated, and it provides incentives for those who have been cheated to provide evidence of their injuries. Then, the reputation system itself provides the incentives for honest behavior and for payment by those who are found to have violated the code, and it encourages traders to boycott those who have flouted the system. Neither the reputation mechanism nor the institutions can be effective by themselves. They are complementary parts of a total system that works together to enforce honest behavior.

Our account of the Law Merchant system is, of course, incomplete. Once disputes came to be resolved in a centralized way, the merchants in Western Europe enhanced and refined their private legal code to serve the needs of the merchant trade — all prior to the rise of the nation-state. Without this code and the system for enforcement, trade among virtual strangers would have been much more cumbersome, or even impossible. [10] Remarkably, the Law Merchant institution appears to have been structured to support trade in a way that minimizes transaction costs, or at least incurs costs only in categories that are indispensable to any system that relies on boycotts as sanctions.

Our model is a stylization, not set in a particular locality at a particular date. Necessarily, then, it omits many important elements that some historians will argue are essential to understanding the institutions that are found there and then. However, our core contention that institutions sometimes arise to make reputation mechanisms more effective by communicating information seems almost beyond dispute. The Mishipora, described in the Hebrew Talmud, according to which those who failed to keep promises were punished by being publicly denounced; the use of the "hue and cry" to identify cheaters in medieval England; the famed "Scarlet Letter," described in Hawthorne's famous story; and the public stocks and pillories of 17th century New England, which were sometimes used to punish errant local merchants, are all examples of institutions and practices in which a principal aim is to convey information to the community about who has violated its norms.

It is our contention that an enduring pattern of trade over a wide geographical area cannot be sustained if it is profitable for merchants to renege on promises or repudiate agreements. In the larger trading towns and cities of northern Europe in the 10th through 13th centuries, it was not possible for every merchant to know

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[10] Of course, merchants could and did communicate extensively, writing letters, engaging in trial relations, and checking the credentials of their trading partners. Where possible, they also relied on family members and client relationships to provide reliable services. But with geographic specialization in production, these devices alone could not allow merchants to escape the need to rely on the promises of individuals with whom they were not well acquainted.

the reputations of all others, so extensive trade required the development of some system like the Law Merchant system to fill in the gap.

Many of the key characteristics of our model correspond to practices found at the Champagne Fairs. While merchants at the Fairs were not required to query prior to any contract, the institutions of the Fair provided this information in another manner. As noted above, the Fairs closely controlled entry and exit. A merchant could not enter the Fair without being in good standing with those who controlled entry, and any merchant caught cheating at the Fair would be incarcerated and brought to justice under the rules of the Fair. So anyone a merchant met at the Fair could be presumed to have a "good reputation" in precisely the sense of our model. It did not indicate that all free merchants had never cheated in the past; but it did indicate that anyone who had been convicted of cheating had made good on the judgment against him. Moreover, because merchants might disappear rather than pay their judgments, judges at the Fairs had to balance the size of their judgment so that the value of being able to attend future Fairs exceeded the award.

According to Verlinden (1963, p. 132): "At the end of the 12th century and during the first half of the 13th, the Champagne Fairs were indeed the centre of international commercial activity of the western world." This is a long time for a single fair to maintain such dominance, but the Champagne Fair had two advantages over its potential competitors. First, it had an effective system for enforcing exchange contracts. Second, as we observed earlier, there are important economies of scope and scale in reputation mechanisms. Other, smaller fairs that tried to compete with the Champagne Fairs on an equal footing would have to contend with merchants who participated only long enough to make a profitable cheating transaction and then return to the Champagne Fairs where their participation rights were intact.

Despite this observation, it must be counted a weakness of the model that it does not fully account for trade outside of a single trading center. Even if the Law Merchant and related systems were effective underpinnings for local trade, how was information about a trader's dishonesty in one location transmitted to another? The model in this paper is too simple to handle this problem, but we hope to extend our approach to the institutions that developed during the middle ages to protect against the added problems raised by spatial separation. This includes the merchant gilds in northern Europe, the consulates of the Italian city states, and the organization of alien merchants into colonies (like the Steelyard in medieval London) with local privileges and duties. These institutions can also be understood from the perspective developed in this paper — they are designed to reinforce reputation mechanisms that alone are insufficient to support trade.

The Law Merchant system of judges and reputations was eventually replaced by a system of state enforcement, typically in the late middle ages or the early modern era in Western Europe. Enforcement of the private codes by the state added a new dimension to enforcement, especially in later periods when nation-states exercised extensive geographic control. Rather than depend for punishment

upon the decentralized behavior of merchants, state enforcement could seize the 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. 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 Q each period. As the volume of trade increased in the late middle ages, the cost saving from that source would have been substantial.[11] 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.[12]

In closing, we return to the broader implications of our work for the study of institutions. In complete information settings, institutions are frequently unnecessary because decentralized enforcement is sufficient to police deviations. However, this conclusion fails in environments where information is incomplete or costly. In the context of our model, the Adjusted Tit-for-Tat strategy requires that a trader know his current partner's previous history. When such information is difficult or costly to obtain, decentralized enforcement mechanisms break down. Institutions like those of the Law Merchant system resolve the fundamental problems of restoring the information that underpins an effective reputation system while both economizing on information and overcoming a whole array of incentive problems that obstruct the gathering and dissemination of that information.

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[11]Historically, the successful state enforcement came in a series of stages. As suggested above, state enforcement began with the adoption of the legal codes by a wide range of cities and towns. Some of these evolved over time into large city-states (e.g., Venice or Genoa) or, later, became part of a larger nation-state (e.g., London). For a discussion of the evolution of legal codes underpinning merchant trade, see North (1987).

[12]As we emphasized in section 4, however, a full evaluation of state enforcement must also assess the potential for corruption in the enforcement mechanisms of state enforcement.

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