Institutions and Economic Governance

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ESNIE 2012
Cargèse, Corsica

Motivation: A Historical Example

- On March 28, 1210, Rubeus de Campo of Genoa agreed to pay a debt of 100 marks sterling in London on behalf of Vivianus Jordanus from Lucca (Scriba, 1210, as cited in Greif, 2006:3).

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- Greif (ibid): "there is evidence of thousands of such agreements in Europe at the time"
- This implies for the European late middle ages:
  - long-distance trade ("London ... Lucca")
  - merchants trusting agents to handle their business affairs abroad without direct/short-term control ("on behalf of")
  - impersonal lending ("pay a debt ... on behalf of")
  - sufficiently secure property rights such that merchants dared to travel with their riches ("of Genoa ... in London")
- But: in 13th century no centralized political entity in Europe $\Rightarrow$ long-distance trade not protected by any one government's law $\Rightarrow$ why/how did these markets work well?

Outline

1. Introduction:
   - Economic Governance: Definitions, Classifications, and Motivation; draws on Dixit (2004, ch.1; 2009)
   - Alternative Governance Institutions
     - to Secure Property Rights
     - to Ensure Collective Action
     - to Enforce Contracts
2. Private v. Public Enforcement
   - Social Networks: Dixit (2003b)
   - Communities and Courts: Masten/Prüfer (2011)
3. Enforcement in the Shadow of the Law: Decentralized v. Centralized Institutions
   - Social Networks: Greif (1993)
   - Merchant Guilds: Greif/Milgrom/Weingast (1994)
   - Private Judges: Milgrom/North/Weingast (1990)
   - Criminal Organization of Pirates: Leeson (2007)

Part 1. Introduction: Economic Governance

Motivation: The Need for Economic Governance

- In general: expansion of impersonal exchange (trade beyond an individual's immediate circle of acquaintances) played crucial role for substantial economic development throughout last millennium (e.g. Mokyr, 1990, Grossman/Helpman, 1991)
- Why? — Impersonal exchange allows for scale economies, gains from specialization, to take advantage of new opportunities
- Problem: impersonal exchange is risky: in one-shot interactions, transactors have no incentive to honor deals/respect property rights, support collective action.
- Consequence: without mechanisms/institutions that can fix this problem the scope of impersonal exchange (and corresponding benefits) will be reduced $\Rightarrow$ *good economic governance* needed!

What is Economic Governance?

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  - "...by protecting **property rights**, enforcing **contracts**, and taking **collective action** ..."

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- Can be modeled as a *one-sided prisoner's dilemma* with an investor i and potential thief x:

i / x	Not steal	Steal
Invest	$h, 0$	l, w
Not invest	$0, 0$	$0, 0$

- where $h, w > 0 > l$ and $h > w + l$
- Efficient: (Invest, Not Steal)
- Unique Nash equilibrium: (Not invest, Steal)

Why Contract Enforcement?

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Defect	w, l	d, d

- where $w > h > 0 > d > l$ and $2h > w + l$
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  $\Rightarrow$ as private economic activity depends on public infrastructure, transaction costs too high in general
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- Without *collective action*, underprovision of institutional/ organizational infrastructure, e.g. social safety nets
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- Can be modeled as a *multilateral prisoner's dilemma* with citizens $1, ..., n$, where cooperate (defect) means to contribute to the public good (to free-ride).
- Efficient: mutual cooperation
- Unique Nash equilibrium: everybody free-rides.

"Lawlessness and Economics" (LLE) and Other Fields

- a subfield of *New Institutional Economics* (à la Coase, North, and Williamson)
- a complement to *Law and Economics* (LE) and *Positive Political Theory* (PPT)
  - LE focus: interaction between state law and economic activities and outcomes
  - PPT focus: effects of political institutions (e.g. executive/ legislature) on *macro* aspects of economic policy and economic performance
  - LLE focus: *micro* level of individual transactions
    $\rightarrow$ if government's apparatus does *not* (perfectly) work, what takes its place and provides the rules of the game?

Alternative Governance Institutions: How to Organize Good Governance?

Protection of Property Rights

- If the government cannot protect property rights
  - private institutions may step in
  - e.g. private guards, gated communities, Mafia
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  - goal (technically): reduce potential thief's payoff from stealing
- Can private institutions guard against predatory/corrupt governments?
  - Individual citizen is helpless!
  - But organizing a group might help that threatens to boycott a ruler if he exploits only one group member
  - Still difficult to avoid free-riding within group (because individual player may have incentive to deviate from boycott and deal with ruler)
  - Details: Greif/Milgrom/Weingast (1994); see below

Ensuring Collective Action

- Heroine of the field: Elinor Ostrom (see esp. her 1990 book)
- Key ingredients for successful governance of collective action:

1. *Stability of group composition* + *good local information* about (1) identity of group members, (2) members' rights and duties, (3) consequences of misbehavior, and (4) history of individual members' behavior.

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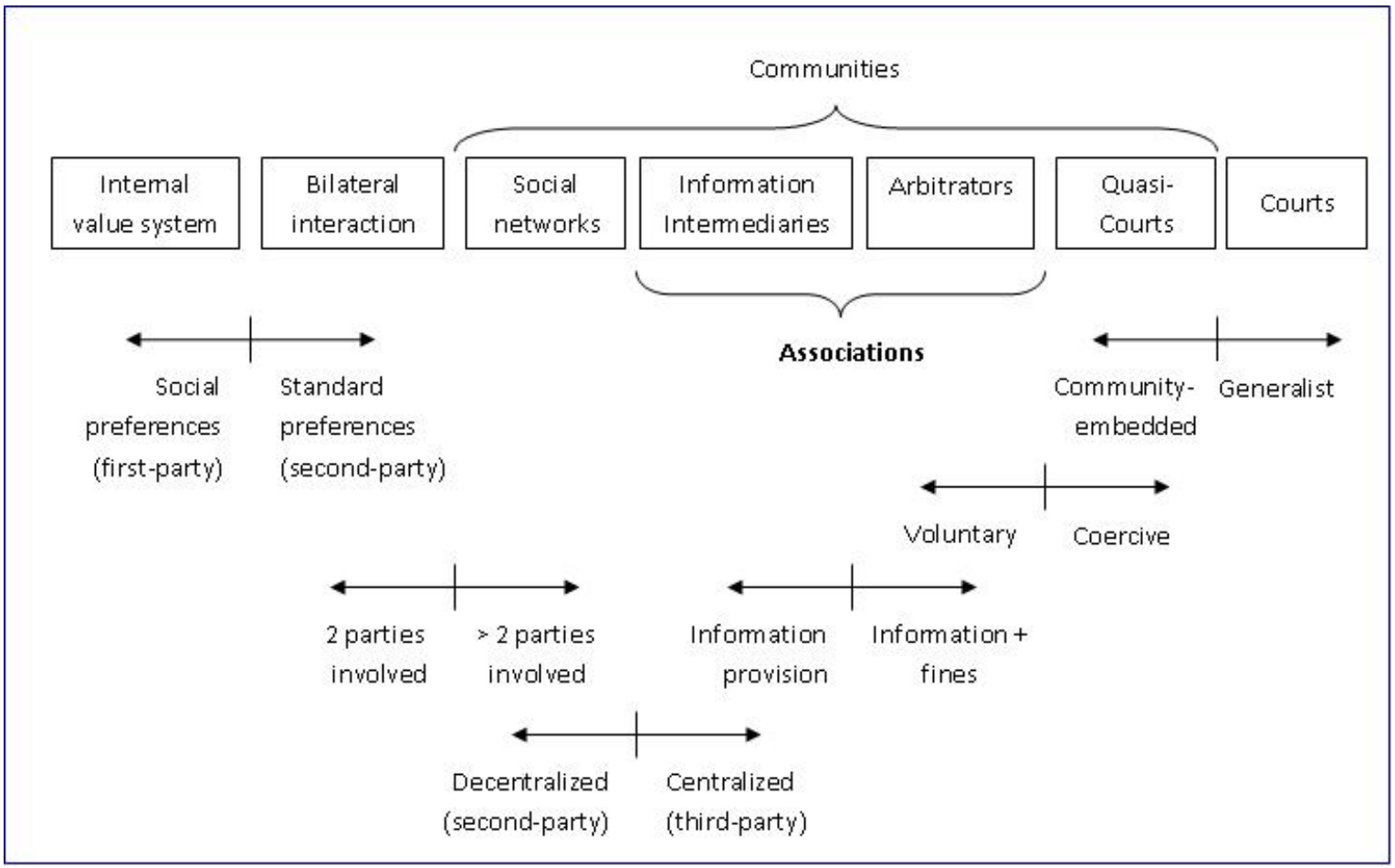
3. Although grim trigger strategies (worst possible punishment) are popular among theorists, case studies found that *graduated punishments* are more successful. See also discussion in Greif (2006, Appendix C).

Enforcing Contracts

- Nota bene: "contracts" here refers to *agreements* in general (written, verbal, and implicit); different from legal term, which is reserved for agreements that would be legally binding in a public court of law.
- *Central transaction* can be modeled as either a two-sided prisoner's dilemma or a one-sided prisoner's dilemma (hold-up)
- *Auxiliary transaction* depends on the specific enforcement institution; usually some kind of information transmission and ostracism or decision on damage payments
- For more on terminology, see Greif (2006, ch.2).

A Classification of Contract Enforcement Institutions



Adapted from Masten/Prüfer (2011)

Internal Value Systems

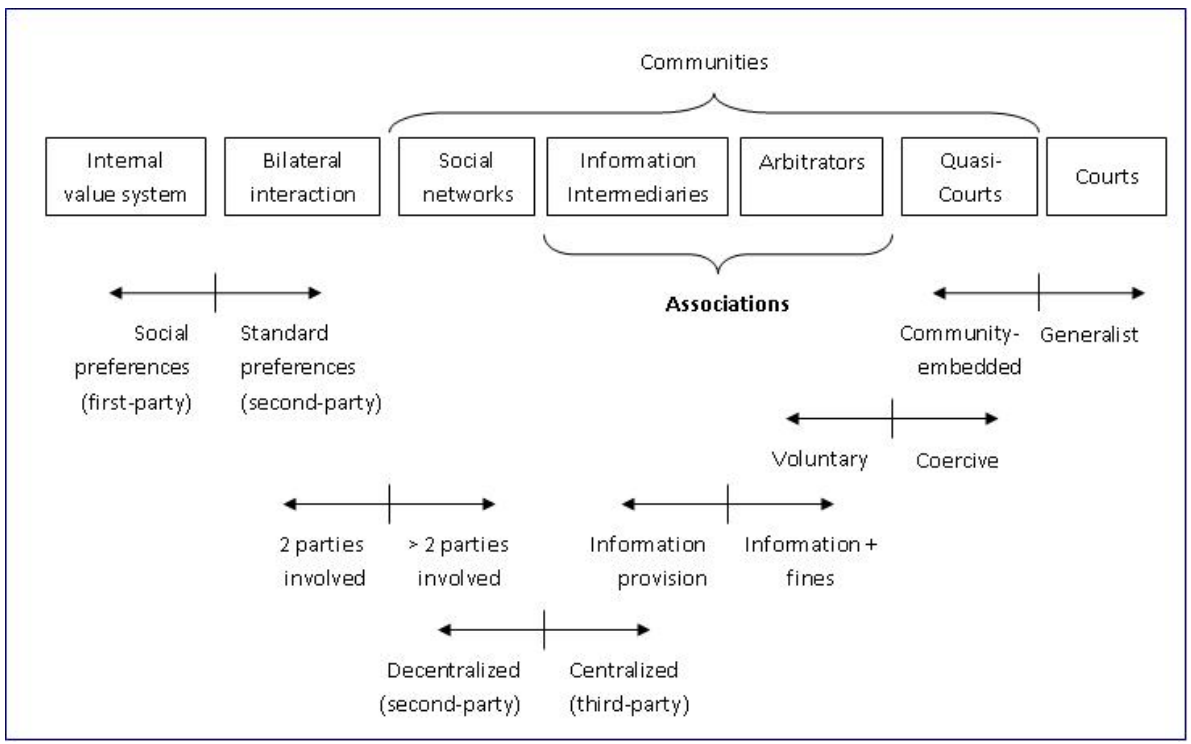
- An individual cooperates because it wants to (has social preferences)
- Works without any monitoring $\Rightarrow$ "first-party system" (Dixit, 2009)
- Widely observed in practice! (e.g. Camerer, 2003)
- Theoretical (evolutionary) idea: social preferences restricted to interaction in certain group that competes with other groups $\Rightarrow$ if individual knows that it can only survive if own group survives, it is rational to support group fitness by cooperating
- Only little economic scholarship on this issue, e.g. Tabellini (2008), Dixit (2009), Baron (2010) $\Rightarrow$ Potential for future research!

Bilateral Repeated Interaction

- If preferences of traders are standard/selfish, cooperation breaks down in one-shot prisoner's dilemma $\Rightarrow$ solution: repeated interaction/relational contracts
- Involves a pair of traders (second-party system)
- Folk Theorem logic (e.g. Friedman, 1971): if both traders play trigger strategy that makes cooperation in period t dependent on cooperation in earlier periods, NPV from eternal cooperation can be higher than NPV from one-time defection and eternal (defect, defect)-payoff
- Problem: crucially depends on frequency of interaction $\Rightarrow$ works well in very small communities with few outside options for trading
- Vast literature; e.g. Baker/Gibbons/Murphy (2002, 2008), MacLeod (2007)

Collective Enforcement Institutions

- *Collective enforcement institutions*:= institutions for the enforcement of agreements involving others than just the parties to the transaction themselves (Masten/Prüfer, 2011))
  $\Rightarrow$ everything right of Bilateral Interaction: Communities and Courts (ostracism vs. coercion)



Social Networks

- If frequency of interaction between two traders $\downarrow$, necessary to leverage trigger strategy threat by involving other players
- Idea: If A cheats B, B will inform his friends C and D about it
  $\Rightarrow$ C and D would not interact with A in the future (or defect)
  $\Rightarrow$ A's NPV from one-time defection reduced
  $\Rightarrow$ cooperation with B is more attractive for A
- Social networks also referred to as *multilateral second-party institutions*, etc.
- Vast literature, e.g. Kandori (1992), Greif (1993), Ellison (1994), Dixit (2003b)
- Important: *decentralized* mechanism based on dyadic information transmission; e.g. used in microcredit lending
- Main problem: without central organization, information transmission (and storage) can be hard to sustain

Information Intermediaries

- If share of members of a social network in all traders too low, some centralized management can help (third-party system)
- Information intermediary (e.g. rating agency/credit bureau) is a formal organization with centralized management (rules, maybe some formal authority) that collects information about behavior of members and their trade partners and distributes it among members
- Important: membership may require a fee $\Rightarrow$ higher fixed cost of operation than second-party systems—but benefits from returns to scale $\Rightarrow$ c.p. better in large economies
- Can be owned by members (e.g. nonprofit business association) or by profit-maximizing third party (e.g. Standard & Poor's)
- See Greif/Milgrom/Weingast (1994), Kali (1999), Baron (2010), Prüfer (2012)
- Main problem: information transmission may not be sufficient for cooperation if good outside options to trade exist

Arbitrators

- Arbitrators investigate cases and make judgement $\Rightarrow$ support contract enforcement by ordering the members not to trade with defecting party that does not respect judgement (ostracism).
- Often a function of business associations
- Compared to information intermediaries, arbitrators have more/harsher punishment options but are more expensive
- Compared to public courts, arbitrators are more flexible & often more knowledgeable about industry and trade customs $\Rightarrow$ have lower marginal cost of enforcement
- See Milgrom/North/Weingast (1990), Bernstein (1992, 2001), Dixit (2003a), Prüfer (2012)
- Main problem: because membership is voluntary, the damage payment arbitrator can award is restricted to NPV of membership (=below courts' maximum)

Quasi-Courts

- If the payoff of one-time defection very high compared to NPV of future relationships (e.g. because of low discount factor), no voluntary institution can support cooperation
- Quasi-Courts come in two realizations: *criminal organizations* (e.g. Mafia) & *specialized courts* (e.g. trade courts)
- Common features:
  - Use *coercion* to enforce their judgements
  - *Community-embedded* $\Rightarrow$ judge knowledgeable about subject of central transaction ($\tau_{QC} > \tau_{Court}$) BUT judge easier to influence via rumours/information sent via communities
- Difference: criminal organizations are *private* for-profit organizations, specialized courts are *public*
- See Masten/Prüfer (planned...)

Courts

- Public courts can use government's monopoly of coercion $\Rightarrow$ in theory, courts can enforce any damage payment (in practice, often *expectation damages* $\Rightarrow$ linked to value of central transaction $\Rightarrow$ if traders believe that courts are effective, defection is not worthwhile
- *Rule-based* decision making $\Rightarrow$ generalist judge knows laws, not trade $\Rightarrow$ *not* community-embedded (for good and for bad)
- Difficult: to make a judgement courts require *verifiability* of claims, by definition; for private institutions *observability* is sufficient (partly different for arbitration tribunals!)
- Hermalin/Katz/Craswell (2007), Masten/Prüfer (2011)
- Main problem: high cost of using courts (cash, decision delay, business secrets, mental cost), main benefit: neutral

Part 2. Private v. Public Enforcement

Modeling a Social Network

Avinash Dixit (2003, JPE): "Trade Expansion and Contract Enforcement"

Motivation and Research Questions

- Starting point: Two types of literatures on communities: Models (e.g. Kandori 1992, Ellison 1994) and case studies (e.g. Ostrom 1990, Ellickson 1991)
- Both have found that reputation-based institutions only effective in "small" communities (Ostrom: max 15,000 members)
- Research Questions: What determines the limits of community enforcement? What happens if trading opportunities expand beyond the close social network group? When does "external governance" (rating agencies/business associations) become more efficient? What happens at the interface between the two systems?

The Model

- Players form continuum along a circle with circumference $2L$, density per unit of arc length: $1 \Rightarrow$ max distance: L
- (Shorter) distance x on circle between two players captures *socioeconomic distance* relevant for transaction: geography/climate, resource endowment, technology, kinship/language/culture, ...
- Two periods ($t = 2$ is reduced form of future), no discounting
- Random matching in pairs, independent across periods
- Matching probability of two traders: $\mu \equiv \frac{e^{-\alpha x}}{2(1-e^{-\alpha L})/\alpha}$
  $\Rightarrow \int_0^L \mu dX = \frac{1}{2}$ (over each arc length),
  where $\alpha > 0$ captures localization of matching technology

Timing of the stage game

In each period matched transactors play the following noncooperative game:

- *Stage 1*: Players decide simultaneously whether or not to play. If either chooses not to play, their payoffs are zero and the period ends for these players.
- *Stage 2*: If the matched players agree to play, each decides whether to be honest or to cheat. Payoffs see below.
- *Stage 3*: If one trader cheats, news about this travel along the circle (see below).

Solution concept: Perfect Bayesian Equilibrium

Player Types and Gains from Trade

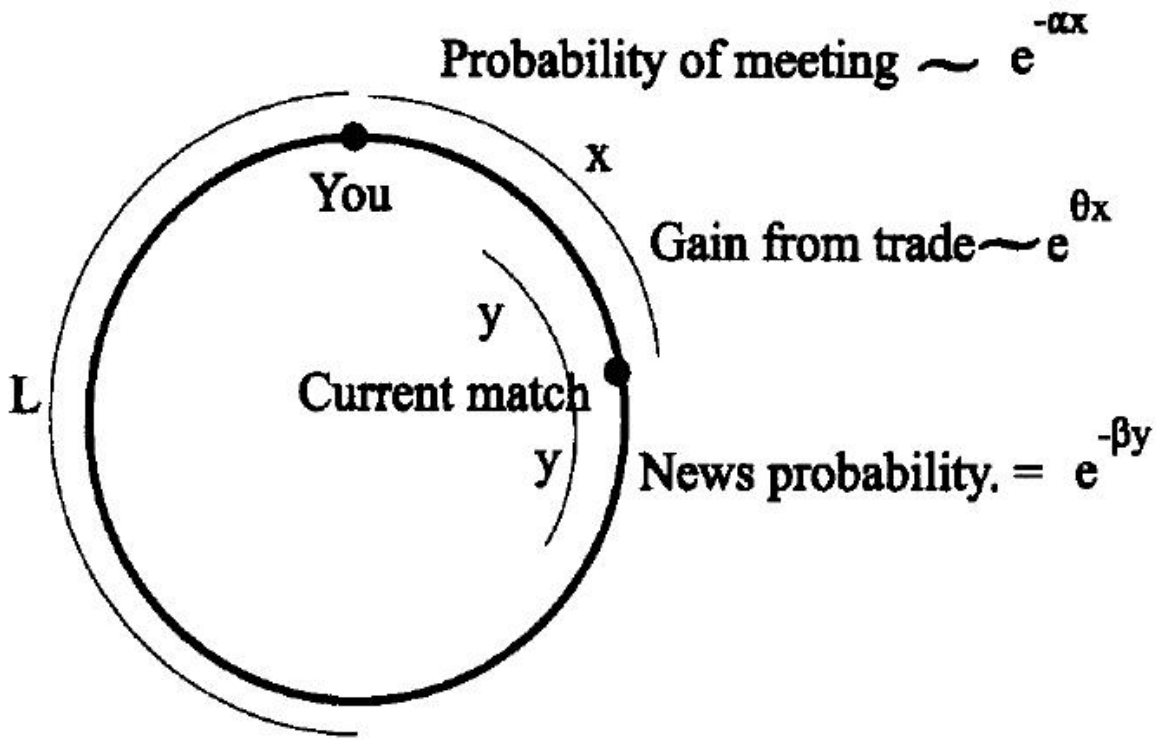
- Two types of traders: *Normal* (N) and *Macchiavellian* (M) $\Rightarrow$ types are private information
  - Shares in population: $1-\epsilon$ (many): N, ϵ (few): M.
- M are skillful cheaters $\Rightarrow$ if an N-type meets an M-type, N-type gets $s_t < 0$, M-type gets $m_t > 0$
- If two M-types meet, both get $m_t > 0$
- If two N-types meet, each gets $a_t e^{\theta x}$, where $a_t =$

N_1 / N_2	Cooperate	Defect
Cooperate	h_t, h_t	s_t, w_t
Defect	w_t, s_t	c_t, c_t

  - where $w_t > h_t > c_t > 0 > s_t \Rightarrow$ Prisoner's Dilemma
  - $(1-\epsilon)c_t + \epsilon s_t > 0 > s_t \Rightarrow$ makes sure N types want to play with a random partner but not with a known M-type
  - $(1-\epsilon)(w_1 - h_1) < (1-\epsilon)c_2 \Rightarrow$ motivates N-types to play honest if cheating is detected & publicized with certainty

Localization of News about Cheating

- If one trader in a match cheats the other, the probability that a third person, located at distance y from the victim of the cheating, receives news of this cheating is $e^{-\beta y}$
  - where $\beta > 0$ describes the communication technology used
  - Assumptions (cf. discussion on p. 1298/9): $\alpha > \theta > 0, \alpha \approx \beta$.



Source: Dixit (2003:1298)

Equilibrium Strategy

- M-types always *play*, strategies unspecified (not important)
- N-types:
  - In period 1, choose to *play*, and choose *Honest* if the partner's location is X or less away from you and *Cheat* if it is between X and L.
  - In period 2, if you have received information that your current match's period-1 match received s_1, then choose *not to play*; else *play* and choose *Cheat*.

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  - In period 2, if you have received information that your current match's period-1 match received s_1, then choose *not to play*; else *play* and choose *Cheat*.
- Note: In $t = 1$, if $x \in [X, L]$, your partner's strategy specifies *Cheat* $\Rightarrow$ your best-response is also *Cheat* $\Rightarrow$ both get $c_1 > 0$ AND your reputation is not spoiled b/c punishment in equ. strategy depends on information on s_1, not on Cheating!
- In $t = 2$, if you have received information that your current partner's $t = 1$-match got s_1, Bayesian inference tells you that your partner is an M-type $\Rightarrow$ *not to play* is optimal
  $\Rightarrow$ M-types necessary to get cheating in equilibrium!

Results

- *Prop 1*: For each L, there exists a unique $X(L)$ such that an equilibrium with strategies as defined above exists for any X satisfying $0 \leq X \leq X(L)$.
- *Intuition*: Cheating becomes more attractive the more distant the partner: 1. ad hoc gain, $(w_1 - h_1)e^{\theta x}$, increases in x.
  2. If x is high, likelihood that your next partner learns about cheating decreases in x

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- *Prop 2*: There exists a unique positive L^* such that $X(L) = L$ for $0 \leq L \leq L^*$ and $X(L) < L$ for $L > L^*$.
- $\Rightarrow$ Recall that $X(L)$ is the *degree of honesty*. L^* is the maximum size of the world for which universal honesty exists.

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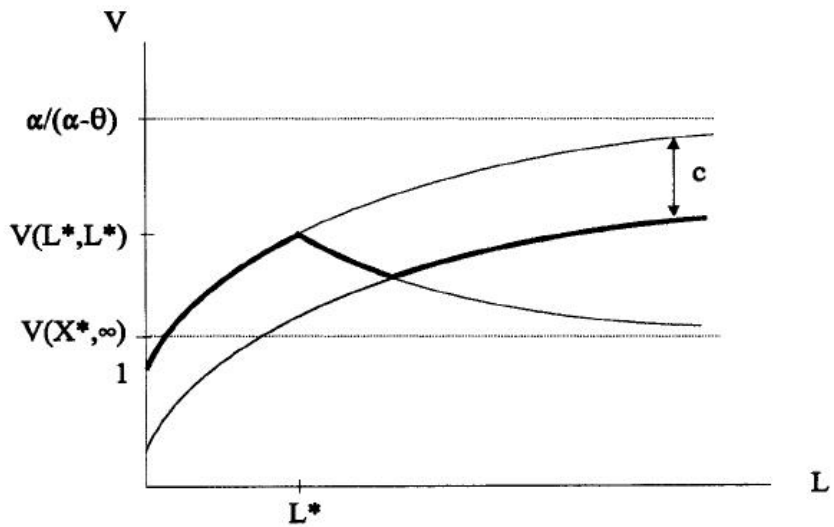
- $\Rightarrow$ Recall that $X(L)$ is the *degree of honesty*. L^* is the maximum size of the world for which universal honesty exists.
- *Prop 3*: If $\beta > \theta$, then $X(L)$ is a decreasing function for $L > L^*$.
- $\Rightarrow$ If the world grows, *relative* honesty shrinks (b/c the density of traders over the circle decreases).

External Enforcement

- For cost c per unit of arc length, any cheating is detected and information spread across entire circle $\Rightarrow$ Information intermediary
- Benevolent manager charges mandatory membership-fee/tax c



Source: Dixit (2003:1310)

- *Intuition*: (i): *Small communities* can achieve full self-governance using their own information systems. (ii): *Large communities* need a system of external governance—at a cost. (iii): *Communities of intermediate size* fare worst: too large for self-governance, too small for external governance.

Some Open Questions

- Do the results on social networks hold in an *infinitely* repeated game with *negative* payoff for (defect/defect) and *without* behavioral types (M/N)?
- What if "external enforcement" is *imperfect* (not any cheating detected automatically)?
- What if "external enforcement" is modeled explicitly? Is it still a *substitute* for social networks?
- How to connect the insights on the "degree of honesty" with *applications* from the real world?

Contrasting Social Networks and Courts

Scott E. Masten and Jens Prüfer (2011): "On the Evolution of Collective Enforcement Institutions: Communities and Courts"

Historical Background and Motivation: the Law Merchant v. State Enforcement

- 11th to 14th century: long-distance trade blossomed although political units were small and fragmented (Lopez, 1971)
- No central government to support trade $\Rightarrow$ growth enabled by non-governmental, self-enforcing institutions
- *Lex mercatoria* (Law Merchant): a system of customary rules governing trade among merchants, administered by private judges chosen for their familiarity with commercial practices
- Apparently efficient institution (low transaction costs) because of "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).
- However, "[t]he Law Merchant system of judges and reputations was eventually replaced by a system of state enforcement" (Milgrom/North/Weingast, 1990:20)

Research Questions

- General: Why do particular institutions, out of the set of potential arrangements, appear (and fade) when and where they do?
- Specific: When do we expect to observe public enforcement (courts) and when private enforcement (communities)?
- Historical: What conditions may have contributed, first, to the emergence of the Law Merchant and, later, to its absorption and supersession by state courts?

The Model

- Framework draws on Dixit (2003b) BUT:
- $L = \alpha = \beta = 1 \Rightarrow$ max distance between players: 1
- Matching probability: $\mu \equiv \frac{e^{-x}}{2(1-e^{-1})}$
- Infinitely repeated game, discrete time: $t \in \{0, 1, 2, ..., \infty\}$, players live forever, have discount factor $\delta \in (0, 1)$
- No behavioral types
- Gains from trade: $ae^{\theta x}$, where a results from:

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

  - where $w > h > 0 > d > l$ and $2h > w + l$
  - $\theta > 0$: trade with specialized goods
  - $\theta < 0$: high transaction costs (transportation, uncertainty)

The *Scope of Cooperation* with Communities

- Probability that player y receives the message of x: $\eta_{x,y} \equiv \kappa e^{-|Y-X|}$, where $|Y - X|$ is distance between y and x, and $\kappa \in [0, 1]$ reflects overall "connectedness"
- Solution concept: Perfect Markov Equilibrium

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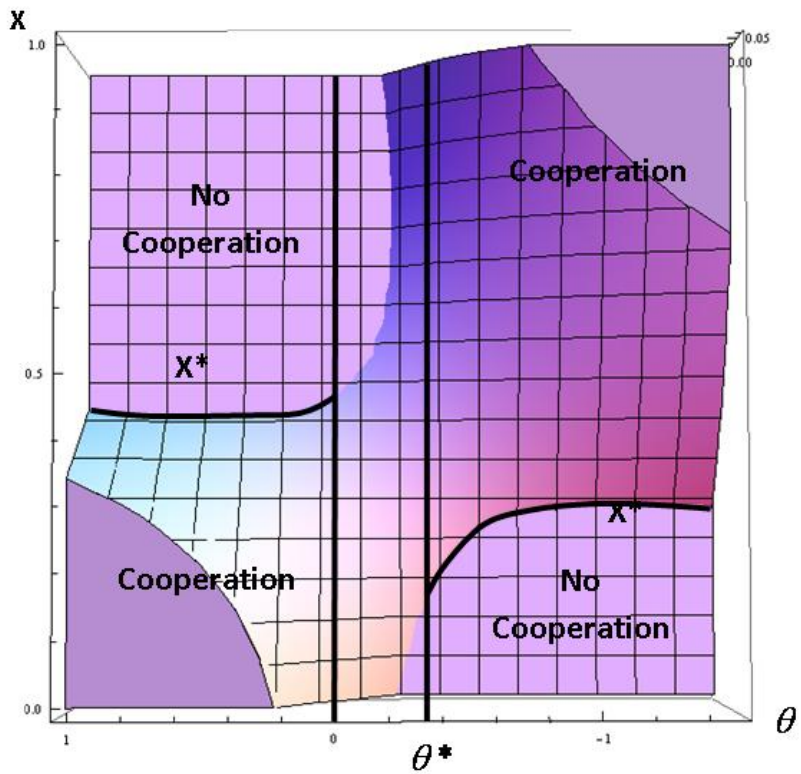
Main results:

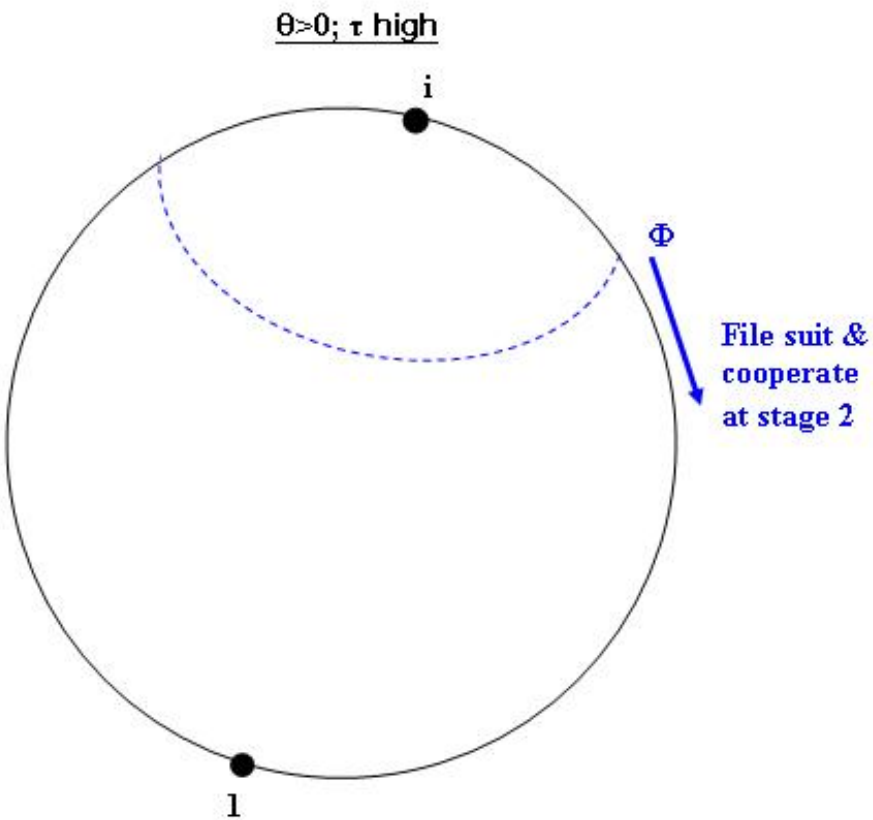
- For $\theta > 0$: *upper* bound on cooperation.
- For $\theta < \theta^*$: *lower* bound on cooperation.

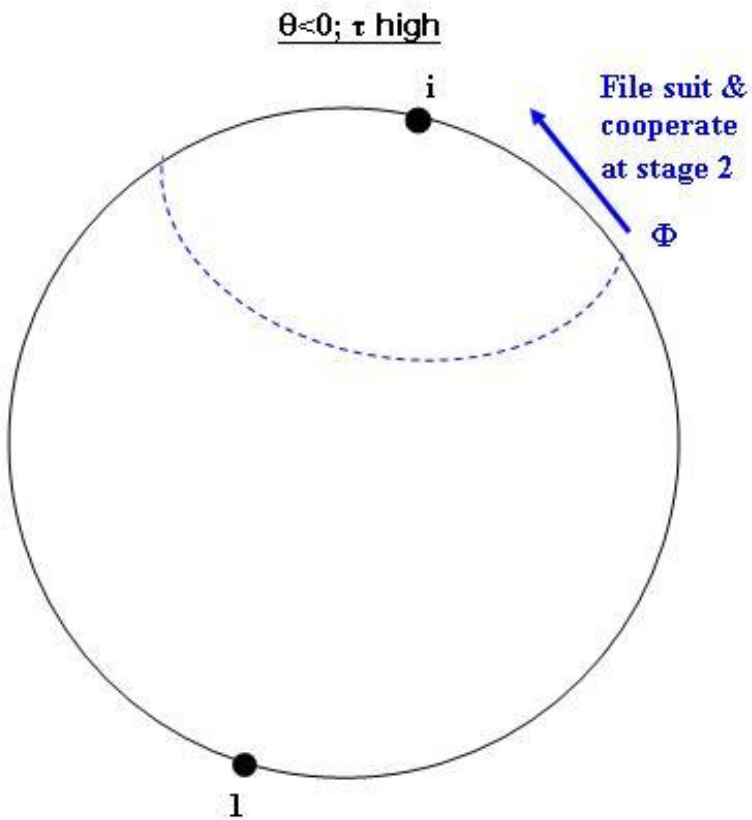


Court Enforcement

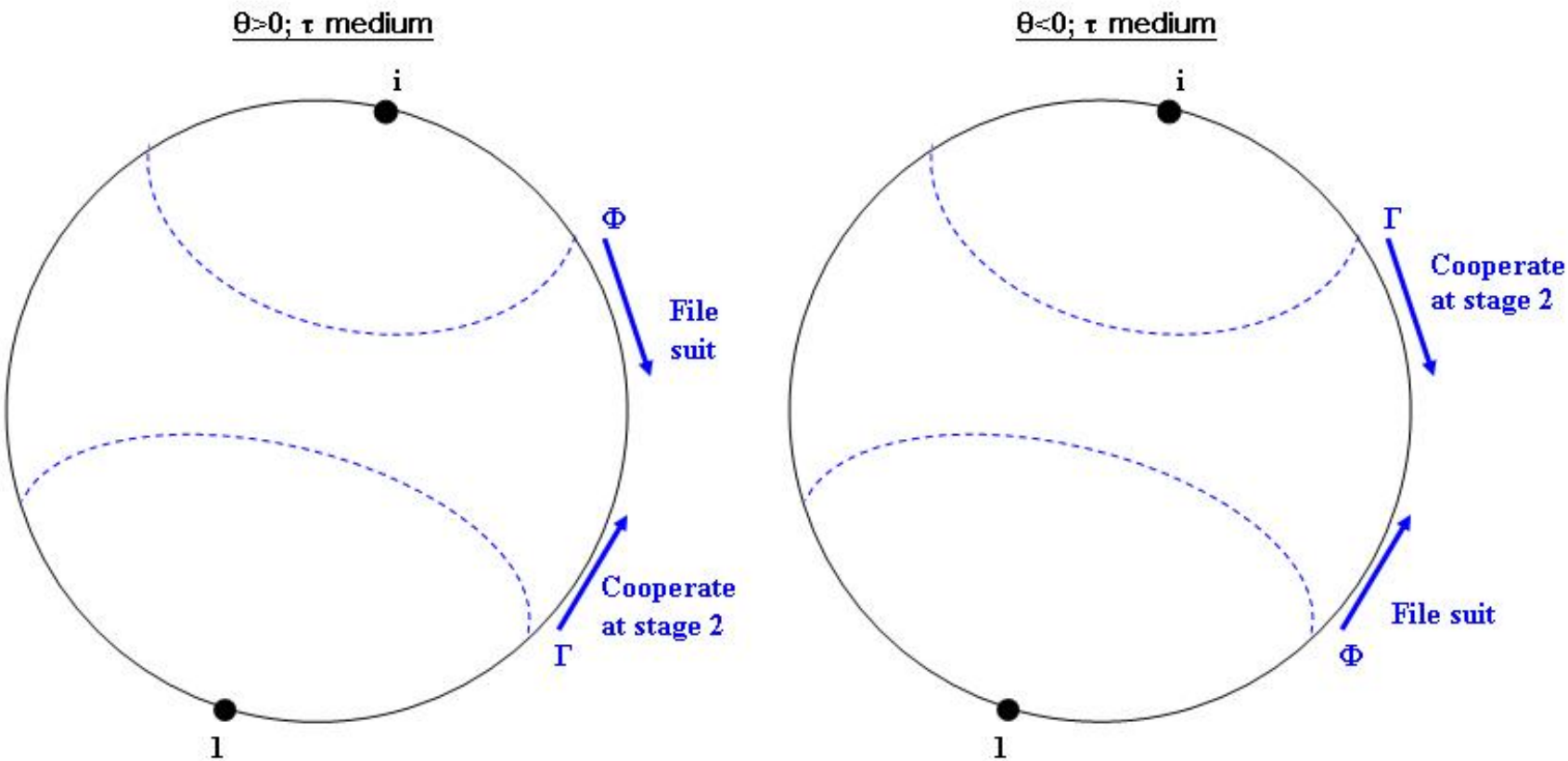
- After central transaction, *each* trader can file suit for cost $c \Rightarrow$ defendant bears legal cost g
- Court enforcement depends on justiciability $\tau \in [0, 1]$ (=probability that a plaintiff with a *valid* claim is able to satisfy the burden of proof necessary to win its case)
- If a court rules for the plaintiff [defendant], the court requires the defendant to pay the plaintiff *damages*, D [0].
- Expected payoff of player i from filing a suit (& counter-suit):
  - If both partners defected or cooperated: $-c$
  - If i cooperated but his partner defected: $\tau D - c$
  - If i defected and his partner cooperated: $-\tau D - c$
- Special case *expectation damages*: $D = (h - l)e^{\theta X}$
- Solution concept: Subgame-Perfect Equilibrium

The *Scope of Cooperation* with Courts (high τ)





The *Scope of Cooperation* with Courts (medium τ)



Results: Comparing Communities and Courts

- The existence of *communities* can enforce cooperation in relatively *low value* transactions
  - Intuition: if value too high, defection is too tempting.
- Public *courts* are *complements* to communities, as they support cooperation in relatively *high value* transactions.
  - Intuition: state guarantees enforcement ($\rightarrow$ no upper bound) but if value too low, the expected income from damage payments does not cover the cost of filing a suit.
- This is only partly true if court effectiveness is limited: then an *upper* bound on the value of transactions enforced by courts exists, too, because the probability of being convicted is relatively low compared to gains from defection.

A New View on the Rise & Fall of the Law Merchant

- Key exogenous development in Europe in Commercial Revolution: transaction costs of trade $\downarrow \Rightarrow$ over time $\theta \uparrow$

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- *Phase 2* (11th/12th cent.): Invasions subsided $\Rightarrow \theta > 0$. But # of markets and traders limited $\Rightarrow \kappa$ high $\Rightarrow$ community enforcement (=LM) works well for merchants "close" in terms of knowledge & experiences (low X)
- Phase 3 (post 1200): θ keeps growing but more differentiated products traded + more traders/ports involved $\Rightarrow \kappa \downarrow$
  $\Rightarrow$ effectiveness of communities $\downarrow$, but courts unaffected
  $\Rightarrow$ courts gain, LM looses enforcement "market share"

Some Open Questions

- What can we learn from studying medieval institutions for today's (practical and research) questions?
- How do the different types of communities (social networks, rating agencies, business associations) differ?
- If membership in a centralized community is costly, who would become member? And why?
- Are *all* communities complements to courts or are there intermediate cases?

Part 3. Enforcement in the Shadow of the Law: Decentralized v. Centralized Institutions

Modeling a Social Network

Avner Greif (1993, AER): "Contract Enforceability and Economic Institutions in Early Trade: The Maghribi Trader's Coalition"

Historical Background and Motivation

- In pre-Modern trade, a merchant had 2 options:
  - Travel along with his merchandise between trade centers.
  - Hire overseas agents to handle his goods abroad.
- Employing agents was efficient, since it enabled the merchant to save the time and risk of traveling, to diversify his sales across trade centers.
- Problem: agent can act opportunistically and embezzle the merchant's goods
  $\Rightarrow$ anticipating this, a merchant will not hire agents
  $\Rightarrow$ efficient trade does not take place
- p.526: "The importance of this organizational problem for pre-Modern trade efficiency is reflected in the fact that the merchant-agent relations are present in all the main forms of business association employed during that time."

Historical Source

- Greif uses a historical source found in Fustat (Old Cairo) known as the *geniza* ("deposit place" in Hebrew):
  - Contains $\approx$ 1,000 contracts, price lists, trade letters, accounts that reflect 11th century trade
  - Written by Jewish traders, the "Maghribi traders"
  - p.526: "... it is reasonable to conjecture that the documents found in the *geniza* contain a representative sample of their commercial correspondence."

Methodology and Research Question

- Methodology:
  1. Review the *geniza* to understand the economic problem of merchants and agents
  2. Use these historical insights in a game-theoretical model
  3. Use the equilibrium found in the model to make predictions that were not part of the model's assumptions
  4. Confront these predictions with historical evidence
- Paper is very rich in historical details; a great read for anyone having some interest in economic history!
- Main hypothesis ($\Rightarrow$ research question): agency relations among Maghribi traders were governed by an institution called a coalition (= social network as introduced above).

The Model I

- Perfect & complete information economy.
- M merchants and A agents; $M > A$; infinitely-lived, discount factor δ.
- Timing: in each period
  1. a merchant can hire an agent from the pool of unemployed agents; max. 1 merchant per agent($\Rightarrow$ competition for agents).
  2. An employed agent can be honest or cheat $\Rightarrow$ payoffs realized.
  3. Merchant can terminate relationship, or not.
- At the end of each period, the relation is terminated for some exogenous reason with probability τ.

The Model II

- Payoffs:

M / A	Honest	Cheat
Hire	$\gamma - W, W$	$0, \alpha$
Not hire	$\kappa, \bar{w}$	$\kappa, \bar{w}$

  - where $\kappa > 0$; $\bar{w} \geq 0$ (nonnegative outside options)
  - $\gamma > \kappa + \bar{w}$ (cooperation is efficient)
  - $\gamma > \alpha > \bar{w}$ (cheating entails a loss; agent prefers cheating over outside option)
  - $\kappa > \gamma - \alpha$ (merchant prefers to operate by himself if agent cheats or wants wage α).

The Multilateral Punishment Strategy (MPS)

- A *merchant* offers an agent a wage W^*, rehires the same agent if he has been honest (unless forced separation has occurred), fires the agent if he has cheated, *never hires an agent who has ever cheated any merchant*, and (randomly) chooses an agent from among the unemployed agents who never have cheated if forced separation has occurred.
- An *agent*'s strategy calls for being honest if paid W^* and for cheating if paid less than W*.

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- An *agent*'s strategy calls for being honest if paid W^* and for cheating if paid less than W*.
- Key questions:
  - Is this a subgame-perfect equilibrium?
  - In particular, will a merchant punish an agent who did not cheat him but another merchant? Why?
  - What is W^*?
- Note: other equilibria exist—but less interesting here.

What is W^*?

- Some notation and semantics:
  - An agent is *honest* [a cheater] if he was honest [cheated] when last employed.
  - h_h: probability that an unemployed honest agent will be rehired
  - h_c: probability that an unemployed cheater will be rehired
  - *Optimal wage* W^*: the *lowest* wage for which it is an agent's best response to play honest

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  - *Optimal wage* W^*: the *lowest* wage for which it is an agent's best response to play honest
- *Proposition 1:* $W^* = W(\delta, h_h, h_c, \tau, \bar{w}, \alpha) > \bar{w}$*; W is monotonically decreasing in* δ *and* h_h*, monotonically increasing in* $h_c, \tau, \bar{w}, \alpha$*.*
- Intuition: an agent is *honest* iff the loss from one-time cheating (=NPV difference of unemployed and employed agent) is higher than the gain from cheating
  $\Rightarrow$ wage can decrease if $\delta \uparrow$ or $h_h \uparrow$ or if agent can gain less by cheating ($\alpha \downarrow$), is more likely to remain employed if he is honest ($\tau \downarrow$), has worse opportunities elsewhere ($\bar{w} \downarrow$), and has a smaller chance of being hired if he is a cheater ($h_c \downarrow$).

Will a merchant punish an agent who did not cheat him but another merchant?

- Recall: "to punish" here means *not to hire* a cheater.
- *Proposition 2: Under MPS a merchant strictly prefers to hire an honest agent.*
- Intuition: an honest agent is expected to be hired in the future, but an agent who has ever cheated is not.

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- Intuition: an honest agent is expected to be hired in the future, but an agent who has ever cheated is not.
- Agents know this $\Rightarrow$ influences their beliefs.
- Since the optimal wage *decreases* in the probability of future hiring, *a cheater's optimal wage is higher than an honest agent's wage*
  $\Rightarrow$ each merchant strictly prefers to hire an honest agent.

Is the MPS part of a subgame-perfect equilibrium?

- Define a *bilateral punishment strategy* (BPS): identical to MPS but merchants do not condition hiring decision on agent's past behavior (because such information is not gathered, given that nobody is expected to use it)

Is the MPS part of a subgame-perfect equilibrium?

- Define a *bilateral punishment strategy* (BPS): identical to MPS but merchants do not condition hiring decision on agent's past behavior (because such information is not gathered, given that nobody is expected to use it)
- *Proposition 3: Assume* $\delta \to 1$. *Cooperation is feasible for all* $\tau \in [0,1]$, *iff:*

$$\gamma - \kappa \geq (\frac{A}{M} - 1)\bar{w} + \alpha + \epsilon, \quad \forall \epsilon > 0 \text{ under BPS,} \quad (1)$$

$$\gamma - \kappa \geq \frac{A}{M}\bar{w} + \epsilon, \quad \forall \epsilon > 0 \text{ under MPS.} \quad (2)$$

- Given that $\alpha > \bar{w}$, (1) is more restrictive than (2)
  $\Rightarrow$ MPS supports more cooperation in equilibrium than BPS
  $\Rightarrow$ *MPS increases efficiency!*

Intuition of the Main Result, Prop 3

1. Consider $\tau = 1$. Under BPS, agents always cheat
   $\Rightarrow$ merchants do not hire agents.
   But under MPS, agent does not always cheat b/c he understands that he can only be employed by other merchants in the future if he has a clean record
   $\Rightarrow$ less cheating under MPS.

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   But under MPS, agent does not always cheat b/c he understands that he can only be employed by other merchants in the future if he has a clean record
   $\Rightarrow$ less cheating under MPS.
2. Optimal wage W^* is lower under MPS than under BPS (cf. Prop 1)
   $\Rightarrow$ if potential gains of trade are low, more transactions under MPS than under BPS take place
   $\Rightarrow$ efficiency $\uparrow$ (i.e. profits of merchants and agents $\uparrow$)

Some Open Questions

- Was the Maghribi traders coalition really a *social network* (as defined above)? Or was it an *association*?

Some Open Questions

- Was the Maghribi traders coalition really a *social network* (as defined above)? Or was it an *association*?
- What if the social network of merchants and agents grows very large s.t. the flow of information about agents' previous behavior among merchants is not perfect anymore (or even erroneous)?

Modeling a Rating Agency

Avner Greif, Paul R. Milgrom, and Barry R. Weingast (1994, JPE): "Coordination, Commitment, and Enforcement: The Case of the Merchant Guild"

Economic Problem (!): Powerful States

- Nice about states: can provide economic governance by using coercive power as threat in case of defection of transactors
- Flip-side: state's coercive power can be abused (withhold protection of private parties or confiscate private wealth)
- Consequence: if state wants to boost trade/economic interactions, an institution has to be implemented that protects traders not only from each other but also from state
- Application: medieval cities (p.746): "It is our thesis that *merchant guilds* emerged *with the encouragement of the rulers* of trading centers to be a countervailing power, enhancing the *ruler's ability to commit* and laying an important institutional foundation for the growing trade of that period."

How Can a Ruler Commit Not to Exploit Traders?

- Theoretically: Bilateral Interaction or Social Network
- BUT (p.748): "historical records indicate that ... ruler-merchant relations were governed by *administrative bodies rooted outside the territory of the ruler*, which held certain regulatory powers over their member merchants in their own territory and supervised the operation of these merchants in foreign lands."
- RQ 1 (economic): What roles could these administrative bodies (merchant guilds) theoretically play in overcoming the ruler's commitment problem?
- RQ 2 (historical): What roles did they play in fact?

On Competing View of Merchant Guilds

- On RQ 2: frequent view among economic historians that merchant guilds were a *means to cartelize trade*
- BUT: if so, why did *powerful* rulers support *alien* merchants and give them privileges?
- $\Rightarrow$ guilds must have benefitted both merchants and rulers!
- On RQ 1: GMW develop a series of models: 1. Bilateral Repeated Interaction 2. Social Network 3. Information Intermediary 4. Arbitrator
- To motivate model details, paper investigates historical records very carefully (see paper, section I.)

The Model: Common Framework

- Players: 1 city, many merchants
- Merchants identified by points on interval $[0, \bar{x}]$
- Trading technology produces *net value* $f(x)(1-c-k)$
  - x: number of traders in the city in a period
  - $f(x)$: gross value of trade
  - c [k]: cost of city [trader] per unit of value traded; $c + k < 1$
  - $f(x) \geq 0, f(0) = 0$, differentiable
  - $argmax\{f(x)\} = x^* > 0$: *efficient volume of trade*
- City charges tax τ per unit of value traded (incl. all transfers)
- Period payoffs (where ϵ: fraction of traders cheated by city):

City / Trader	
Provide services	$f(x)(\tau - c)$, $(1-\tau-k)f(x)/x$
Cheat	$f(x)(\tau - c(1-\epsilon))$, $-(\tau+k)f(x)/x$

Solution Strategy

- City's NPV: $\sum_{t=0}^{\infty} \delta^t f(x_t)(\tau - c(1 - \epsilon_t))$
- Trader's NPV: analogous
- Important: any first-best solution involves trading efficient volume x^* and no cheating ($\epsilon_t = 0$)
  $\Rightarrow$ check when first-best is reached in an equilibrium!

Game 1: Bilateral Repeated Interaction

- No information exchange among traders possible!
- Each trader must decide whether to trade in the city, knowing only his own past decisions and the history of his own behavior by the city
- The city must decide how many (and which) traders to cheat

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- The city must decide how many (and which) traders to cheat
- *Result*: No Nash equilibrium can support honest trade ($\epsilon_t = 0$) at the efficient level ($x = x^*$).
- *Intuition*: If trade takes place at x^*, marginal trader has zero net value to the city. By cheating a few marginal traders, the city loses nothing in terms of future profits but saves a positive expense in the present period.

Game 2: Social Network

- Some decentralized information transmission mechanism among traders (e.g. gossip)
- Each trader must decide whether to trade in the city, knowing his history with the city and some gossip
- If $\mu(T)$ traders cheated by city, $\mu(\hat{T})$ learn this event ($\hat{T} \subset T$)
- Information technology: constant $K \geq 1 \Rightarrow$ upper bound on $\mu(\hat{T})$ is $K\mu(T)$

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- *Result*: No Nash equilibrium can support honest trade ($\epsilon_t = 0$) at the efficient level ($x = x^*$).
- *Intuition*: See game 1! At efficient trade level x^*, small group of traders cheated that tell a proportional number of others still has zero net value (loss) to the city

Game 3: Business Association ("Guild with Coordinating Ability")

- Important: guild is formal/centralized organization, not mere decentralized mechanism/institution $\Rightarrow$ has some management ("aldermen"). Here, corporate governance issues neglected $\Rightarrow$ guild is automaton!
- Guild learns about cheating and announces a boycott with prob $\alpha(T) \geq \mu(T) \Rightarrow$ guild merely aggregates information of members, has no superior information/own intelligence unit
- Traders learn guild's announcement in every period but are free to follow boycott

Game 3: Business Association (contd.)

- *Result*: A Markov perfect equilibrium exists if $\tau + k \leq 1$ and

$$c \leq \frac{\delta}{1-\delta}(\tau - c), \quad \text{where :} \tag{3}$$

  - The city does not cheat unless a boycott is announced by the guild leader; after a boycott is announced, it cheats any trader who offers to trade.
  - Traders offer to trade in a given period if and only if no boycott has been announced.

Game 3: Business Association (contd.)

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  - The city does not cheat unless a boycott is announced by the guild leader; after a boycott is announced, it cheats any trader who offers to trade.
  - Traders offer to trade in a given period if and only if no boycott has been announced.
- *Explanation*: (3) is classical incentive compatibility constraint: from cheating traders, city gains $cf(x^*)$ but foregoes average future profits per trader, $\frac{\delta}{1-\delta}(\tau - c)f(x^*)$.
- *Intuition*: Here *average* trading profits, not *marginal* profits determine city's incentive compatibility constraint.
- Why would city cheat traders who offer to trade during a boycott? - B/c traders will not return anyway (by one-stage deviation principle logic of MPE)

Incentives During a Boycott

- GMW offer more realistic alternative (p.769):
- Suppose that if some traders trade with the city despite the embargo, they cannot rely on the threat of a group boycott to enforce their own claims against the city. $\Rightarrow$ What can enforce honest behavior by the city during the boycott?

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- GMW offer more realistic alternative (p.769):
- Suppose that if some traders trade with the city despite the embargo, they cannot rely on the threat of a group boycott to enforce their own claims against the city. $\Rightarrow$ What can enforce honest behavior by the city during the boycott?
- *Answer*: threat of trader to withdraw his *own* future trade! In game 1, x^* no equilibrium—but $x' < x^*$ can be equilibrium
- *Intuition*: At x', volume of trade is not efficient, i.e. city's marginal payoff from increasing trade volume is >0 $\Rightarrow$ threat to withdraw even small trade has some bite (cf. Prop 4)
- *Implication*: Boycott of *weak* guild reduces trade volume only by $f(x^*) - f(x')$ $\Rightarrow$ less incentives of city to respect guild $\Rightarrow$ incentives for merchants to make guild strong and suppress trade by individual merchants $\Rightarrow$ enforcement association!

Some Open Questions

- What if guild membership was voluntary for merchants and cost a fee? What type of merchants would (not) join?
- Would competition between traders undermine joint formation/support of an association? When (not)?
- Is the governance mechanism within the guild (qualitatively) important for its performance in supporting honest trade? What governance would be optimal (plutocracy of richest merchants or one-member-one-vote rule or election of professional (outside) manager)?
- What do medieval merchant guilds (not) have in common with today's chambers of commerce? Why? Is today's structure efficient given today's major needs of businesses?
- Do today's governments of emerging markets encourage foreign business associations to settle in their countries? Why?

Modeling a Business Association with Arbitration Function

Paul R. Milgrom, Douglass C. North, and Barry R. Weingast (1990, Economics & Politics): "The Role of Institutions in the Revival of Trade: The Law Merchant, Private Judges, and the Champagne Fairs"

Motivation and Research Question

- Observation: Although decentralized reputation mechanisms (social networks) can promote some honest trade in Prisoner's Dilemma situations, many types of formalized institutions have existed throughout history.
- RQ 1: What is the role of formal institutions (organizations) in supporting honest exchange *given that informal mechanisms exist, too*?
- Application: medieval body of commercial law, the *lex mercatoria* (Law Merchant), which was used (and enforced!) by private merchants (largely) without state support
- RQ 2 (variant of RQ 1): Was this private adjudication system a *substitute* for the reputation mechanism that had worked effectively in earlier periods (e.g. Greif, 1993)?
- RQ 3: How could a system of adjudication function without substantial police powers?

Key Hypothesis and Approach

- Focus on trader-trader relationship, not trader-ruler!
- Hypothesis (p.3): In a large community, 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.

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- Solution strategy: solve interconnected 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
  - to honor the decisions of the judges.

Game 1: Social Network (Benchmarking)

- Historical context: trade fairs in Champagne, France
  $\Rightarrow$ traders met regularly at fairs and made agreements about delivery and payment of goods
  $\Rightarrow$ Prisoner's Dilemma with stage-game payoffs $\pi_i(a_{1t}, a_{2t})$:

a_1 / a_2	Honest	Cheat
Honest	1,1	$-\beta, \alpha$
Cheat	$\alpha, -\beta$	0, 0

  - where $\alpha > 1, \alpha - \beta < 2$
- N traders
- Trader i matched by rule M with partner $M(h_t, i)$ at $t+1$, where h_t : history of trade through t
- NPV of trader i: $(1-\delta)\sum_{t=0}^{\infty} \delta^t \pi_i(a_{1t}, a_{2t})$

Game 1: Equilibrium Strategy

- t_0: play 'Honest'
- $t+1$: play 'Cheat' iff:
  - i made the play specified by his equilibrium strategy at date t AND
  - $M(h_t, i)$ did *not* make the play specified by his equilibrium strategy at date t.
- Otherwise, play 'Honest'.

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- Otherwise, play 'Honest'.
- Note: clever idea to let equilibrium strategy depend on adherence to equilibrium strategy!
- *Intuition*: Why punish a cheater if you weren't cheated yourself?
  1. Punishing means to play 'Cheat' $\Rightarrow$ directly profitable
  2. A trader who does not punish a cheater is subject to punishment himself!

Game 1: Results

- For all matching rules M, there is an equilibrium where all traders play the strategy described above if:

$$\delta \geq Max\{\frac{\beta}{1+\beta}, \frac{\alpha-1}{1+\beta}\} \tag{4}$$

- $\Rightarrow$ Note that 1. condition harder if being cheated hurts more, 2. condition harder if cheating yourself is more profitable.
- *Main problem*: equilibrium depends on assumption that all traders know entire history h_t: they need complete information about *all* other traders' behavior $\Rightarrow$ in reality often not fulfilled $\Rightarrow$ different institution needed!

Game 2: Private Judge / "Law Merchant"

- Now: actions in PD only observable for traders involved, *not for outsiders* $\Rightarrow$ every trader just knows *own* history
- Adjusted matching rule: no two traders meet again!
  $\Rightarrow$ unique NE: everybody always cheats!

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- Now: actions in PD only observable for traders involved, *not for outsiders* $\Rightarrow$ every trader just knows *own* history
- Adjusted matching rule: no two traders meet again!
  $\Rightarrow$ unique NE: everybody always cheats!
- Solution: centralized institution, Law Merchant (LM)
  $\Rightarrow$ uses a private judge as centralized organization/third party to support honest trade
- Similar to *business association* (substitute "membership-fee" for "cost of query" on the next slide)

The LM System Stage Game in Period t

1. Players may *query* the LM about their current partner at cost $Q > 0 \Rightarrow$ LM reports to *both* whether/which party has any "unpaid judgments".
2. *Central transaction*: Prisoners' Dilemma.
3. Each player may *appeal* to the LM at personal cost $C > 0$ — but only if he has queried the LM.
4. If either party makes appeal, the LM awards a *judgment*, J, to the plaintiff if he has been Honest and his trading partner has Cheated. Otherwise, no award.
5. If a judgment is awarded, the defendant may *pay* it, at cost $f(J)$, or refuse to pay.
6. Any *unpaid judgments are recorded* by the LM and become part of the LM's permanent record.

Equilibrium Strategy: The LM System Strategy (LMSS)

- Stage 1: a trader queries the LM if he has no unpaid judgments on record, but not otherwise.
- Stage 2: if either player has failed to query the LM or they learn that at least one player has an outstanding judgment, then both traders play 'Cheat'; otherwise, both play 'Honest'.
- Stage 3: if both parties queried at stage 1 and exactly one of the two players Cheated at stage 2, the victim appeals to the LM; otherwise, no appeal.
- Stage 4: if a *valid* appeal was filed, the LM awards damages J to victim.
- Stage 5: defendant pays the judgment J iff he has no other outstanding judgments.

Game 2: Results

- LMSS is a symmetric sequential equilibrium strategy iff:

$$\frac{\delta}{1-\delta}(1-Q) \geq f(J) \geq max\{(\alpha-1), f(C)\} \tag{5}$$

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- If *left inequality* holds, it is reasonable to pay a judgement if told to do so by the LM $\Rightarrow$ if damage payment too high, system breaks down
- If *right inequality, part 1,* holds, it deters cheating and paying the fine
- If *right inequality, part 2,* holds, the transaction cost of using the system/filing an appeal is not prohibitive

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- If *right inequality, part 1,* holds, it deters cheating and paying the fine
- If *right inequality, part 2,* holds, the transaction cost of using the system/filing an appeal is not prohibitive
- *Remark:* If transaction cost to transfer wealth too high (e.g. $\frac{f(J)}{J}$ is low), possible that system breaks down
- Equilibrium underlines difference of private/public institutions b/c public court does not have to satisfy left part of (5)!

Some Open Questions

- What if the private judge cannot perfectly reveal what has happened in central transactions ex post?
- What if the private judge has low talent or is corrupt/biased? (see section 5 of MNW as a starting point)
- Which governance mechanism of the business association leads to the minimal (=efficient, assuming some transaction cost) $f(J)$ that supports the LMSS in equilibrium?
- What if *not all* traders join the association / "query the LM", e.g. because of some heterogeneity, or if some traders have significantly higher stakes in 'jurisdiction' of one LM b/c some live there and others are foreign, occasional traders?
- What are the key differences between the LM system and today's business associations?

Pirates!

Peter T. Leeson (2007, JPE): "An-arrgh-chy: The Law and Economics of Pirate Organization"

Motivation and Historical Background

- Pirates in 17th/18th centuries (in Caribbean, Atlantic & Indian Oceans) faced severe *collective action problem*: because ships required large crews, they could only do business ("raid and plunder") if they cooperated with each other.
- Problem: could not use public courts to enforce contracts (b/c of illegal business)

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- $\Rightarrow$ Why? How?
- *Methodology*: Analyze historical documents, postulate economic logic of institutions identified, and provide a lot of anecdotal evidence that is unclear without these explanations.
- No model, no regressions, nothing quantitative!—Still great!
- Offers a case study of criminal organization that may imply lessons for related organizations ...

Research Questions and Main Hypothesis

- Leeson (2007:1051): "To effectively organize their banditry, pirates required mechanisms to prevent internal predation, minimize crew conflict, and maximize piratical profit. I argue that pirates devised two institutions for this purpose. First, I analyze the *system of piratical checks and balances that crews used to constrain captain predation*. Second, I examine *how pirates used democratic constitutions to minimize conflict* and create piratical law and order. Pirates adopted both of these institutions before seventeenth- and eighteenth-century governments."
- $\Rightarrow$ Main claim: pirates were no romantic liberty seekers or sadistic misanthropists, they were profit-maximizers!

Pirates' Outside Option: Sailor on Merchant Ship

- Merchant ships owned by groups of landed (!) merchants who purchased shares in various trading vessels and financed their voyages
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- Institutional response: appoint *captain* of ship (incentivized well by profit shares & family ties to other owners) who can monitor small merchant ship crews and has dictator power while on sea
- $\Rightarrow$ solves P-A problem but creates a new one: *captain predation* of crew members (b/c unrestricted power easily abused)

Pirate Ship Organization

- Main difference: no outside owners $\Rightarrow$ no P-A problem!
- Pirate crews formed *producer cooperative* (my wording, cf. Hansmann 1996)
  - Founded on democratic voting (instead of hierarchical fiat) $\Rightarrow$ each crew member some right to residual control
  - Used checks and balances to restrict power of potential abusers
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- The *pirate captain*:
  - Necessary institution to get fast decisions in key situations (battle, chase) $\Rightarrow$ captain had unlimited authority (only then!)
  - Otherwise, *quartermaster* (="business association manager") most influential: select and distribute loot, allocate provisions, adjudicate minor conflicts among crew members, ...

Pirate Constitutions

- Separation of power restricted abuse by captains—but abuse by quartermaster?
- $\Rightarrow$ all pirate crews had written constitutions, often the same across ships ("Custom of the Coast", "Jamaica Discipline")
- Key elements:
  - Democratic governance: captain & quartermaster (+ other positions) were elected and could be replaced by majority vote
  - Prohibited activities creating negative externalities or risking entire enterprise: e.g. gambling, excessive drinking, onboard fighting, women & young boys on board
  - Incentives to exert effort/prevent shirking: e.g. social insurance system (x money for lost arm, ...)
  - Bonuses for special performance: e.g. in battle
  - In case of major struggles: entire crew (not quartermaster) serves as judiciary and votes
  - Every member can leave crew if he does not agree with conditions $\Rightarrow$ exit right makes sure participation constraint has to hold $\forall$ members

Main Results (p.1090)

- "Ordinary 'foot soldiers' inside criminal organizations may face a problem of leader predation similar to the problem citizens under governments face with respect to political rulers."
- "The institutions that constituted the pirates' system of governance—democratic checks, the separation of power, and constitutions—are remarkably similar to those governments employ to constrain ruler predation in the 'legitimate world.'"
- "Organized criminals are as interested in creating order among themselves as noncriminals."

Some Open Questions

- What can we learn from historical criminal organizations about *today's* criminal organizations? In particular, what does the study tell us about how to *fight* criminal organizations?
- Can we draw lessons for *noncriminal* organizations that may have related problems (abuse of power by key players) but do not want to resort to public courts to solve internal struggles, e.g. country/sport clubs?
- Methodologically: how to evaluate the nonquantitative, historical approach of Leeson as compared to modeling and/or data analysis?
  $\Rightarrow$ cf. Dean Williamson on "Financing Long-distance Trade in Venice 1190-1220 and Venetian Crete 1278-1400"

Thank you very much for your attention!