

# The effect of private judgement system on cooperation: An experimental test

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ESA 2022  
June 16, 2022

## Motivating example

Xianyu is a second-hand trading platform owned by Alibaba. Buyers and sellers trade freely on this platform, but sometimes disputes will arise. Imagine the following scenario after a transaction:

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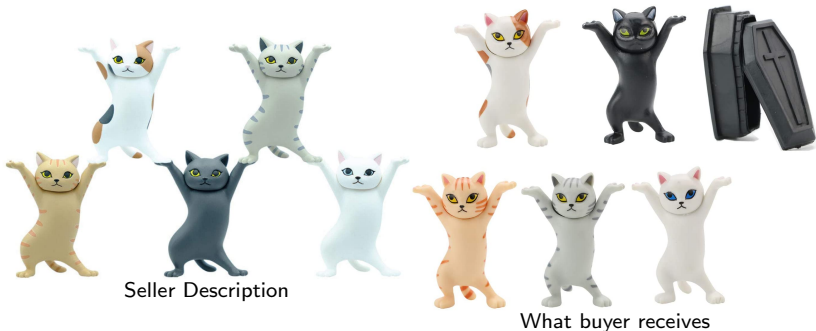


Seller Description

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2. The **seller** does not want to accept a return or issue refund.
3. The **buyer** could then go to **mini court** on Xianyu.

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This is a real-life example of how a private judgement system helps to resolve disputes.



# The Dilemma

Cooperation is difficult to achieve among agents who are confronted with a social dilemma but cannot identify each other or effectively build reputations.

When frequency of interaction is low (ex: online shopping), it is not feasible for an agent to:

- **Retrieve complete history** of current partner.
- **Enforce cooperation** by punishing the partner immediately.

Therefore, an institution may help to promote cooperation.  
(Real-life ex: Airbnb reputation system and eBay resolution center)

# Background of the Law Merchant Enforcement System

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- Milgrom et al. (1990) developed a game-theoretic judicial enforcement system to characterize the Law Merchant. This system could help to lower the information cost, settle the disputes and therefore could help to enforce agreements, and sustain cooperation.
- Special feature: punishment is voluntary in this system

# This Paper

## Research Questions:

- (1) To what extent can the Law Merchant Enforcement system increase cooperation in an economy?
- (2) If the system is given the opportunity to request bribery from agents, what would this influence cooperation?

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## Main Findings:

1. The introduction of Law Merchant system has limited improvement on cooperation. The presence of bribery would decrease cooperation significantly.
2. Economies with the Law Merchant system has a decreasing trend in cooperation.
3. The Law Merchant system could help to improve rate of efficient outcome though.
4. Agents do not make use of the system as much as they should.

# Literature

**Institution:** An institution that enables agents to impose costly personal punishment to defectors **could promote cooperation** in both finitely repeated and indefinitely repeated interactions (Ostrom, Walker & Gardner, 1992; Fehr & Gaechter, 2000; Camera & Casari, 2009).

**Reputation system:** Focus on the effect on trust and trustworthiness and on market efficiency (Keser, 2003; Bolton et al., 2004; Bolton et al., 2008; Kalyanam McIntyre, 2001; Houser Wooders, 2006; Lucking-Reiley et al., 2007).

**Bribery Experiments:** Studies **extrinsic and intrinsic motives** of bribe (Abbink, 2004; Abbink & Renner, 2002; Banerjee, 2016; Alatas et al., 2009b, 2009a) and institutions that could help to **reduce bribery** (Abbink et al., 2014; Lowen Samuel, 2012; Ryvkin et al., 2017; Serra, 2012).

# Environment

- A **Set**(Economy): 5 subjects.
- A **Cycle**: the course over which this set will exist.
- **Roles**: 2 roles in a set. 1 randomly chosen *observer* and 4 *active participants*. Roles are fixed within a cycle.
- A **Round**: 2 *active participants* meet and play PD game.
- **Matching protocol**: Random matching.
- PD game used: (Action Y: Cooperate; Action Z: Defect)

		<i>active participant 2</i>	
		<i>ActionY</i>	<i>ActionZ</i>
<i>active participant 1</i>	<i>ActionY</i>	25, 25	5, 30
	<i>ActionZ</i>	30, 5	10, 10

- Indefinite time horizon:  $\delta = 0.9$



# Honest LM: Design

- **Record:** Every *active participant* starts with a “Good” record.
- **Query:** The action of an *active participant* to get a statement from the *observer* about the record of his/her partner. Costs 3 points.
- **Report:** An *active participant* is **eligible** to report his/her partner if he/she queried, chose action Y and partner chose action Z. Costs 3 points. → Partner will receive a fine from the *observer*.

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Stage game played in each round:

- (1) An *active participant* decide whether to **query** the *observer*.
- (2) Play PD game and observe the outcome.
- (3) **Eligible** *active participant* decides whether to **report**.
- (4) Whoever receives a fine decides whether to give his/her partner 20 points.
- (5) The *observer* updates record for those who refuse to pay fine to “Bad”.

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Four essentials:

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- The *observer* will adjudicate the dispute **perfectly and honestly** at a cost of 3 points to the plaintiff. The *observer* will record the disputes and award a fine to the defendant.
- The payment to the fine is **voluntary** such that the *observer* cannot enforce the defendant to pay the fine.

# Honest LM: Design

Four essentials:

- Any eligible *active participant* can **report** to the *observer* after each interaction.
- The *observer* will adjudicate the dispute **perfectly and honestly** at a cost of 3 points to the plaintiff. The *observer* will record the disputes and award a fine to the defendant.
- The payment to the fine is **voluntary** such that the *observer* cannot enforce the defendant to pay the fine.
- Before any interaction, any *active participant* can **query** the *observer*, at a cost of 3 points, to see the record of his/her partner.

# Honest LM: Observer's Interface

(1) Query: One player queried the observer.

Record of *active participants* in your set

ID	Record	Match's ID	Match's record
1	Good	3	Good
2	Good	4	Good
3	Good	1	Good
4	Good	2	Good

Player 4 queried.

The table below shows the statements to be sent.

ID	Statement to send
1	No record will be shared with you.
2	Your record is Good.
3	No record will be shared with you.
4	Your match's record is Good.

# Honest LM: Observer's Interface

## (5) Update records

Player 2 rejected to pay fine. Below shows the updated record of *active participants* in your set.

Updated record of *active participants* in your set

ID	Record
1	Good
2	Bad
3	Good
4	Good

Submit



# Dishonest LM: Design

- **Request** (bribe): The *observer* can request points from *active participants*(AP). If AP 1 (Good record) refuses to give and happen to be queried by AP 2, AP 2 will receive a false statement saying AP 1 has a “Bad” record.

Stage game played in each round:

- (0) The *observer* decides whether to request points. *Active participants* decides whether to give the requested amount.
- (1) - (5) Same as in Honest LM

# Dishonest LM: Observer's Interface

## (0) Request points

### Your choice

How much points do you want to request from player 1?

0  5  10  15  20

How much do you want to request from player 2?

0  5  10  15  20

How much do you want to request from player 3?

0  5  10  15  20

How much do you want to request from player 4?

0  5  10  15  20

Submit

### Record of *active participants* in your set

ID	Record
1	Good
2	Good
3	Good
4	Good

# Dishonest LM: Observer's Interface

## (1) Query

Record of *active participants* in your set

ID	Record	Match's ID	Match's record
1	Good	4	Good
2	Good	3	Good
3	Good	2	Good
4	Good	1	Good

Player 4 queried.  
Player 1 rejected to pay you.

The table below shows the statements to be sent.

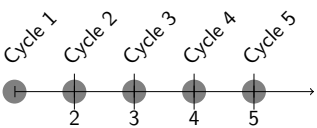
### ID Statement to send

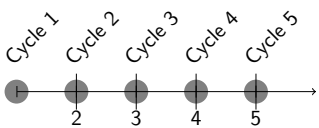
- 1 Your record is Good. However, your match will receive a statement saying that "Your match's record is Bad" since you rejected to give the requested amount.
- 2 No record will be shared with you.
- 3 No record will be shared with you.
- 4 Your match's record is Bad.

# Treatments and session

Treatment	Observer's decision	Observer's earning per round
Baseline	Do not interact with active participants.	18 points
Honest LM	Give correct information when active participants make a query.	18 points
Dishonest LM	Can request bribe from active participants. Can give incorrect information.	18 points + 1 point per query + received bribe

## In session:

- 10 subjects in one session, i.e. 2 sets.
- Records, player histories are destroyed after each cycle.
- 2 new sets are formed in a new cycle.
-  with pre-drawn length



# Propositions and hypotheses

## **Proposition 1** (for *active participants*)

The efficient outcome (both choose Action Y) **can** be sustained as an equilibrium in Baseline and Honest LM treatments, but **can not** be sustained in Dishonest LM treatment.

## **Hypothesis 1** (for *active participants*)

The rate of **efficient outcomes**:

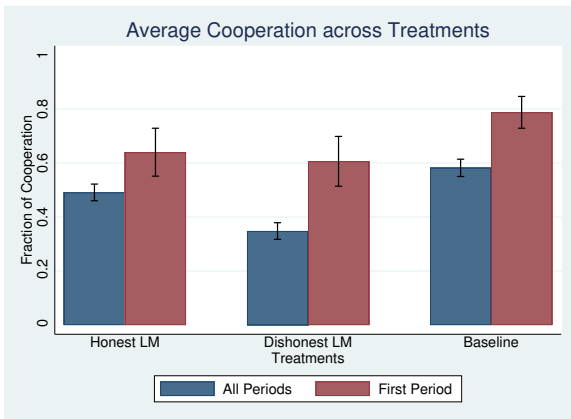
Honest LM  $\geq$  Baseline  $>$  Dishonest LM.

## **Hypothesis 2** (for *active participants*)

The rate to **query**: Honest LM  $>$  Dishonest LM

# Cooperation

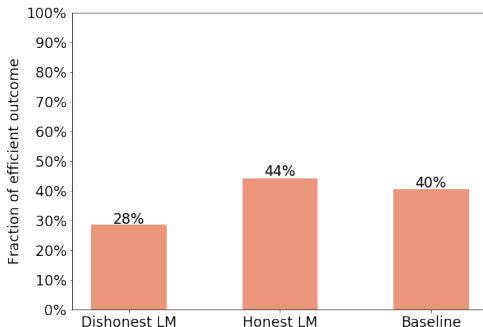
**Result 1a** The introduction of the Law Merchant system does not increase average cooperation but the opportunity to bribe decreases cooperation.



# Cooperation

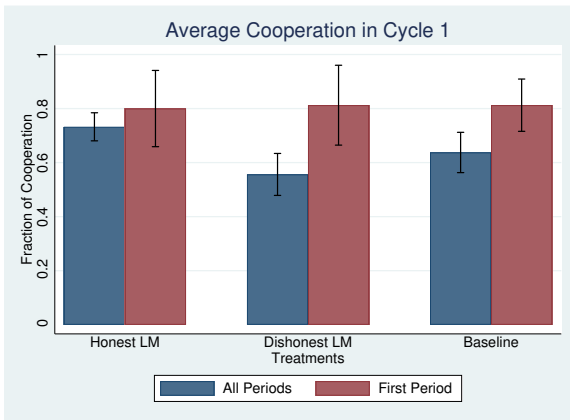
**Result 1b** Introducing an Honest LM **increases** the rate of **efficient outcomes** in an economy. Honest LM > Baseline > Dishonest LM

**Hypothesis 1**  $Honest\ LM \geq Baseline > Dishonest\ LM$ .



# Cooperation

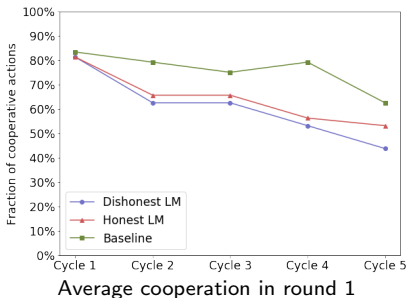
**Result 2a** Initial cooperation rates across treatments are at similar high levels.





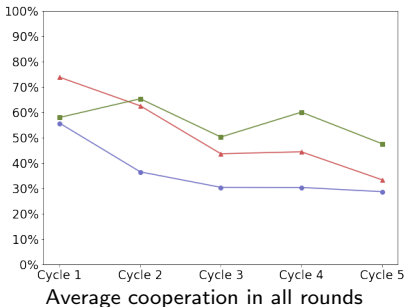
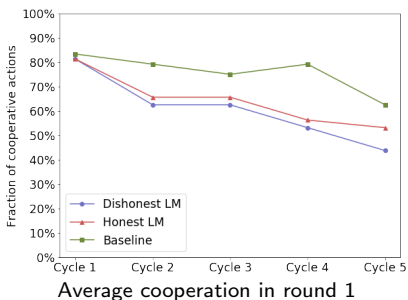
# Cooperation

**Result 2b** In economies with the Law Merchant, cooperation has a **decreasing trend** and is lower in later cycles than in earlier cycles.  
→ The LM failed to help sustain high initial cooperation rate.



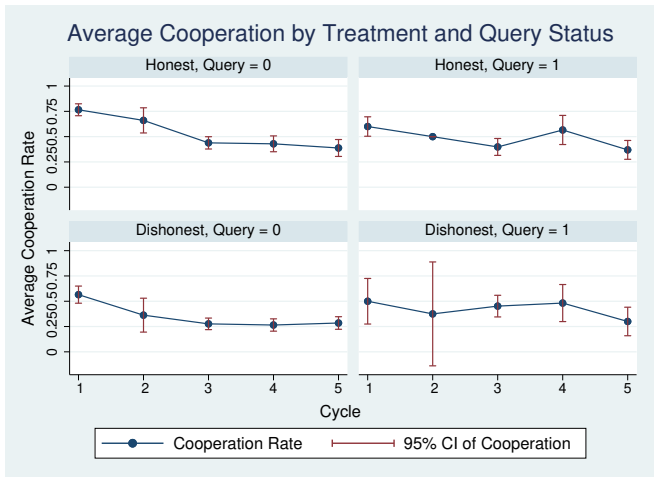
# Cooperation

**Result 2b** In economies with the Law Merchant, cooperation has a **decreasing trend** and is lower in later cycles than in earlier cycles.  
→ The LM failed to help sustain high initial cooperation rate.



# The usage of the LM system

**Result 3a** When query is being used in an economy, the decreasing trend of average cooperation disappears.  
(Query = 1 if at least 1 active participants queries.)

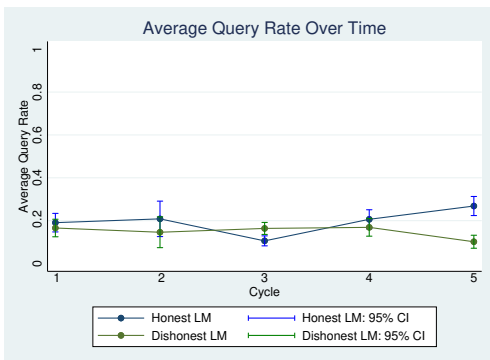


# The usage of the LM system

**Result 3b** *Active participants query* more in Honest LM treatment. But overall query rate is too low.

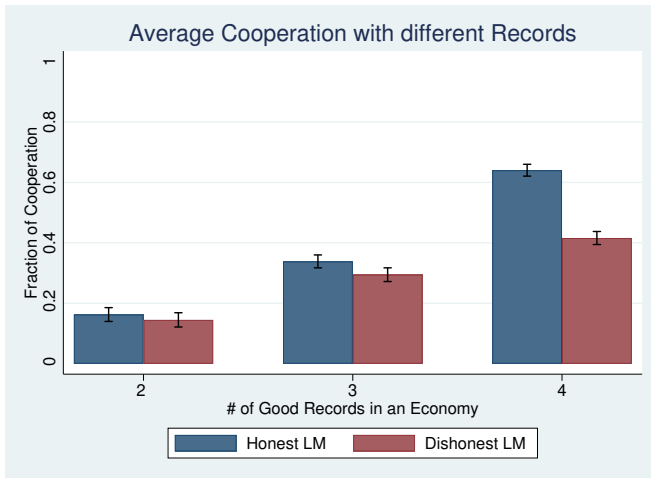
→ An explanation of why the system failed?

**Hypothesis 2** *Honest LM* > *Dishonest LM*.



# The usage of the LM system

**Result 3c** When bribe is present, records mean less.



# Conclusion

- The introduction of Law Merchant did not manage to increase cooperation but help to boost rate of efficient outcome.
- Bribery reduces cooperation by discouraging agents to use the Law Merchant system.
- Economies could achieve higher cooperation if the active participants make use of the Law Merchant system more often when bribe is absent.

Potential explanations for no improvement on cooperation rate with Honest LM.

- PD game chosen is easy to cooperate even without the system. Room for improvement very limited.
- Cost of using the system maybe too high (5 points to query, 5 points to report).
- Fine so high such that defectors don't think it's worthwhile to pay to keep a good record.

## Q & A

Thanks for listening! Any questions?  
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# Individual choice of cooperation

## Probit Regression: Marginal Effects

Dependent variable: Cooperation	Baseline	Honest LM	Dishonest LM	With LM
Has seen any defect	-0.345*** (0.110)	-0.452*** (0.045)	-0.364*** (0.090)	-0.427*** (0.047)
Duration of last cycle	0.001 (0.016)	-0.016*** (0.005)	-0.015* (0.008)	-0.015*** (0.004)
Received fine(lag)		0.142 (0.126)	0.334** (0.130)	0.224** (0.097)
Paid fine(lag)		-0.314*** (0.092)	-0.352*** (0.130)	-0.387*** (0.081)
Query x other good record		0.094*** (0.023)	0.068 (0.077)	0.076** (0.036)
Other Query x me good record		0.370*** (0.056)	0.260*** (0.075)	0.311*** (0.050)
Requested bribery(lag)			-0.071* (0.037)	-0.060 (0.038)
<i>Cycle dummies</i>	✓	✓	✓	✓
Treatment = Dishonest				-0.029 (0.078)
Observations	1,320	1,760	1,760	3,520

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



# Power of report

## Transitional Matrices in Honest Treatment

	(A)Choice if a subject report		(B)Choice if a subject is being reported		
	ss choice in next period		ss choice in next period		
Did ss receive fine?	Cooperate	Defect	Did ss pay fine?	Cooperate	Defect
Yes	80	20	Yes	0	100
No	37.8	62.2	No	20	80

## Transitional Matrices in Dishonest Treatment

	(A)Choice if a subject report		(B)Choice if a subject is being reported		
	ss choice in next period		ss choice in next period		
Did ss receive fine?	Cooperate	Defect	Did ss pay fine?	Cooperate	Defect
Yes	83.3	16.7	Yes	16.7	83.3
No	40.5	59.5	No	16.2	83.8

# Observer

## Observer's behavior in Dishonest Treatment

The observers learn not to request too much bribe across cycles.

