Autocracies, Lawlessness, and Corruption

Political Economy

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Goals

1. Political Institutions versus Economic Institutions

Institutions

- Economists have found the study of the role of institutions in economic development to be one of the most exciting research topics.
- Too bad it is very hard to understand what many talk about when they talk about *institutions* (or what policies really identify or affect these "institutions").
- So far, we have focused on political institutions. They are easier to pin down (usually some *de iure* guideline exists).
  - Some find them fundamental *(Persson and Tabellini 2004)*.
  - Others tend to consider the role of political institutions to be less relevant *(Mulligan and Tsui 2008)*.
  - Others downplay their role *(Glaeser et al. JOEG 2004)*.
- On the other hand, several studies have found that certain proxies for economic institutions perform well in explaining cross-country differences in income per capita *(Acemoglu, Johnson and Robinson, AER 2001, Easterly and Levine JME 2003, Rodrik, Subramanian, and Trebbi JOEG 2004)*.

A Model of Relation-Based Governance

1. Contract enforcement is an essential economic institution. We are going to study it in detail.
2. Developed countries often rely on external enforcement of contracts through specific institutions, such as the courts.
3. Developing societies, however, often rely on relation-based enforcement in the form of reciprocal interaction employed to solve prisoner-dilemma type of games where defection has a short-term gain that is offset by long-term relational value.
4. We explore the fundamental components of relation-based governance and we study its limitations.
5. Why do we observe that when the extent of trade increases, external enforcement replaces relation-based contract enforcement within a society?

Greif (AER 1994, 1997): Historical Example

The authors present evidence concerning the role of relation-based enforcement within a tight-knit group of Jewish long-distance traders in medieval Europe, the Maghribis. They operated in the Mediterranean trade.

The typical trade involved parties consigning goods to others to sell on its behalf. The tricky part was that each trader would also face different counterparties at different times.

A Maghribi trader in Palermo, Sicily, could sell his wool in Tanjer, Morocco, through another Maghribi trader stationed there, thus reducing his costs of transaction. But he needed to be sure the trader in Tanjer was reporting a price on the wool than was not lower than what he had actually received (keeping the difference for himself).

Multilateral group governance was necessary. An extremely accurate trading history of each member was kept and defecting behavior punished harshly by the whole coalition (no Maghribi would ever trade with you in the future if you cheated a Maghribi once).

Historical Example (cont.)

Greif defines a coalition:

> *"a non-anonymous organizational framework through which agency relations are established only among agents and merchants with a specific identity ('coalition members'). Relations among the coalition members are governed by an implicit contract which states that each coalition merchant will employ only member agents ... Moreover, all coalition merchants agree never to employ an agent who cheated while operating for a coalition member. Furthermore if an agent who was caught cheating operates as a merchant, coalition agents who cheated in their dealing with him will not be considered by other coalition members to have cheated."*

Historical Example (cont.)

Conversely, Genoese traders (from the port of Genoa, Italy) relied on bilateral transactions with an external formal enforcement structure.

They "ceased to use the ancient custom of entering contracts by a handshake and developed an extensive legal system for registering and enforcing contracts." The result: a court of (merchant and commercial) law.

When the extent of trade increased, Genoese merchants prospered, but the Maghribi failed. Multilateral punishment becomes an issue if the number of traders/the interaction of traders changes.

Why? The size of Maghribis' coalition/network became too small relative to the extent of trade opportunities.

Other Historical Examples

Dynamic incentives are shaped by different (more or less) formal institutions taking different shapes over time.

- Example: *Milgrom, North and Weingast (1990)* show how fairs in the Champagne region of France during in the Middle Ages were not just relevant as trading events, but where also characterized by the presence of private merchant courts which kept exact record of trading merchants behavior - this enabled exclusion of non-compliers.
- Example: *McMillan and Woodruff (1999)* present survey evidence from Vietnam to show how social and business networks provide information on reputation of trading partners before a trade.

Dixit (JPE 2003) Model: Setup

Traders are a continuum of mass 1, uniformly distributed over a circle of circumference $2S$.

S is the "size of the world". The distance between two traders, x, is measured by the shortest of the two arcs (clockwise or counterclockwise) which connects them. So the *maximum* distance possible between two traders/points is S.

Agents live two periods. The second period (the future) is necessary because the prospect of being punished in the future for current actions is what is going to be relevant in a relation-based contract.

In what follows, all payoffs are in present value.

Model: Trades

Each trader is randomly matched with another in each time period. Matches are independent across time.

Assumption 1: Independence - The actual match in period 1 does not affect the probability of matches in period 2. This exclude direct bilateral repeated interaction.

However, in a second we are going to introduce an informational transmission mechanism, so that others in the community may find out about the past cheating behavior of a trader they are facing.

There are going to be reputational concerns in this model and they will help sustain some honesty in trade.

Model: Matches

Random matching has a local bias. Traders are more likely to be matched with traders close to them than to traders further away.

The probability of a match between two parties in each period decreases exponentially with the distance, x, between them. The rate of decay is α.

Assumption 2: Localization of matches - There is one match in each period. For each trader the probability of meeting another trader at distance x is:

$$\frac{e^{-\alpha x}}{2[1-e^{-\alpha S}]/\alpha}$$

[Note: The denominator is just a normalizing factor to make sure the probabilities for every distance between 0 and S on either side of any trader sum up to 1.]

The higher α is, the more localized the technology, and the lower the chance of meeting somebody far away.

Gains from Trade

We assume that there is a gain from meeting distant traders: The further away your counterparty is, the more beneficial trading is.

Consider this a reduced-form representation of a comparative advantage argument.

Assumption 3: Gains from Trade - The payoffs from a match with a trader at distance x are proportional to:

$$e^{\theta x}$$

For convergence of expected values when S is large we will also assume that a $\alpha \geq \theta > 0$.

We will specify the payoffs from trading shortly.

Information Transmission

Consider the possibility that some information about other players' behavior is transmitted.

In particular, let us assume that if a player gets cheated in period 1, then he may communicate this information to his neighbors, they may pass it along to their neighbors, and so on...

The probability that a third person located at a distance y from the victim of this cheating is assumed to be exponential with a rate of decay β.

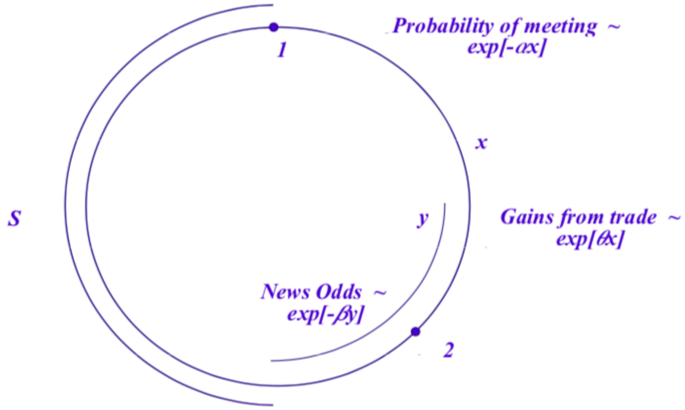
Assumption 4: Localized Information - If a trader in a match cheats, the probability that a third person at distance y from his victim receives news about the cheating is:

$$e^{-\beta y}$$

The assumption of localized information makes a lot of sense and creates some incentive for honesty:

- If you cheat somebody, chances are people around him will know. They will thus avoid trading with you in the future, given your bad reputation.

Representation



Player types

There are two types of players. Normal players (N) and Bernie Madoff-type players (M, extremely skillful cheaters).

The M players are very few, just a tiny positive fraction ϵ. Type is not observable.

We use the Madoff players as a way of pinning down expectations out of equilibrium.

According to assumptions 1 and 2, independent and identically distributed random matches are made to determine trading pairs in each period.

- Trading history becomes available in Period 2 according to assumption 4.

Distance x is observable.

Timing of the Game

1. Nature determines pairs of traders (random matching).
2. Each trader decides whether to play. This choice is simultaneous. The outside option from not playing is normalized to 0. If they play, they follow what is below.
3. When two N-types meet in period t, the game has payoff matrix $exp[\theta x]$ times:

		Trader N2	
		Comply	Deviate
Trader N1	Comply	C_t, C_t	L_t, W_t
	Deviate	W_t, L_t	D_t, D_t

4. If a M-type meets an N-type, the N-type gets $L_t$regardless of his action and the M-type gets a positive payoff. When two M-types meet in period t, they both get a positive payoff.

Assumptions About Payoffs

- The stage game between two N-players is a prisoner dilemma, so: $W_t > C_t > D_t > L_t$
- A N-type player will play instead of sitting out against a random opponent even if the latter is going to cheat, but he will prefer to sit out if he is playing against a known Madoff, so:

$$\epsilon L_t + (1-\epsilon) D_t > 0 > L_t$$

- In a distanceless world, if cheating is detected and publicized with certainty, then there exists an equilibrium where all N-types comply in period 1. An N-type player will not have the incentive to cheat because the gain at time 1 ($W_1 - C_1$) is lower than the loss at time 2 (your counter-part will not play, leaving you with 0, instead of D_2 when playing).

$$(1-\epsilon)(W_1 - C_1) < (1-\epsilon)(D_2 - 0) \text{ } i.e. \text{ } (W_1 - C_1) < D_2$$

Equilibrium

Equilibrium concept: Perfect Bayesian Equilibrium.

This can be characterized by an equilibrium where there is a distance X below which the trader **Complies** and above which the trader **Deviates** (i.e. cheats).

Specifically we are going to focus on these "candidate" equilibrium strategies:

1. In period 1, the N-type plays and plays Deviate only if the other trader is at a distance above X. Otherwise, **Comply**.
2. In period 2, if you have received information that your current match produced a payoff of L_1 to his previous match (i.e. period 1 match), do not play. Otherwise, play and choose **Deviate**.

Note: the M player is really not important as they always play. **So focus on the** N **player**.

Solution

- In period 1 there are expected positive payoffs for everybody by assumption a). So everybody plays.
- In period 1, if the partner is located further than X away from you, his strategy dictates he will play Deviate. Your best response is Deviate as well and since you will induce a payoff D_1 to him (not L_1), you are not losing reputation in period 2.

Solution (cont.)

- It is clear that in period 2 if you meet somebody who produced a payoff L_1 to his counterparty in period 1 you'll think it's Bernie Madoff.
  - This is important because allows to have cheating in equilibrium and pins down beliefs when cheating is observed.
  - Without this assumption on M-types, you should not observe cheating in equilibrium and out-of-equilibrium responses to cheating could only be set arbitrarily.
  - Of course, the M-types should not be too many to keep trading attractive.
- In period 2, if you do not have information about your partner you have a dominant strategy: Play and Deviate (it's your last period –no further punishment).

Solution (cont.)

There are simple conditions under which it is optimal to play 'Comply' if the trading partner in period 1 is at a distance less than X.

You have to compare the short-term benefit from cheating in period 1:

$$(1-\epsilon)(W_1 - C_1)exp[\theta X]$$

With the cost of not being able to play next period. Since your trading partner is following the equilibrium strategy and duly playing 'Comply' you are going to inflict L_1 on him with your deviation, and be marked as an M. You will then get zero and forego:

$$D_2 exp[\theta z]$$

which of course you'll need to integrate over all possible potential partners z. The expression for the expected cost is a bit boring and not informative, but in essence tells you that a range of X exists.

Intuition

In this game localization of information and communication leads to a localization of honesty.

The equilibria of the game are characterized by this extent of honesty X, so that honesty can be sustained only with people close to you.

The intuition is that *cheating becomes more attractive the more distant the partner* is because:

- You are *less likely* to meet people close to a more distant partner in period 2 (those who know what you did).
- The *short-term gains from cheating are very large for distant partners* (recall that the payoffs get multiplied by $exp[\theta x]$).

There is also the cost of potentially losing very valuable matches in period 2, but the assumption of $\alpha \geq \theta$ assures this loss is not too large.

Multiplicity of Equilibria

Note: in this game there are several X supported by appropriate expectations, and as is common in this type of settings, multiple equilibria will arise.

The reason for this is that if I believe everybody is expecting to only Comply to their close neighbors $x < X$, I am **not** going to Comply to somebody who is **not** my close neighbor.

There is a range $0 < X < X(S)$ with $X(S)$ function of the size of the circle, for which every X can be an equilibrium.

We are going to focus on the equilibrium which gives the best shot to relation-based contracts, $X(S)$.

$X(S)$ is the maximum distance at which honest trade can be sustained as an equilibrium in this world. The extent of honesty.

When is it possible to live in a honest world?

When is it possible to have honesty over the full circle? That is, $X(S) = S$.

This is an important question, because it tells you when the social gains from honest trade are going to be fully appropriated.

Let's start to compute the gains from honest trade for given X and S.

When is it possible to live in a honest world? (cont.)

The size of the gain is going to be given by the probability that a trader is matched with another trader within the extent of honesty X *multiplied* by the excess payoff from mutual compliance relative to mutual defection (this latter factor is a constant by assumption so we can forget about it):

$$V(X,S) = \frac{\alpha}{2(1-e^{-\alpha S})} 2 \int_0^X e^{-\alpha z} e^{\theta z} dz$$

$$= \frac{\alpha}{(\alpha-\theta)} \frac{1-e^{(\theta-\alpha)X}}{1-e^{-\alpha S}}$$

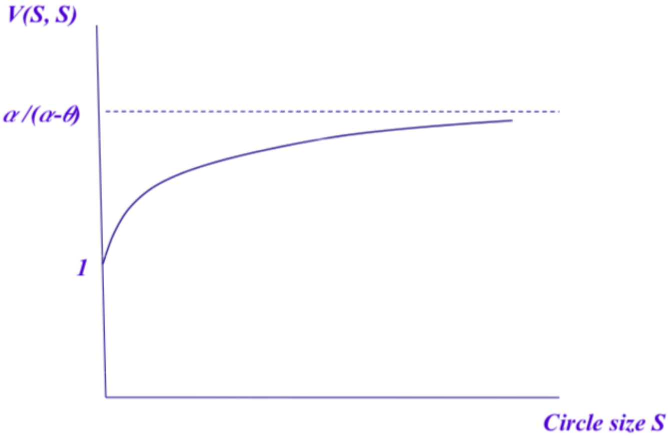
Benefits of sustaining honest trade

The benefits for $X(S) = S$ are then:

$$V(S, S) = \frac{\alpha}{(\alpha-\theta)} \frac{1-e^{(\theta-\alpha)S}}{1-e^{-\alpha S}}$$

Here our assumptions that $\alpha \geq \theta > 0$ appear relevant to get the benefit of honesty to increase with the size of the world and to have convergence to finite values.

The benefits of sustaining honesty over larger circles



The Limits of Honest Trade

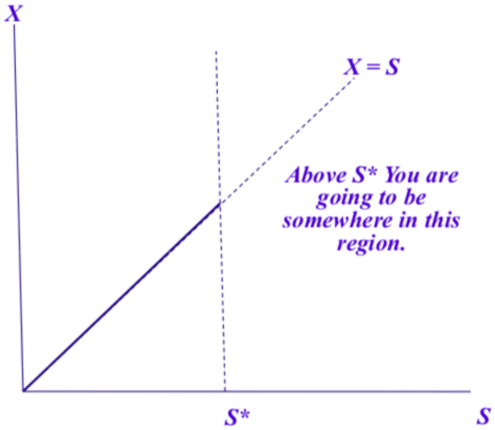
There is localization of information and matches: If the world becomes large enough at a certain point it will no longer be possible to sustain honesty over the full circle.

Just like the Maghribi could not cope with the increase in pre-modern trade and their relation-based system collapsed, in this model there are going to be circles too large to support honest trade over their whole circumference $2S$.

Intuition: If the world is large enough, there are going to be people so far away that cheating them is just *too good an opportunity.*

Proposition: There exists a unique positive S^* such that $X(S) = S$ for $0 \leq S \leq S^*$ and $X(S) < S$ for $S > S^*$.

Honesty X(S) as a function of the size of the world S



Other effects

The model is rigged to deliver this, so it makes sense.

For a given communication technology β , increasing the size of the world more and more will stretch the extent of honesty so much that it will eventually break down and people will start cheating.

Also intuitively, the better the communication technology, the lower the rate of decay of information about cheaters β, the higher the sustainable S^* .

A Surprising Result

So far the model has delivered interesting results, but this one is the most intriguing:

Proposition: For sizes S above S^*, the extent of honesty $X(S)$ can decrease with size S.

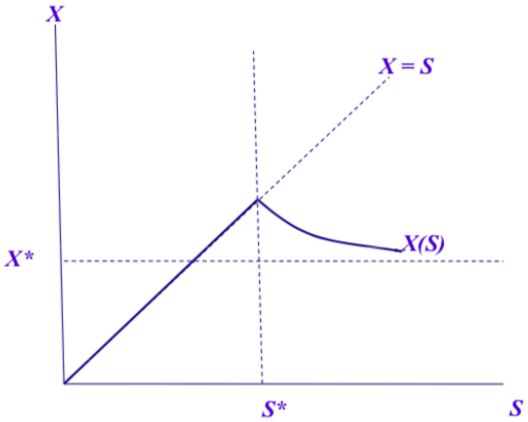
Note: this results holds if β is larger than θ, so it is **parameter-dependent**.

- Note however that the range of parameters delivering this result is the most realistic one.

So, in general, not only can you not sustain honesty over the full circle for size above S^*, but as the world grows larger, the extent of over which you can sustain honesty **will decreases with** S!

The larger the circle, the more difficult is to sustain honesty. Actually, honesty may be much lower in a large world than in a small world.

Honesty X(S) as a function of the size of the world S



A Surprising Result: Intuition

Suppose in a world of size S^* you take the furthest trader from you (the trader at distance S^* that is).

Since S^* is the critical point, you are indifferent between cheating and complying.

Now suppose you add one trader to his left (trader A) and one to his right (trader B)

- *I know traders have no mass but bear with me in this analogy and think of it as widening the world by a tiny bit.*

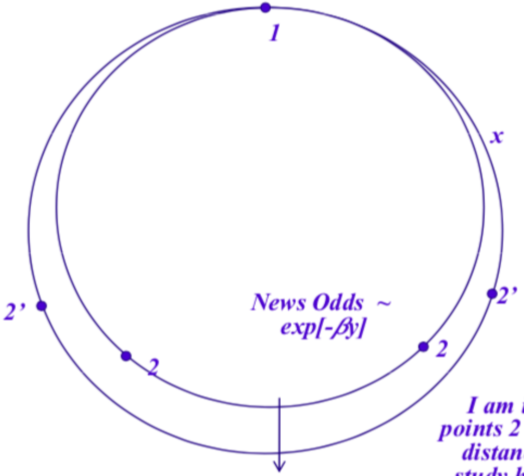
Your original partner is now at distance $\epsilon + S^* > S^*$ while A and B are both precisely at distance S^*

A Surprising Result: Intuition (cont.)

Suppose you cheat somebody at distance S^* , say A, what is the chance B will know it?

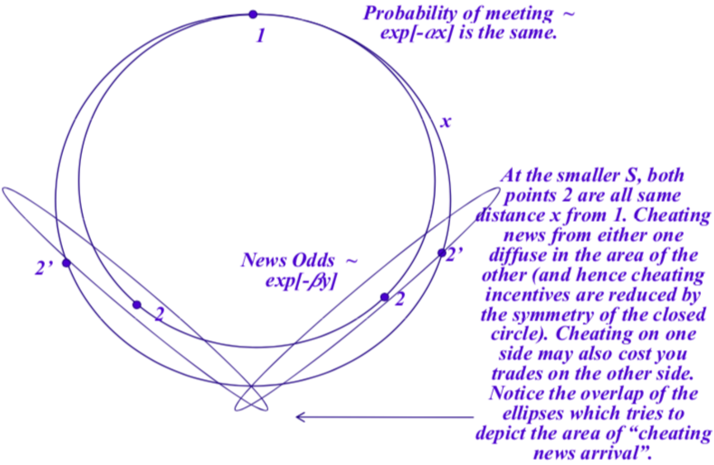
- Well, there is a good chance, but it's less than 1 $(= e^{-\beta 2\epsilon})$!
- But before the increase, anybody at distance S^* from you would have known that you had cheated with probability $1 = e^{-\beta 0}$.
- After the increase, the cost of cheating a trader at distance S^* has gone down.
- In a larger world, people at the same distance become easier to cheat.

A Surprising Result: Intuition (cont.)

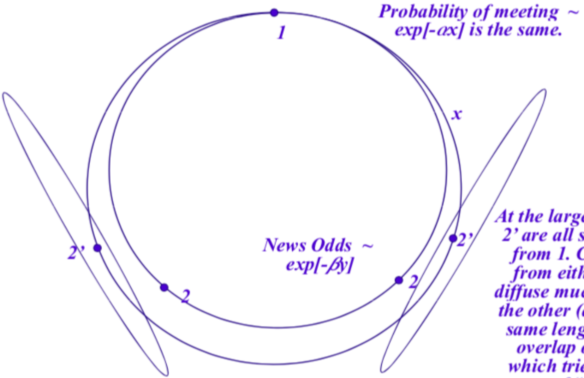


I am increasing S, but points 2 and 2' are all same distance x from 1. Let's study how cheating news diffuse (and hence cheating incentives).

A Surprising Result: Intuition (cont.)



A Surprising Result: Intuition (cont.)



At the larger S, both points 2' are all same distance x from 1. Cheating news from either one do not diffuse much in the area of the other (all ellipses have same length). Notice the overlap of the ellipses which tries to depict the area of "cheating news arrival" is now gone.

Honesty X(S) as a function of the size of the world S

Under some parametric assumptions, the decreasing function $X(S)$ asymptotes to a positive number X^* (otherwise it will asymptote to zero, which is paradoxical but possible in this model: in a large world there is no honesty).

In a sense, this value $X^*(\infty)$is *"the extent of honesty in a large world"*.

The larger the circle the more difficult is to sustain honesty - actually, honesty may be much lower than in a small world.

Dixit (2003) shows how the main thrust of the paper goes true in more general setting and assumptions like uniformity or the simple circular function do not drive the results (more or less).

External Enforcement

Consider now the case of introducing formal and external enforcement of trades. Cheating gets punished for sure in a system with a functioning rule of law.

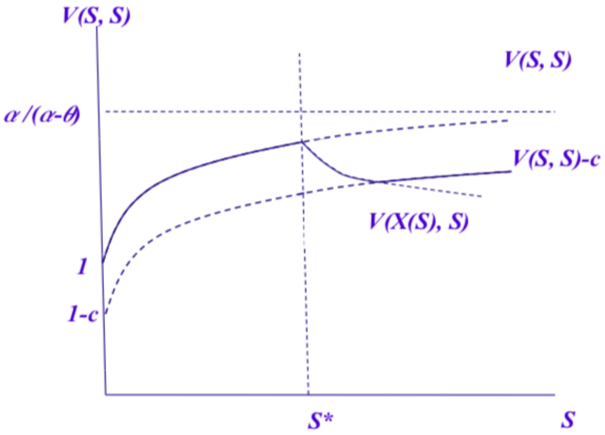
However, such formal enforcement mechanisms are costly. Sometimes huge fixed costs have to be paid to get them working.

Assume there's a technology allowing to detect cheating over the whole circle, but at a cost.

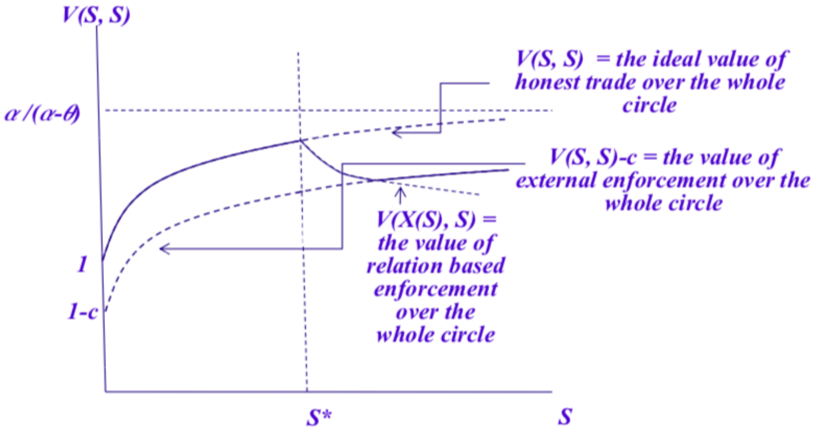
- The external enforcement is financed by levying a lump-sum charge c on each trader and full-circle honesty will be sustainable at any size S.
- Now the payoff for each trader will be $V(S,S) - c$.

How does the external enforcement system compare to the self-enforcement relation-based system?

Benefits of sustaining honesty over larger circles V(S,S)



Benefits of sustaining honesty over larger circles V(S,S)



External enforcement (cont.)

Notice that self-enforcement is globally effective for $S < S^*$ and saves the detection cost c.

Communities of intermediate size fare the worse as they are *too large for full honesty* but *not large enough to justify the investment into the external enforcement technology*.

"Darkest just before dawn"

Sufficiently large societies will be able to efficiently sustain honesty through the external enforcement mechanism. Asymptotically they will get $V(\infty, \infty) - c$

Notice that, depending on the parameters, the payoffs from external enforcement may or may not climb back up to $V(S^*, S^*)$.

- If they do not, it would be efficient to split the country in smaller units over which full honesty can be sustained in a relation-based fashion.

Conclusions so far

- Political institutions aside, we consider the role of economic institutions (rule of law, contract enforcement, etc.)
- The role of relation-based contract enforcement is investigated vis-à-vis external enforcement.
- Formalization presented: Very tractable model by *Dixit (JPE 2003)*.
- Next: Expropriation risk.

Protection of Property Rights

- So far we have focused on contract enforcement.
- Another important economic institution is property right protection: the possibility of gaining from investment by staking a claim on what is own.
- Expropriation risk is one of the main indicators employed in the empirical study of institutions *(Acemoglu, Johnson, and Robinson [2001])*.
  - Interestingly enough, economists started using cross-section studies measures that were initially sold by research companies either to potential investors (for FDI's) in the West or to financial intermediaries interested in pricing sovereign debt default risks
  - The **Economist Intelligence Unit**, for instance, produces the *International Country Risk Guide*.

See Dixit ch. 5

Threats to Private Property

These threats come from two broad classes of predators:

1. Other individual citizens who could steal, occupy, or damage the property;
2. The State or its agents may engage in expropriation or extortion.
    - *See Shleifer and Vishny (QJE 1993, 1998)*, *Frye and Shleifer (AER 1997)*, *Besley and Prat (AER 2006)*.

Protection of Private Property

Protection xomes from three broad classes of security providers:

1. The State or its agents may provide protection;
2. Private protection by self;
3. Private protection by non-government external providers (private security, mafia, mercenaries).

Usually, 2 and 3 will play a role if the government underprovides security of property rights.

- See *Gambetta (1993), Bandiera (2002)* on the origins of the Sicilian Mafia.

Bandits

- Understanding the incentives of protectors and expropriators in a productive system is particularly important.
- A very important distinction with respect to expropriation is: **a.** the time horizon; **b.** the organization of the expropriators.
- Organized and stable expropriators – think of a dictator in a stable autocracy – will take growth-enhancing policies, since they are going to appropriate the rents in the future. *Olson (1993)* calls them the *stationary bandits*.
- Disorganized and unstable expropriators – think of a warlord in an unstable region – will take fully expropriatory and growth-diminishing policies since they are not going to be there in the future. *Olson (1993)* calls them the *roving bandits*.
- *Shleifer and Vishny (QJE 1993)* apply the same insight to the political organization of corruption.
    - African roving bandits **vs** stable corruption in Indonesia under Suharto (in power from 1967-2008) , or the USSR.

Bandits (cont.)

- A stationary bandit expects to prey on his victims for a long time. This will imply that his incentives will be (possibly just slightly) less distortionary than a roving bandit's.
- A stationary bandit will probably try to maintain a reputation for leaving some of the fruits of his prey's investment in his hands. Again, short-term versus long-term benefit equalization will determine what are the credible incentive compatibility constraints of such a bandit.
  - *See Myerson (2008).*
- An economy ruled by a stationary bandit will usually perform better than one under a roving bandit.
- In general, disorganization of the bandits will produce larger distortions in behavior. Let's look at some...

Expropriation under Anarchy

- *Herschel Grossman (1995), Hirshleifer (2001)* model of predation.
- Consider a simple economy model of two participants.
- Each agent controls a unit of resources.
- i's resources can be used for production P_i, defense against aggressors D_i, and aggression of others to expropriate them A_i.
- Resource constraint: $P_i + D_i + A_i \leq 1$

Expropriation under Anarchy (cont.)

Production takes place with a decreasing returns technology P_i^a with $0 < a < 1$. So, the smaller a, the faster decreasing returns set in.

Output has to be defended to be kept.

Defensive efforts D_i are going to be pitted against the counterparty's offensive efforts A_{-i}

The probability that the initial producer keeps the output is assumed to be:

$$D_i^b/(D_i^b + \theta A_{-i}^b)$$

With $0 < b < 1$. This is a logistic function, a typical assumption in conflict models. The smaller b, the faster decreasing returns in fighting set in. Note that θ is a parameter for how more effective defense is relative to offense.

Payoffs

The Payoff of player 1 is:

$$\Pi_1 = P_1^a * D_1^b/(D_1^b + \theta A_2^b) + P_2^a * \theta A_1^b/(\theta A_1^b + D_2^b)$$

The Payoff of player 2 is:

$$\Pi_2 = P_2^a * D_2^b/(D_2^b + \theta A_1^b) + P_1^a * \theta A_2^b/(\theta A_2^b + D_1^b)$$

Symmetric Equilibrium

- The unique symmetric Nash equilibrium of this game can be found by checking the reaction functions.
- [Try to do the algebra as an exercise before checking out the appendix of *Dixit ch. 5* where they are spelled out.]

Equilibrium solution:

$$P_1 = P_2 = a/(a + 2b\psi)$$

$$D_1 = D_2 = A_1 = A_2 = b\psi/(a + 2b\psi)$$

where $\psi = \theta/(1+\theta)$

Symmetric Equilibrium (cont.)

- Each player has the temptation of being aggressive, so the other will need to engage in defensive expenses to counter such aggression.
- **The equilibrium is highly inefficient.**
- If the two players could commit to cooperate and not arm themselves, they could get the efficient output of $P_1 = P_2 = 1$.
- That would not be a spot-game Nash equilibrium because this game is a prisoner's dilemma: Arming up is a dominant strategy when the counterparty is defenseless.

Symmetric Equilibrium (cont.)

Notice that the productive use of resources P increases:

- If a increases (diminishing returns in production set in later);
- If b decreases (diminishing returns in fighting set in earlier);
- If θ decreases, that is the technology of fighting favors defense over offense.

Predation

- We have seen a simple model where inefficiencies arise naturally in anarchy.
- Resources are wasted to prevent predation.
- Now we continue with a model of protection from predation where alternatives to private protection are analyzed.
- *Anderson and Bandiera (JDE 2005)*: Private enforcement.
  - *See Dixit ch. 5*

Protection from Predation: Setup

The world is again a circle of length 1. On this circle, there is a uniform mass of owners.

At each location on the circle there is a continuum of properties indexed by $\alpha \epsilon [0, 1]$

The value of property α is $V(\alpha)$ and properties are arranged by decreasing value so $V'(\alpha) < 0$.

There are n **specialized protectors**. We will focus on symmetric equilibria with each protector covering an equal share $1/n$ of the circle. n will be determined endogenously in the model.

There are B bandits and they will spread equally on the circle, so each protector is up against B/n of them.

Property values are unknown to bandits and protectors.

Protection from Predation

Individuals may self-protect at no cost (say trying to hide their goods) or hire protectors. In this one-shot game, protectors do not know property values - so, they cannot price discriminate.

Bandits do not observe property values, but they do observe the endogenous form of protection that owners employ.

- Since an owner with a more valuable piece of property will be more likely to employ private protection, this will signal something about value to bandits.

An endogenous fraction λ of the bandits will go after property that is under specialized protection and $(1-\lambda)$ will go after self-protected property. So, the mass of bandits going after self-protected property in a segment of length $1/n$ is $B(1-\lambda)/n$

Notice that in this model owners, bandits, and protectors come from three exogenously separate populations. In reality, you may think about making such choice endogenous in a single population (a career choice: it'd be a cool extension).

Protection Odds

The probability that the owner keeps the property is assumed to be different depending whether he is self-protecting or hiring protectors.

The probability that the owner keeps the property if self-protecting is π^S.

The probability that the owner keeps the property if hiring protectors is π^P.

For both probabilities, the odds are assumed proportional to the relative number of people involved in the predatory and defensive activities (a logistic assumption just like in our previous model).

Of course, entry is endogenous, so we need some more structure before defining π^S and π^P.

- *We will derive them in a second.*

Protectors

The protector operating in each of the n segments sets his own price p.

Since protectors do not observe property values $V(\alpha)$ they will set a uniform price.

Clearly this result hinges on the fact that protectors do not operate dynamically - no learning the value of properties over time. There are no other dimensions of protection (say, quality) along which to price-discriminate.

The value of protection has to be equalized to its cost to find the marginal buyer:

$$(\pi^P - \pi^S)V(\alpha) = p$$

So, owners of properties $[0, \alpha]$ will hire protection and $(\alpha, 1)$ will not.

Protectors (cont.)

Each protector is a monopolist in his own area $1/n$.

This is a reduced-form representation of a game where protectors have a capability of enforcement which diminishes with distance or their costs increase with distance.

Let us assume that in order to open shop the protector incurs a **fixed cost** $f > 0$.

This will be useful when later we consider a collusive provider of protection as the mafia.

Protectors (cont.)

The profit maximization decision of the protector: maximizing profits w.r.t α

$$p * (\alpha/n) - f = (\pi^P - \pi^S) V(\alpha) * (\alpha/n) - f$$

with **FOC**:

$$[V(\alpha) + \alpha V'(\alpha)] = 0 \tag{1}$$

Which fixes the equilibrium fraction of properties served α^*.

Note: that even if the protector doesn't observe the value of the property & can't price discriminate the infra-marginal owners, he can still set its supply of protection. He sets the equilibrium fraction of agents served $[0, a^*)$ to the point that maximizes profits.

Now we can state the odds of keeping the property. Everyone acts as a "probability taker" (too small to change the odds).

Under self-protection:

$$\pi^S = \frac{(1-\alpha)/n}{(1-\alpha)/n + \theta B(1-\lambda)/n} \tag{2}$$

Where:

- θ is a parameter for how much more effective defense is relative to offense.
- $(1-\alpha)$ is the number of self-protecting agents in the area
- $\theta B(1-\lambda)/n$ is the share of bandits in the area

Protection Odds (cont.)

Now we can state the odds of keeping the property. Everyone acts as a "probability taker" (too small to change the odds).

Under private protection:

$$\pi^P = \frac{R}{R + \theta B \lambda / n} \tag{3}$$

Where:

- R is a parameter for R is a parameter for how more effective (i.e. tough) a private protector is.
- $\theta B \lambda / n$ is the share of bandits in the area

Notes on Protection Odds

Vis-à-vis an equal number of bandits attacking them:

A. Protection success for the self-protecting is basically driven by the number of self- protecting. So, if they are many of them it is relatively more difficult for the bandits to rob them:

- Because they play hide-and-seek so each individual has a lower probability of being picked OR;
- Because they have some sort of neighborhood-watch type of system that can use to alert each other of predation attempts).

B. Protection success for the privately protected depends on the strength of the protector, R.

Bandits' choices

The model allows for free entry of bandits B (people who already made the occupational choice of being bandits).

Consider a bandit already committed to enter the market. Since a bandit can observe the type of protection used, he can tell in what range of values the property is (but does not know its exact value).

He will divide its attention equally between properties that are self-protected $(a^* < a)$ and those which are privately guarded $(a^* > a)$.

In equilibrium the expected values of different predation types equalize:

$$(1-\pi^S)\int_{\alpha^*}^{1} V(\alpha)d\alpha = (1-\pi^P)\int_{0}^{\alpha^*} V(\alpha)d\alpha = V^B \tag{4}$$

Bandits' choices (cont.)

Assume that bandits belong to a population of size 1 and have an outside option. We assume the bandits have outside options distributed uniformly on $[0, w]$.

The share of bandits B becoming active predators is going to be given by those with outside option less or equal to the expected value of predation, given in (3):

$$B = \int_0^{V^B} \frac{1}{w} dx$$

That is $Bw = V^B$, so:

$$Bw(1-\pi^S)\int_{\alpha^*}^{1} V(\alpha)d\alpha = (1-\pi^P)\int_0^{\alpha^*} V(\alpha)d\alpha = V^B \qquad (5)$$

Equilibrium

An equilibrium of this game will be determined by a vector $(\alpha^*, B, \lambda, n, \pi^S, \pi P)$ such as:

1. All owners optimally decide whether to self-protect or hire protectors;
2. Protectors maximize their profits;
3. Predators maximize their profits.

Equilibrium with Free Entry of Protectors

The equilibrium vector $(\alpha^*, B, \lambda, n, \pi^S, \pi P)$ will be determined by the solution of the system of equations (**1**)-(**5**) plus an additional condition that is determined by the market structure of protection.

Let us start from the simplest case where there is free entry by protectors in this market so a zero-profit condition will enable us to close the model.

The zero profit condition is:

$$(\pi^P - \pi^{S)} V(\alpha) * (\alpha/n) – f = 0 \tag{6}$$

Which is basically what pins down n in equilibrium. The problem can be solved numerically, but not in closed-form.

Equilibrium with a Collusive Mafia

Some of you may think the disorganized set of protectors which underpins the previous equilibrium is not realistic.

Anderson and Bandiera also solve the case of a collusive Mafia that organizes entry of protectors - it recognizes the impact that the number of protectors has on the probability of success of self and private protection. Particularly, think of the Mafia choosing n to maximize aggregate profits:

$$max_n\{n * (\pi^P(n) - \pi^S(n))V(\alpha) * (\alpha/n) - nf\} \tag{7}$$

Notice that B and λ are still taken as given by the Mafia (as if it were playing Nash simultaneously against the bandits).

Note: Dixit highlights this as not being very realistic (probably the Mafia also directs the bandits).

Comparison: Free-entry, Mafia, & Other considerations

Anderson and Bandiera also show that a disorganized set of protectors with free entry will induce a higher n than a collusive Mafia that organizes entry.

The argument is the usual: a monopolist restricts entry to be able to charge higher prices.

Of course, how protectors deter entry is not clear. Especially because the protectors here are the "good guys".

Possibly, the fixed cost f for individuals is higher than that for an organized operator (increasing returns).

It also remains to be shown how reputational incentives may help maintaining the protectors honest.

Comments

- **Interesting externality**: If somebody buys protection, the predators will start targeting others, wo will at that point will *also* need to buy more protection.
- The model also points out that the ones suffering more from this externality are the agents with lower value of their properties (the poor), an empirically relevant feature.
- We get some insight on the industrial organization of the protection industry (*Gambetta, 1993*).

Conclusions

- A brief set of interesting formalizations of economic institutions (relational enforcement and property rights protection) to give content to an often ambiguous concept.
- Focused on:
  - Relation-based vs. formal contract enforcement;
  - Organized or unorganized Property Rights Protection
- Of course, this is just a glimpse in an area of very wide and still open questions (both theoretical and empirical).
- What we should take home is how to complement our understanding of de jure institutions versus informal or de facto institutions by focusing on "difficult to formalize" de facto economic institutions.

Bonus Material: An Interesting Application

The Dixit (2003) model is employed by David Baron (AER 2010) work on 'Morally Motivated Self-Regulation'.

Private provision of public goods is something widely diffused in society. Civic behavior is for instance identified by *Putnam (1993) 'Making Democracy Work'* as an essential explanatory variable of differential economic outcomes across Italian regions.

A large strand of papers in political economy have been trying to investigate altruism and civic behavior.

Once again, we are dealing with social and institutional features that are difficult to measure and to conceptualize theoretically.

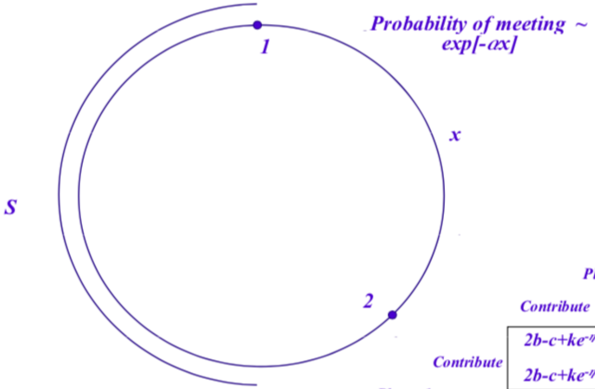
Self-Regulation

Baron defines **Self-Regulation** as:

> *"The noncontractable voluntary provision of a public good or private redistribution of wealth. For individuals, self-regulation may involve the mitigation of an environmental externality, a contribution to a community project, or the purchase of products produced in factories with good working conditions"*

Contributing is assumed to have a cost $c > 0$ and provides benefits $b \geq 0$ to the contributor and to a counterparty. Also, assume there are free riding incentives, that is privately contributing is not optimal $c > b$.

People are matched in pairs in a one-shot self-regulation game (described below) so the aggregate benefits from the public good accruing to each when they both contribute are $2b$.



		Player 2: Contribute	Player 2: Free Ride
Player 1	Contribute	$2b-c+ke^{-\eta x}$ $2b-c+ke^{-\eta x}$	$b-c+\rho k e^{-\eta x}$ b
	Free Ride	b $b-c+\rho k e^{-\eta x}$	0 0

Moral Preferences and Altruism

- Altruism can be **generalized** or **limited**.
  - Generalized altruism is independent of the characteristics, e.g., the socioeconomic distance of one's matched partner.
  - Limited altruism depends on the socioeconomic distance x.
- Altruistic preferences also may be independent of the action of the matched partner (unconditional) or depend on the counterparty's action, i.e. reciprocal (conditional).

Moral Preferences and Altruism (cont.)

Altruistic preferences are represented by the component: $\rho k e^{-\eta x}$

Where:

- $\rho \in [0, 1]$ is the degree of reciprocity with $\rho = 1$ being unconditional altruism (you are happy to contribute no matter what your match does)
- Perfect reciprocity by $\rho = 0$ [the citizen cares about the match partner only if s/he contributes], or something in between.
- η represents the degree of limited morality with $\eta = 0$ corresponding to generalized altruism (you care about everybody no matter how far away/different from you the match is)
- $\eta \to \infty$ corresponds to no altruism (you do not care about the others even if they are very close to you).
- $k > 0$ reflects the size of the benefits to others.

Moral Preferences and Altruism (cont.)

	Generalized	*Limited*
Unconditional	k	$ke^{-\eta x}$
Reciprocal	ρk	$\rho ke^{-\eta x}$

Timing of the Game

1. Nature first draws a match for each citizen (based on exponentially decaying probabilities).
2. The matched pairs simultaneously choose their actions.
3. Payoffs are realized.

Note: the game is played only once, to rig the model to the case in which the chances of self- regulation are the worse.

Strategies

A strategy σ is a mapping from the match distance x to the action set $\{C, N\}$, where C denotes contributing and Ndenotes free riding.

Reciprocity pertains to actions, so a citizen must have beliefs about whether her trading partner will contribute:

So, let $\delta = \delta(x)$ denote the probability that the partner at a match distance x plays C.

Strategies (cont.)

If a citizen contributes/self-regulates, her expected utility EUC is:

$$EUC = \delta(2b - c + ke^{-\eta x}) + (1-\delta)(b - c + \rho k e^{-\eta x}) \qquad (1)$$
$$= (1+\delta)b - c + (\delta + \rho(1-\delta))ke^{-\eta x}$$

If the citizen does **not** contribute, her expected utility EUN is:

$$EUN = \delta b \qquad (2)$$

Self-Regulation Equilibria

With unconditional altruism $\rho = 1$, the game exhibits strategic neutrality and has a dominant strategy equilibrium. For instance, for $b - c + k > 0$ two players at the same locations play $\{C, C\}$ and it's the dominant strategy equilibrium.

[Instead $\{N, N\}$ will be the equilibrium for pairs sufficiently far away.]

With reciprocal altruism $(\rho < 1)$ the self-regulation game has strategic complements and is a coordination game. For $b - c + k > 0$, two players at the same locations play $\{C, C\}$ *only* if $\delta = \delta(0)$ is sufficiently large to give a positive EUC-EUN difference:

$$b - c + (\delta + \rho(1 - \delta))k > 0$$

Self-Regulation Equilibria (cont.)

The expected value of playing C is given by the difference:

$$EUC - EUN : b - c + (\delta + \rho(1-\delta))ke^{-\eta x} > 0$$

By equating to 0 and analogously to the *Dixit (2003)* suggested equilibrium, we can find the scope of self-regulation of this game (a threshold below which C is played in equilibrium) as:

$$X(\delta;\rho) = 0 \qquad \text{if } (\delta + \rho(1-\delta))k \leq c-b$$

$$X(\delta;\rho) = 1/\eta * \ln(k(\delta + \rho(1-\delta))/(c-b)) \qquad \text{if } (\delta + \rho(1-\delta))k > c-b$$

Self-Regulation Equilibria (cont.)

Proposition 1 (Baron, 2010):

With unconditional moral preferences or with reciprocal altruism and the Pareto dominant equilibrium, self-regulation $\{C, C\}$ results only for matches with $x \in [0, X]$, where $X = X(1, \rho) = X(\delta, 1)$.

The scope of self-regulation and the expected utility EU* of citizens are:

- Increasing in the quality of self-regulation ($b - c$, or how high are the benefits relative to the costs)
- Increasing in the strength of moral preferences (lower η or how much you care about others that are different from you).

The expected utility is increasing in α and decreasing in S.

How to Mitigate Free-Riding

Baron (2010) further shows that within the model:

1. Social label and certification organizations can expand the scope of self regulation, but not beyond that with unconditional altruism $(\rho = 1)$.
   - Examples: Social label organizations that identify products meeting specific environmental standards; Organizations that certify working conditions in the factories of suppliers (e.g. the Fair Labor Association (FLA) formed by NGOs and firms in the apparel and footwear industries provides for inspections of working conditions in factories and makes public the results); Fair trade labels, etc.
2. Enforcement organizations (such as assurance organizations that directly punish participants who break their promise not to free ride) expand the scope of self- regulation farther, and for-profit enforcement is more aggressive than nonprofit enforcement.
3. Enforcement through social pressure imposed by NGOs also expands the scope of self-regulation.