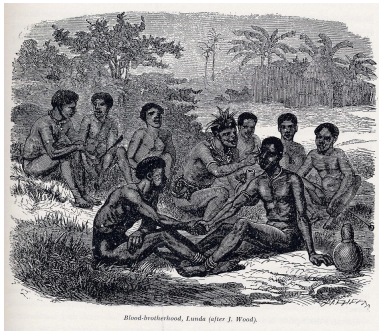
Prehistoric Finance



CSSS Santa Fe—June 17, 2008

Dan Hruschka
Santa Fe Institute

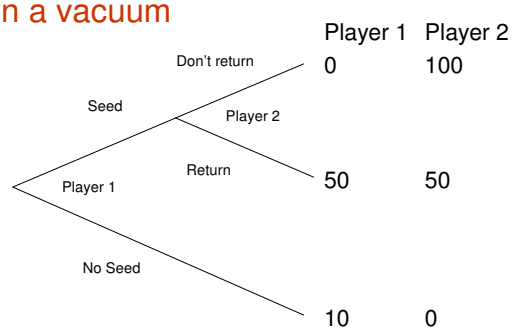
Market and bus-stop, Lagos, Nigeria

Financial Progress

- "Financial progress is about learning to deal with strangers in more complex ways. The village moneylender, limited by his need to know those he did business with, was gradually superseded by ever-broader impersonal markets that can cheaply mobilise colossal sums and sell more complex products. The remarkable thing is not that finance suffers from booms and busts, but that it works at all. People who would not dream of lending £1,000 to that nice family three doors down routinely hand over their life savings to strangers in a South Korean *chaebol* or an Atlantan start-up. It all depends on trust." Economist, 2008

One of the most amazing aspects of modern markets is that we can engage in transactions (buying, selling, saving, investment) with complete strangers with good certainty that it will work as expected.

Anonymous interaction in a vacuum



Case Study
Traders in Sub-saharan Africa

- Actors rarely have valuable assets that could be seized to service a judgment
- Assuming faulty party could be forced to pay, the size of transactions is often too small to justify court action anyway (cost of lawyer, time lost)

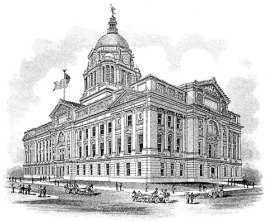
(Fafchamps 2001)

More examples

- **Non-spot transactions:** Ebay
  - Non-delivery of goods
  - Late payment
  - Deficient quality
- **Commodities of unknowable quality:** Tuna markets (Feldman 2006)
- **Risk and Labor sharing:**
  - Fair-weather friends

Ways of circumventing the problem

- Money
- Effective legal and court system
- Reputation system: better business bureau



6. Symbolic Medium of Exchange
2. Crimes against person or property punished by specialist
5. Full-time specialized priest
4. Formal and full-time specialized teacher
3. Full-time bureaucrats unrelated to government head
8. Written language

Freeman and Winch 1957

Society	Rate per 100,000 p-y
US (1980)	10.7
Kent, England (13th century	15.1
!Kung (1920-55)	41.9
Yanomamo (1970-74	165.9
Mexican village (1961-65)	251.2
Agta (1977-84	326.0
Murngin (1906-1926)	330.0
Goilala (1896-1946)	533.0
Gebusi (1940-1962)	683.0
Hewa (1959-1968)	778.0

Knauft 1987, Wrangham et al. 2006

Points

- There are many ways that people have made exchanges separated over time and space without markets and money
- Try to understand how these systems are self-enforcing
- Examine case of risk-sharing partnership
- Dilemma created by a good thing

Exchanges over time and space

- Contrast with spot trades and barter
- Risk sharing (Illness, bad luck foraging)
- Reciprocal hosting
- Labor sharing
- Aid in disputes
- Aid in financing dowry or brideprice

Long period

- Prior to 100,000 ybp, cultural materials (obsidian, amber, sea shells, stone tools) occur within 15 km of extraction site
- After 100,000 ybp, often occur hundreds of kilometers from their points of origin (Marwick 2003).
- Interpreted as inter-group exchange

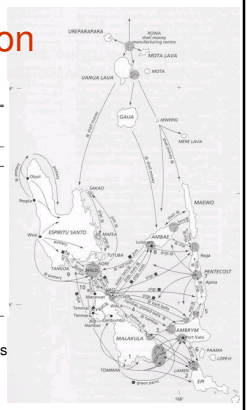
Exchange is common

Number of Different Kinds of Items Traded, Imported, and Exported in Ten Papua New Guinea Societies

	Imports	Exports	Imports Retraded	Total Exports[b] Locally Produced	Retraded Imports	Total Traded
	no.	no.	no.	no.	%	%	no.
Agriculturalists							
Mt. Arapesh	61	7	(13)[a]	14	50	93	62
Busama	19	6	10	15	40	67	24
Manam	21	7	4	11	64	36	28
Sio	37	8	14	19	42	74	39
Wogeo	25	10	7	17	59	41	34
Traders							
Mailu	33	9	9	17	53	53	40
Mandok	33	10	21	31	32	68	43
Manus	46	7	(34)[a]	41	17	83	52
W. Motu	30	10	6	15	67	40	40
Murik	31	18	11	28	64	39	46

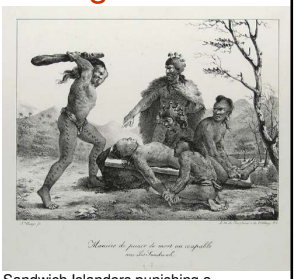
Food, Raw materials, Craft Objects and Valuables

(Harding 1994)



Self-enforcing

- Robust to opportunism by either party, with little legal regulation
- Each party has incentive to continue to follow rules



Sandwich Islanders punishing a taboo violator

Punishment (Boyd et al. 2003)
Ostracism (Bowles & Gintis 2004)

Institutions

- Laws, informal rules, and conventions that give a durable structure to social interactions among the members of a population (Bowles 2004)
- To steer individual behavior in a particular direction
- Provides structure to everyday activity and thus reduces uncertainty in human relations

Greif 2006, Ostrom 2005

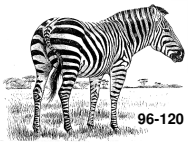
Examples of Exchange

- **Risk pooling**
- **Reciprocal hosting:** Kula exchanges

Food Sharing
Frequent windfalls and shortfalls

14-41 kg

360-450 kg



96-120 kg

1 kg

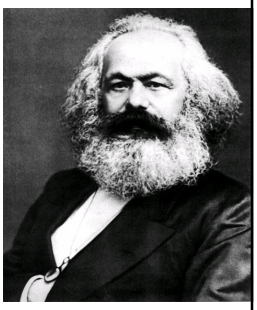
Other kinds of sporadic need

- Labor sharing
- Dispute support
- Income shocks

Myth of primitive communism

"An undifferentiated unity of individual and society" that "arrests the individual's power to disengage himself from the generality of society and establish a self-interest distinct from the general interest of society"

(Cited in Platteau 2002)



Restricted scope of food sharing

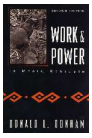
- Cross-sectional data (Gurven 2005)
  - –Hiwi: less than six out of 23 families
  - –Ache: less than six out of 36 families
  - –Yora: less than three out of 10 families
  - –Yuqui: about five out of 15 families

Down-the-line sharing

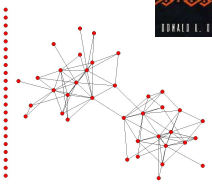
"After the first wave of sharing, recipients launched a second and third wave of sharing, following their respective obligations, until the meat reached all members of the camp…" (Ju/'hoansi, Wiessner 2002)

Similar observations for Hiwi (Gurven et al. 2000) and Aka (Kitanishi 1998)

Labor "groups"



- Maale, Ethiopia
- Tasks: Clearing, cultivating, weeding, harvesting
- Size of team at single event (2-30)
- Beer served by host
- Norm of "not counting", but people keep mental track
- Recruitment via personal ties and friends of friends



Mutual labor sharing in Maale work teams over 12 months

(Donham 1985)

Coalitionary support

- Tausug horticulturalists (Kiefer 1968)
- New Guinea Highlands (Strathern)
- Yanomamo axe fight (Chagnon and Bugos)

(Kiefer 1968)

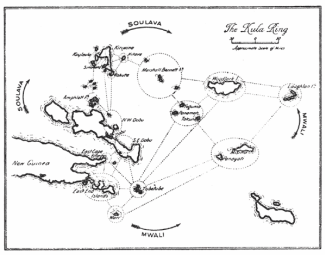
Income shocks

- When one examines how income/resource shocks are distributed in small-scale agricultural societies:
  - Income shocks relative to the entire community reduce spending
  - Income shocks relative to one's closest network do *not reduce spending*

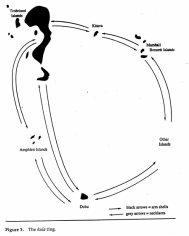
Fafchamps and Lund (2001), Murgai (2002)

What unites these diverse cases is the cultivation of long-term personal relationships that somehow mitigate the risk of opportunistic behavior.

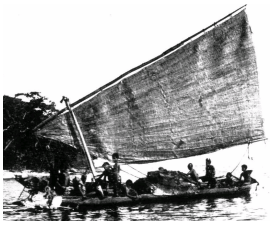
Puzzle of the Kula

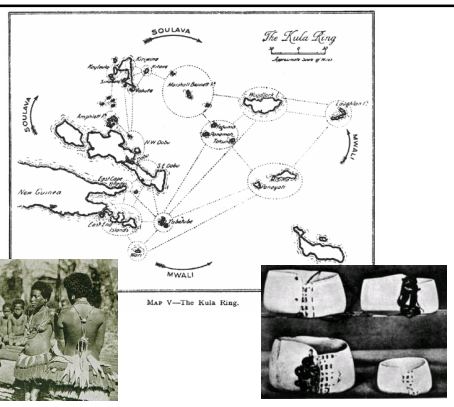


Map V—The Kula Ring.



Why make the voyage?





Map V—The Kula Ring.


Soulava

Mwali

Signalling argument

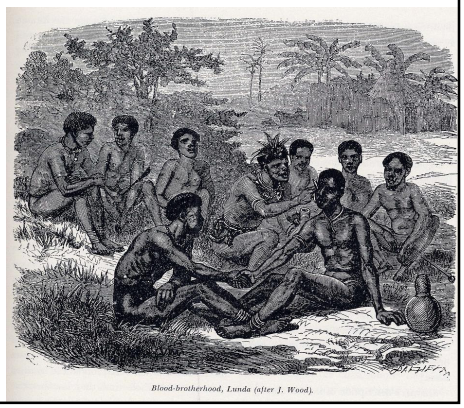
- Small communities divided into insiders and dangerous outsiders. Faraway places are particularly dangerous.
- Kula partners provide lodging and support when in their village
- One can then trade with locals (food, pots, canoes) (*gimwali)*
- Once a kula relationship is established it can last for life or over generations

Landa (1994)

Other Examples

- Medieval European Community Responsibility System (Greif 2006)
- Islamic *Hawala* Financial system (Schramm and Taube 2003)
- Blood-brother relationships (Tegnaeus 1951)
- Maghribi traders (Grief 2006)

Modeling Risk-Sharing



Stylized facts

- Long-term maintenance of sharing partner
- Not contingent on balance of help
- Costly, but worthless, initial gifts/courtship
- Costly, but worthless, recurring gifts
- Theoretically no limit to acceptable cost of helping, but this must be built up over time

The World

- At any time, there is a probability of experiencing a "hit" (need to move, an illness, a dispute, a drought, threat of drowning).
- Big hits (H), little hits (L), and no hits have probabilities p(H), p(L), and p(0).
- A hit incurs a cost of H or L
- A partner can help at cost c(H) or c(L) and remove these costs (if they themselves haven't been hit). H > c(H) & L > c(L).

Two Partners, no Outside Option

- Two people who devalue the future by a value $0 < \delta < 1$.
- If both agree to cooperate, the expected payoff at one time is:

$$Lp(L)p(0)+Hp(H)p(0)-c(L)p(L)p(0)-c(H)p(H)p(0)$$

$$(L-c(L))p(L)p(0)+(H-c(H)p(H)p(0)$$

- If neither cooperate: 0

Two Partners, no Outside Option (continued)

- Future value of a relationship at any time point when both help

$$V=\sum_{t=1}^{\infty}\delta^t\left[(L-c(L))p(L)p(0)+(H-c(H)p(H)p(0)\right]$$

$$V=\frac{\delta p(0)}{1-\delta}\left[(L-c(L))p(L)+(H-c(H))p(H)\right]$$

- If one helps until the other fails to help, then the partner's best response is to continue helping as long as: V > c(H)

Neilson 1998, Kranton 1996

Problem

- So far assumed that one must stay with a partner or go it alone.
- If one can move to new partners, a travelling "grifter" could:
  - start a relationship
  - continue to receive help until asked for help
  - Then move and start a new relationship

$$V_O - c(H) < V_N$$

The value of costly, worthless gifts

- If there is an institution such that each partner is required to provide a costly, but worthless gift (costing Cs).
- The "grifter" strategy doesn't pay if

$$V_O - c(H) > V - Cs$$

$$Cs > c(H)$$

Carmichael and MacLeod 1999, Kranton 1996

Costly, but worthless "gifts"





They also need to be surprises, so that players cannot coordinate on the cost

Problem

- The cost of helping for a large hit, may be too large for a start-up cost

A poor man's relationship

- Start with c(L) < Cs < c(H)
- New strategy
  - Start helping with *all* hits at cost for little hit (c(L)), and end relationship if partner doesn't help in similar manner
  - If one has the opportunity help at higher level, help at higher level, and continue until partner doesn't help at higher level and go to lower level.
- The value of relationship is first:

$$V(c(L)) = \frac{\delta p(0)}{1-\delta}\left[(L-c(L))p(L)+(L-c(L))p(H)\right]$$

Increasing the Value of the Relationship

- If one's partner is hit by c(H), then there is an incentive to bump up

$$V(c(L)) - c(L) < V(c(H)) - c(H)$$

$$\frac{H-L}{c(H)-c(L)} > \frac{1-\delta}{\delta p(0)p(H)} + 1$$

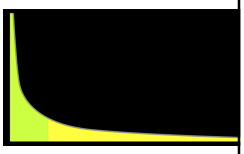
If:
timestep is a week
δ = 1/(30*52)
p(0) = 0.50
p(H) = 0.025

$$\frac{H-L}{c(H)-c(L)} > \frac{1}{(1560)(0.50)(0.025)} + 1 > 1.05$$

$$\frac{B}{C} > 1.05$$

Implications

- Can start with low courtship cost and build-up relationship
- Reflects three observations
  - A relationship deepens due to exogenous events
  - good partners can *potentially* help in most cases
  - Relationship can withstand large imbalances
- Can extend to distributions of hits that are not discrete



An Open Question

- Why do people in long-term relationships continue to give gifts (that arguably lose some value in the giving)?

Generally

- In an environment characterized by high search and verification costs, market participants have incentive to enter cultivate and maintain institutions that economize on these costs:
  - Long-term relationships
  - Close-knit, exclusive trading communities

Costs of embedded exchange

- Gift-giving
- Trust-building can be time-consuming.
  - Malagasy grain traders require ~10 cash sales (2-3 months) to think of buyer as bona fide business person (Fafchamps and MInten 2001)
  - Waiting periods of 6-12 months before manufacturers trust clients enough to grant them trade credit (Fafchamps 1996, 1997)

Opportunity Costs

- Maghribi traders never made it to Italy (Grief 2006)
- African manufactureres purchase their inputs from a handful of suppliers to whom they are extraordinarily loyal, even when alternative suppliers are available (Bigsten et al. 2000)

Modern examples

- Labor “market”
- Baby-sitting
- Hybrids
  - Sending meals
  - Helping friends move

How does an economy based on personal ties become more market-like?

- Both are self-reinforcing
- In the US and other developed economies: the range of goods and services produced by the household for its own consumption is very limited and social protection is provided primarily through market and taxes
- African households, esp. in rural areas, exchange a range of goods and services: food, shelter, fuel, child and elder care, training and food preparation, manufacture of numerous craft goods

Kranton

Conclusions

- There are many ways that people make exchanges separated over time and space without markets and money
- Try to understand how these systems are self-enforcing
- Examine case of trade partnerships
- Dilemma created by a good thing

Data Issues

- What we’re talking about often does not involve written much less electronic records, thus data is much more difficult to identify

Modern day examples

- E-bay and its reputation system
- International Trade Disputes
- How do we know it’s organic? Free-trade?
- How do know the toy doesn’t have lead? The pet food doesn’t have melamine?
- Brand relationships
- Why do we keep giving gift cards?