

Why Pay?

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It's Not Just “Plumbing”

Technological Innovations

Concern about stability

Incentive consequences

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Regulatory issues: tradeoff of efficiency and stability

- ◆ **Netting systems vs. gross payment systems**
- ◆ **Membership requirements**
- ◆ **Overdraft rules**
- ◆ **Competing payments systems**

Messages

Payments matter even when the world is not decentralized.

**The crucial pieces are time mismatch and limitations to enforcement--
specifically informational limitations**

Anonymity comes in many forms but someone somewhere knows you

**Verification of identity is central to accounts systems just as counterfeit
protection is central to store of value systems**

Origins

Monetary Theory: Means of Payment one function of money.

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General Equilibrium Theory: No payments, agents keep “running tabs” with Walrasian auctioneer

Money vs. Payment

Focus on Money leads to questions like:

Why do people hold dominated asset?

How can inside money and outside money co-exist?

How does fiat money obtain its value?

What should regulators do to the supply of money?

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Payment more fundamental

As method of payment changes definition of money changes.

Strategy

Follow Nosal-Rocheteau (2006): build up payments environments.

Fundamental Distinction:

Store of Value Systems

Rely on Asset Verification

Baseline: Spot trade for liquid assets

Account Systems

Rely on Identity Verification

Baseline: Pure credit

Payments systems aim towards one of these two ideals

Baseline: Credit

A current good can be exchanged for a promise ('gift giving') if

There is a future benefit

The benefit can be withheld if good not given

- 1. Defection readily observable**
- 2. Value of reputation**
- 3. Potency of threats**

Examples:

P. Diamond (QJE 1990) pairwise meetings with credit, autarky as punishment.

Jin and Temzelides (RED, 2004) frequency of meetings key variable; credit relationships with individuals met frequently and cash relationships with individuals met infrequently

Baseline: Credit

Variety of threats

1. Individual refusal to trade
2. Expulsion from the group
3. Reversion to autarky
4. Centrally organized punishment

Baseline: Credit

Araujo, JME 2004:

Gift giving is supportable,

- 1. even if identity of defector not known,**
- 2. even if act of defection not publicly revealed**
- 3. provided agents sufficiently patient**

Through a “contagion equilibrium.”

Still, much easier if you can identify and focus punishment on the deviant

Next level: Hostages

Agent takes a (possibly costly) action which makes retaliation for defection easier or more potent.

Example: “Marriage” (Corbae and Ritter, ET 2004) in random meetings world, augmented with partnerships that can extend voluntarily over time.

Message: even if the partnership arrangements are inferior to further search, can be useful to enhance cost of defection

Next level: Hostages

More typical example: collateral

Numerous examples of costly financial collateral and its role

Shi (RES 1996); Li (IER 2001) agent takes another agent's "tools" until debt is repaid.

If neither side reliable, third party escrow Koeppel and Monnet (2006)

What makes good collateral?

1. Low cost of transfer into creditor's control

(Transportation costs, likelihood of damage while hostage)

2. High cost of loss to debtor relative to value to creditor

(O. Williamson, 1985)

Spot Trade in Assets

Small jump from collateral:

Value to initial owner vs. value to third parties

“Money” is asset with negligible cost of transfer (Ostroy and Starr, *Econometrica*, 1974, Kiyotaki and Wright, *JPE* 1989)

Economics on the Afghan Frontier

Pairwise meeting

Anonymity; no enforcement beyond spot trade

If no double coincidence, trade for store of value

Economics on the Afghan Frontier

Parsimony of information:

Need to verify genuineness of store of value, but not of counterparty

**Hence, day and night models (Lagos Wright)
temporary island models (Freeman)**

**Trade in Assets useful if malefactors can't be caught and punished
(Centralization with anonymity suffices)**

A Digression: Fiat Money

If assets with negligible cost of transfer in short supply, they can be created

Source of value:

1. Souffle theory

Money has value today because it is believed to have value tomorrow.

2. Mahagony theory

Government's coercive powers give money its value. Those without money can be punished.

Equivalently: Money is useful for paying taxes (Starr)

Our Story So Far

When credit won't work (Can't identify and punish malefactors)

Then trade in assets (stores of value)

Value in use (barter)

Value in redemption (collateral)

Value in trade (commodity money)

When cheaply transferable assets in short supply, invent some.

Pieces of paper which are believed to be in short supply.

Pieces of paper which are good for paying taxes.

Economics on the Afghan Frontier

Pretty Extreme and Unrealistic (Are Spot Trades Enforceable?)

Plenty of mechanisms to ameliorate

Record Keeping

Alternative: society develops costly infrastructure:

**Better courts, better surveillance techniques, better ID's for people,
better record keeping.**

All of these increase the cost of deviations.

Therefore they make credit more powerful.

Retreat of Store of Value

Store of value less flexible than record keeping

Thus Kocherlakota (JET 1998) argues that money substitutes for expensive public record keeping.

As record keeping costs fall, use of store of value decreases:

Temzelides and Yu (IER 2004) Money used when it is not worthwhile to track credits and debts in more complex ways: Small transactions

Hybrids: Transferable Debt (Inside Money)

Private pieces of paper as alternative to government pieces of paper.

Value from promise to repay.

So one individual's debt is another's means of payment.

Information required: validity of paper, identification of issuer

Transferable Debt in Random Matching Models

Cavalcanti-Wallace (1999)

Kiyotaki-Moore (2000)

**Some agents (bankers) are able to transact in their own debt:
bankers are either famous (C-W) or highly committed to
repayment (K-M)**

Others (less reputable) use items of value to transact, e.g.,

Real assets

Outside money

Bankers' debt

But do not use own debt

Debt for Debt

In C-W and K-M separation between *own-debt payors* and *money payors*

But bankers never “settle” (pay up on own debt with other debt)

Kahn Roberds (2002) Ability to issue debt not permanent characteristic payment in debt from change in assets held over trade cycle.

Debt for Debt

Significance: Modern Financial Institutions

Payment becomes method of adjusting portfolio

Settlement is a reordering of seniority of liabilities

Crucial for modeling choices in timing payments

Transferable Debt and Transportation Cost

Bullard and Smith (2003): Paper is cheaper to move than is bullion, particularly when distance imposes the limitation on enforcement.

Make geographical circuit of payments in paper, settle at the end in gold.

So geographical spread can explain some transferable debt, but not necessary.

Evidence of Transactions

Payments arrangements provide information about trades

Paper records can provide an evidentiary trail

IOUs and receipts as evidence of private trades

IOUs as hostage: redemption forestalls lawsuits.

Paper is one-sided evidence (a la Lacker and Weinberg, JPE, 1989)

Again, decentralization not necessary

Evidence of Identity

Payments arrangements provide information about trader identity

Kahn, Roberds (2006) Difficulty linking traders to their accounts. Credit Cards as a method of reducing the cost of identity verification

See identity theft as equilibrium phenomenon; payments systems only survive if they keep the problem to a manageable level.

Application to Large Value Payments Systems

Mechanism design comes most naturally in this case: immediate link to behavior of payments systems designers

- **View of large-value payment systems:
arrangements for economizing on collateral necessary to enforce obligations**

Means for economizing on collateral

- **Private systems**
 - **Setting off one obligation against others (netting)**
 - **Hierarchy of system (and associated monitoring of participants for risk, esp. credit risk)**
 - **Position limits**

Private versus public systems

- **Public systems use all means available to private systems, plus**
 - **Substitution of public-sector claims for private claims**
- **Central-bank operators of public systems have ex-post incentive to offer uncollateralized (or undercollateralized) credit during times of “market duress” (Rochet & Tirole 1996)**
- **Public systems are often at a disadvantage in monitoring participants (or more realistically, acting on the basis of information received, due to political pressure to forebear)**

Summary

Started with distinction between store of value methods and account methods of effecting payment, and the differences in information requirements

Examined a simple hybrid—private transferable debt—and models of its working and explanations of its role.

Argued that payments arrangements can be (and are) set up to provide additional evidence of transactions and evidence of agents' identities

Glanced briefly at large value systems as collateral cost reducers, and at the differences (such as they are) between private and public systems

Summary

Temporal, not spatial separation of trades, fundamental to payments

**Arrangements develop in response to limitations to enforcement--
specifically informational limitations**

**Misleading results can arise if environment rules out improvements to
information**

**Verification of identity is central to accounts systems just as counterfeit
protection is central to store of value systems**

Our models have made a start—but we've just scratched the surface.