Money Talks: Information and Seignorage

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Motivation 1 — Producer currencies with two benefits

Private, centralised digital currency (PCDC)

issued by firms with profit motive and competitors.

Benefit 1: Information

Transactions are verified centrally, generating data.

Benefit 2: Seignorage

Do PCDC pose a threat to central banks?

Motivation 2 — Existing models of currency competition

- Assumption: **Perfect substitutability**

a) Portfolio indeterminacy

b) Fixed exchange rates if all currencies are valued in equilibrium

[Kareken and Wallace (1981), Schilling and Uhlig (2019), Fernadez-Villaverde and Sanches (2019),...]

→ Decoupling of token price and monetary policy, inflationary equilibria.

- **Sunspot crash risk**: coordinate on no longer valuing currency
- With firms, the issuer is also part of the transaction

Research questions and preview of results

Q1 How do the two benefits affect issuance and acceptance of PCDC?

Q2 What are the monetary policy consequences, private and public?

The paper develops a benchmark of imperfectly competing firms in which

R1 Information shapes the degree of currency competition

R2 Central bank (CB) loses policy autonomy

R3 Private currency market power breaks this benchmark

Benchmark: Set-up

i) Unit measure of **consumers**, two types $\theta \in \{L, H\}$, consumption utility $u(C) = \theta^{1-\alpha} C^{\alpha}$

- Consume, supply labour, buy bonds and money
- Information: Type is unobservable
- Seignorage: Require medium of exchange (cash-in-advance constraint)
- Directed search: forced to choose a firm each period. Firms have market power.
- OLG, quasi-linear utility (Lagos and Wright, 2005)

ii) Two **firms** $i \in \{f, g\}$ produce consumption good, may introduce private currency

- Set price p_t^i, produce at constant marginal costs
- Advertising: directs consumer search, in limited capacity
- Set private monetary policy

iii) Public and private **money**, $M^{\$}$ and $M^{\approx}$

- Private currency usage reveals consumer types
- Firms decide which currencies to accept

Benchmark: No interoperability

Assumption (No network effects.)

Consumers perfectly anticipate which currencies each firm accepts.

Proposition 3

Firms don't accept competitors' private currencies.

Intuition: Firms optimally don't generate information for their competitors.

Alibaba	does not accept	WeChat Pay.
Amazon	does not accept	Google Pay or Apple Pay.

Benchmark: Opportunity cost of money as a consumption tax

- Cash-in-advance constraint (of consumer i with firm j):

$$\underbrace{p_t^i C_{j,t}}_{\text{consumption expenditure}} \leq \underbrace{\gamma_t^i \phi_t \boldsymbol{M}_t}_{\text{accepted real money balances}}$$

- Opportunity cost of money τ_t^i acts like a consumption tax, scaling up price p_t^i:

$$C_{j,t} = C(\theta_j, p_t^i, \tau_t^i) = \theta_j \left[\frac{\alpha}{p_t^i (1 + \tau_t^i)} \right]^{\frac{1}{1-\alpha}}$$

Benchmark: Optimal Dollar and Diem pricing

Proposition 3: Diem holdings are bound from above by firm f's transactions.

$ Firm sets price p, the CB implements $\tau^{\$}$. The profit max problem is given by

$$\tilde{p} = \underset{p_t^g}{arg\ max} \left(p_t^g - mc\right) \theta_j \left[\frac{\alpha}{p_t^g(1+\tau_t^{\$})}\right]^{\frac{1}{1-\alpha}}$$

≋ Firm chooses both price and private monetary policy jointly.

$$\tilde{p} = \underset{p_t^f(1+\tau_t^{\approx})}{arg\ max} \left(p_t^f(1+\tau_t^{\approx}) - mc\right) \theta_j \left[\frac{\alpha}{p_t^f(1+\tau_t^{\approx})}\right]^{\frac{1}{1-\alpha}}$$

Benchmark: Optimal private monetary policy

Proposition 1

Firms optimally remove the seignorage tax on private currencies.

Corollary (Currency design equivalence)

Firms may do so by a) implementing the Friedman rule, b) giving price discounts, or c) paying interest on private money.

Central bank loses policy autonomy

Consumers' producer and currency choice induces currency competition.

Lemma

Suppose $\tau^{\$} > 0$. *All consumers use the private currency.*

Central bank loses policy autonomy

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Lemma

Suppose $\tau^{\$} > 0$. *All consumers use the private currency.*

Proposition 2 (Central bank loses policy autonomy)

Suppose the government supplies a positive amount of money, $M^{\$,S} > 0$. *Government fiat money is only valued,* $\phi^{\$} > 0$, *if*

$$\tau^{\$} = i^{\$} = 0$$

- This policy is associated with deflation: $\pi^{\$} = \beta - 1 < 0$
- Efficiency: 2^{nd} best, monopoly distortion remains

Digital currency areas (DCA)

Definition

A firm introduces and accepts only their own private digital currency.

- Decompose life-time gains: information and seignorage

$$\Delta\Pi \quad = \Delta^{I} + \quad \Delta^{\$}\left(\left\{\tau^{\$}_{t+s}\right\}_{s\geq 0}\right)$$

positive externality

Proposition 4 (Equilibrium currency introduction decisions)

Both firms form DCAs, and $M^{\$}$ loses its role as medium of exchange, if

$$k \leq \Delta^{I}$$

One-sided DCA formation if

$$\Delta^{I} < k \leq \Delta\Pi$$

Breaking the benchmark: Private currency market power

Firms form currency consortia which are dominated by one firm.

- Two consumption goods markets, each as in benchmark model
- Currency consortium consisting of a leader and a member
  - Leader decides on private monetary policy
  - Both share the consortium's seignorage dividends equally

Leader's profits = Product profits − 1/2 seignorage tax on leader + 1/2 seignorage tax on member

Proposition 5

Whenever the member's transaction share exceeds the leader's transaction share, then $\tau^{\approx} > 0$.

Intuition: Seignorage tax base not connected to own product profits is sufficiently large.

Scenarios: Public currency disciplines private currency

Diem seignorage tax is s.t. upper bound due to desired CB policy $\tau^{\$}$.

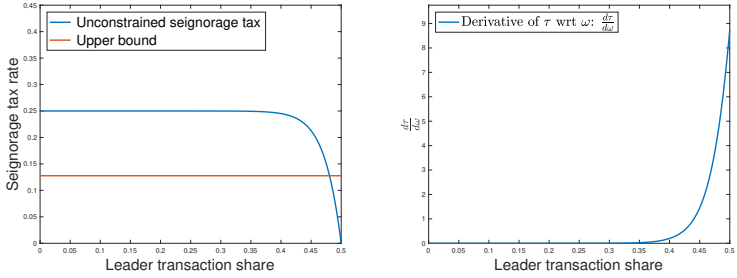

Figure 1: Unconstrained profit-max. Diem seignorage tax rate, upper bound.

Corollary (Inflationary information)

Information is inflationary if it leads to a relative increase in the consortium member's transaction share.

Literature review

Customer recognition & privacy in the digital economy: Villas-Boas (1999), Fudenberg & Tirole (2000), Acquisti & Varian (2005), Fudenberg & Villas-Boas (2012), Bergemann & Bonatti (2019), Goldfarb & Tucker (2019), Bonatti & Cisternas (2020), Parlour et al. (2020), Liu et al. (2021), Chen et al. (2021), Abis et al. (2022), Bian et al. (2022), ...

Currency competition: Kareken-Wallace (1981), Schilling & Uhlig (2019), Benigno et al. (2019), Brunnermeier et al. (2019), Fernandez-Villaverde & Sanches (2019), Skeie (2019), Fernández-Villaverde et al. (2020), Cong & Mayer (2022), ...

Firm currency: Gans & Halaburda (2015), Li & Mann (2018), Catalini & Gans (2018), Brunnermeier et al. (2019), Garratt & Van Oordt (2019), Prat et al. (2019), Rogoff & You (2020), Cong et al. (2020), Chiu & Wong (2020), Gryglewicz et al. (2021), Li & Mayer (2021), Mayer (2021), ...

Payments: competition, privacy & monetary policy: Kahn et al. (2005), Andolfatto (2019), Garratt & van Oordt (2021), Garratt & Lee (2021), Lagos & Zhang (2019, 2021), Huberman et al. (2021), Chiu et al. (2022), ...

- Firms issue currency which competes with government fiat money
- Consequences for monetary policy
  a) if money generates information
  b) the issuer has private currency market power

Discussion

- Central bank can pay interest on CBDC to escape benchmark.
- 'No seignorage' result also applies to credit card fees and bank deposit rates.

Contribution

Firms issue money which competes with government fiat money.

Information breaks the usual indeterminacy in models of currency competition.

The central bank loses policy autonomy. Role for CBDC?

Private currency market power induces inflationary pressures.