Competing digital monies

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Motivation

- New forms of digital money have started to compete with cash and bank deposits : digital platform tokens and central bank digital currencies (CBDCs).
- Retail fast payment systems (FPS) offer very efficient ways to transfer commercial bank money. They link banks and, sometimes, non-bank payment service providers (PSPs) in a single system.
- How are these new payment solutions going to transform the industrial organisation of payment systems ?
  - Payment systems could become fragmented in competing walled gardens
  - or they could become more efficient, integrated and accessible.

What we do

- We integrate two-sided markets theory into payment economics.
- We model competition between a bank and a platform (=digital platform token issuer).
- We compare the equilibrium of the payment system in three different contexts :
  - status quo (walled gardens),
  - new public infrastructure (central bank-operated FPS),
  - new public money (CBDC).

Our results

- 1) When payment systems are not interoperable (walled gardens), access to accounts and trade volumes are inefficiently low.
- 2) When a fast payment system enforces interoperability, financial exclusion disappears at the cost of some degree of disintermediation by PSPs and (surprisingly) **higher** intermediation fees for merchants.
- 3) CBDCs and FPS are essentially equivalent and enable to achieve a superior outcome to the laissez-faire approach in terms of welfare.

Fast payment systems in practice

- Many countries have already implemented FPS : UPI in India, Pix in Brazil, SPEI in Mexico, SINPE Móvil in Costa Rica...
- These FPS offer immediate transfer of funds on a 24x7 basis between end users (P2P) and businesses (P2B and B2B).
- They are often, but not always, operated by central banks.
- Merchant fees are very low and users fees are often nil.
- FPS have contributed to a spectacular increase in financial inclusion, notably in Latin American countries (Aurazo et al. 2025).

Retail CBDCs in practice

- **Current examples of live / pilot CBDCs :** the Central Bank of The Bahamas (CBOB) with the SandDollar, the Bank of Jamaica (BOJ) with JAM-DEX, the People's Bank of China (PBC) with the e-CNY (pilot) and the Central Reserve Bank of Peru (BCRP) with Dinero Digital.
- **Similarities :** emerging market and developing economies, with under-served regions (i.e. gaps in financial inclusion).
- **Central bank objective :** common aim is to increase financial inclusion (by reducing either the cost of opening an account or the price of financial services).
- **Different design parameters :** technical architecture, interoperability with existing payment systems, know-your-customer (KYC) requirements to open an account, fee structure, account limits...
- **Competition and retail CBDCs :** in each case, retail (client-facing) services are offered by private sector banks and/or PSPs.

Relation with the literature

- **Literature on CBDCs :** surveyed by Auer et al. (2022). Largely focused on macroeconomic implications of CBDCs for monetary policy and financial stability. We focus instead on the industrial organisation aspects of CBDCs.
- **Literature on interoperability in platform markets :** surveyed by Bianchi et al. (2022).
- **Literature on interoperability and CBDCs :** Brunnermeier and Payne (2022), Ahnert, Hoffmann and Monnet (2025).

This presentation

- The model
- Walled gardens
- Impact of a fast payment system
- Impact of a CBDC
- Discussion
- Conclusion

The model

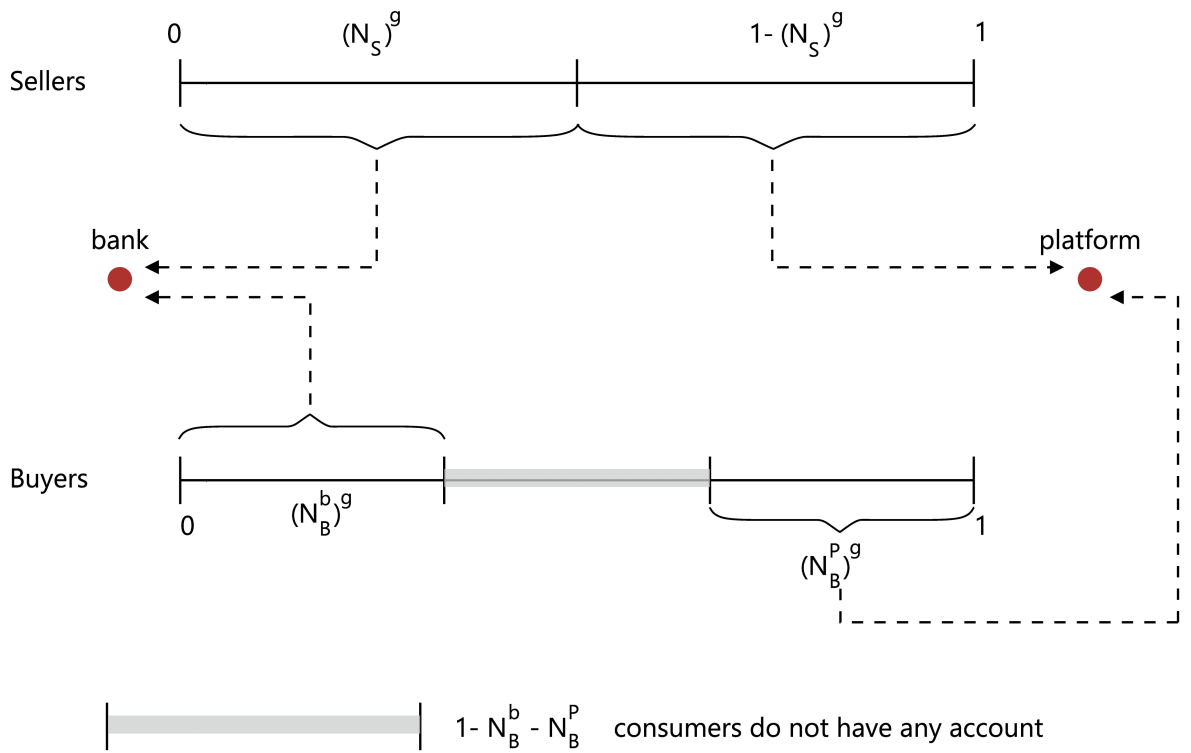
- Continuum of buyers and sellers located on Hotelling lines.
- Two trading modes : b (brick and mortar) and p (online platform).
- Simplifying assumption : same gains from trade in each environment : α.
- Share r goes to buyers and share $(1-r)$ to sellers.
- Single-homing on both sides (one trading mode and one intermediary).
- We make two assumptions :
  - (H1) $t_B > r\alpha$ (implies multi-homing too costly for consumers)
  - (H2) $t_B t_S > r(1-r)\alpha^2$ (implies concavity of profits+multi-homing too costly for merchants)

Walled gardens : assumptions

- Only two intermediaries : b (bank) and p (platform).
- Charge fixed fees f_b and f_p to sellers but nothing to buyers.
- Transport costs $t_B x$ for buyers and $t_S x$ for sellers, where x represents the "distance" between the service offered by the intermediary and the service desired by the user.
- Platform requires specific payment instrument for online trading.

Illustration : walled gardens

Payment systems with walled gardens — Figure 1



Source: Authors' elaboration.

Properties of walled gardens

- Number of bank depositors increases with number of brick and mortar merchants :

$$N_B^b = \frac{r\alpha}{t_B} N_S$$

- Number of platform users increases with number of online merchants :

$$N_B^p = \frac{r\alpha(1 - N_S)}{t_B}$$

- Equilibrium is inefficient :
  - financial exclusion : $1 - \frac{r\alpha}{t_B}$ consumers have no accounts,
  - low volume of trade : $V^G = \frac{r\alpha}{2t_B}$,
  - merchant fees : $f^b = f^p = t_S - \frac{r(1-r)\alpha^2}{t_B}$.

Introducing a fast payment system

We model an FPS as a system ensuring the transfer of money between any private accounts at zero cost.
New intermediaries (non-bank PSPs) provide universal access for zero fees but the quality of service w.r.t. the intermediaries is reduced by a factor $q \in (0, 1)$.

- Number of bank depositors decreases :

$$N_B^b = \frac{r\alpha}{t_B}(1-q)N_S$$

- Equilibrium is more efficient :
  - financial exclusion disappears,
  - the market share of financial intermediaries on the consumer side is reduced by a factor $(1-q)$,
  - maximum volume of trade : $V^F = 1$,
  - merchant fees increase : $f^b = f^p = t_S - \frac{r(1-r)(1-q)^2\alpha^2}{t_B}$,
  - the profits of the intermediaries increase.

A CBDC as an alternative form of money

We model the (retail) CBDC as electronic cash : all consumers can pay with it for free, but the quality of service w.r.t. the intermediaries is reduced by a factor $q \in (0, 1)$ determined by the central bank.

- Many similarities between CBDC and FPS : universal access to digital payments at no cost.
- However there are differences : CBDC transfers public money while FPS transfers commercial bank money. Moreover, only regulated intermediaries have access to the CBDC (not the PSPs).
- We assume that these intermediaries offer CBDC payment services at no fee for users, but with a fee for merchants.
- **Equivalence result :** if quality of service is the same as with an FPS, a CBDC is equivalent (in our model) to an FPS.

Discussion : comparing FPS and CBDC

Both systems have a lot in common :

- Improve financial inclusion
- Increase trade opportunities

But they also have important specificities :

- Public money vs commercial money
- FPS more inclusive than CBDC

Design and architecture matter a lot.

Discussion : design possibilities

- The CBDC is distributed by incumbent intermediaries, in addition to PSPs
  - Consumers trade off between a full service account with a maximum quality of service and a CBDC wallet
  - In that case, the risk of disintermediation is less acute because incumbent intermediaries keep the management of CBDC deposits, which might be used as reserves
  - The quality of service q may be controlled by the central bank
- The CBDC is integrated within an existing FPS
  - This solution avoids a costly duplication of infrastructure
  - One potential drawback could be the concentration of risks (such as cyber risk) in one infrastructure
- CBDC and disintermediation
  - The trade-off for public authorities is between disintermediation which increases for a higher q and financial inclusion (more buyers and sellers benefit from a higher quality of service)

Conclusion

- Our results suggest that public provision of payment infrastructure (FPS or CBDC) will affect market structure and pricing in the market for payment services.
- A CBDC or a FPS could improve financial inclusion in emerging market and developing economies but (in our model) at the expense of higher merchant fees.
- This new organisation of payment systems can create complex trade-offs between competition, financial inclusion and qualities of service.