Cross-Border Payments and the Industrial Organization of Correspondent Banking

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[1]The views expressed are those of the authors and do not reflect those of the Federal Reserve System or the Board of Governors.

Motivation

- Why are cross-border payments expensive?
- Only consider e-commerce for now, so no cash, just deposits. We (Americans) buy US goods with dollars, but if we want to buy goods from European firms, we need to pay euro. We cannot hold euros directly in our deposit accounts or open a foreign deposit account (or costly), but our US banks can hold foreign deposits for us at foreign banks (correspondent banking). Sellers cannot open foreign account either (cannot accept foreign deposits). Assume both banks are monopolies and can price discriminate. The foreign bank charges domestic bank (monopoly) and domestic bank charges us (monopoly).
- $\Longrightarrow$ double marginalization in vertical supply chain of payments/banking.

Motivation

- CBDC's can be held by all households and banks, which could mitigate banks' monopoly power.
- when CBDC rate is low, set a floor to bank deposits (when banks have market power, and set deposit rate below perfect competition by restraining supply of deposits), which improves welfare – more supply of deposits, more output, reduce loan rate, expand lending
- If CBDC high enough, forces banks to have higher deposit rates, and then higher lending rates, lower deposits and loans (negative effect)

Model features

A New Monetarist search model

- stuff tbd

Model

Environment

- Time is discrete and infinite; discount factor $\beta \in (0, 1)$
- Two subperiods in each period:
  - Decentralized market (DM):
    pairwise meeting, lack of commitment and record keeping
  - Centralized market (CM):
    Walrasian
- Agents: buyers, sellers, banks, entrepreneurs
- Countries: home, foreign
- Goods: general good X, and special good q
- Assets: deposits (issued by banks)

Technology

Period utility functions

- Buyers:

$$U^B = u(q) - (H - U(X))$$

where $u(q)$ is the utility of consumption in DM, and $H - U(X)$ is labor supply less consumption in CM.

- Sellers:

$$U^S = -c(q) + U(X) - H,$$

where $c(q)$ is the cost of production in DM, and $U(X) - H$ is labor supply less consumption in CM.

Decentralized market

In the DM, each buyer is randomly matched with a seller.

- Matching technology:
  $\mathcal{M}(B, S) = BS/(B + S)$
  B: number of buyers
  S: number of sellers

Environment – Buyers and Sellers

Two subperiods in each period:

- Decentralized Market (DM):
  - Buyers may purchase goods from the other country $(1 - \alpha)$
  - pairwise meeting b/w Buyers and Sellers in each country
  - trade special good (q_i)
  - lack of commitment and record keeping
  - only payments technology is transfer of (local) bank deposits
- Centralized Market (CM):
  - Buyers work (H) to linearly produce X, buy deposits.
  - Sellers liquidate deposits, may work, consume X

Environment – Entrepreneurs

- provides investment opportunity
- one Entrepreneur per country
- live for one period (CM_t to CM_{t+1})
- linear preferences over CM consumption when old (in CM_{t+1})
- have technology: transform X CM_t good into $f(X)$ in CM_{t+1}
- no endowment (need loans for investment)
- lack commitment (cannot directly borrow from buyers)

Environment – Banks

- provides payment services/intermediates savings
- one Bank per country
- Banks live for one period (CM_t to CM_{t+1})
- linear preferences over consumption when old (in CM_{t+1})
- have commitment (can make promises)
  - take CM_t good from buyers, issue deposits
  - make loans to local Entrepreneur, enforce repayment
- have payments technology (deposits are transferable in DM)

Environment – Correspondent Banking

- In DM, Buyers may purchase foreign goods and need to pay with **local** deposits
- But, Buyers only have relationship with their **home** bank
- Banks, however, can have international relationships
- Hence, Banks offer their Buyers both
  - own deposits backed by loans to Entrepreneurs
  - foreign deposits backed by deposits at the foreign bank

Environment – Market Structure

- In CM, trade general goods, deposits
  - Bank issues both own (d) and foreign ($\tilde{d}$) deposits
  - Bank has monopoly over local Buyers
    - assume linear pricing: gross real rate R and $\tilde{R}$.
  - Bank also has monopoly in issuing deposits to foreign Bank
    - can price discriminate between buyers and foreign bank
    - assume linear pricing: gross real inter-bank rate R_B
  - for simplicity, assume competitive market in loans to Entrepreneurs (R_ℓ)
- In DM, trade special goods for local deposits
  - 1-1 trade with proportional bargaining between Buyer and Seller

Equilibrium

4 rates per country:

- 2 for domestic HHs: domestic and foreign deposits
- 1 interbank: deposits at foreign bank
- 1 for domestic entrepreneur: lending by domestic bank

CBDC

CBDC's are issued by central banks. All HHs and banks can hold CBDC's directly.

- Mitigate monopoly power of the banks
- $r_{competition} > r_{monopoly}$.
  In a monopoly deposit market, banks restrain the deposit supply to keep the deposit interest rate below the level under perfect competition.

CBDC

- If $r_{comp} > r_{monop} > r_{CBDC}$, no effect.
- If $r_{comp} > r_{CBDC} > r_{monop}$, r_{CBDC} sets a floor for deposits. Positive effect: This floor limits the reduction in the deposit rate and reduces commercial banks' incentive to restrain the deposit supply. Banks supplies more deposits, reduce the loan rate, and expand lending (crowding in).
- If $r_{CBDC} > r_{comp} > r_{monop}$, CBDC crowds out deposits Negative effect: forces bank to have higher deposit rates, higher lending rates, contract deposits and lending (crowding out).

CBDC

Two CBDC's and two deposits. At Home, deposit rates: $r^H > r^F$

- If $r^H > r^F_{CBDC} > r^F$, floor for foreign deposits, no effect on home deposits

Value functions

$$W_d^B(\vec{z}) = \max_{X,h} U(X) - h + \beta(\alpha V_d^B + (1-\alpha) V_f^B)$$

$$s.t. X + \vec{1}\vec{z'} = h + \vec{R}\vec{z} + T$$

$$FOC$$

$$\alpha\beta \frac{\partial V_d^B}{\partial z_d'} \leq 1$$

$$(1-\alpha)\beta \frac{\partial V_f^B}{\partial z_f'} \leq 1$$

$$\vec{z} = (z_d, z_f)$$

Value functions

$$V_d^B(z_d) = u[Y(\mathcal{L}_d)] - P(\mathcal{L}_d) + W^B(\vec{z})$$
$$V_f^B(z_f) = u[Y(\mathcal{L}_f)] - P(\mathcal{L}_f) + W^B(\vec{z})$$
$$V_d^S(\vec{0}) = \alpha[-Y(\mathcal{L}_d) + P(\mathcal{L}_d)] + (1-\alpha)[-Y(\mathcal{L}_f) + P(\mathcal{L}_f)] + W_d$$
$$V_f^S(\vec{0}) = (1-\alpha)[-Y(\mathcal{L}_d) + P(\mathcal{L}_d)] + \alpha[-Y(\mathcal{L}_f) + P(\mathcal{L}_f)] + W_f$$

$$\mathcal{L} = Rz$$