

# Money in the Digital Age

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Based on joint work with  
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# Rethinking Money in the Digital Age

- Ubiquitous digital money, M-Pesa, Alipay, Libra
  - So far: digital inside money (liability of issuer)
  - Now: digital outside money/ “currencies”



- Questions:
  - Will private digital money drive out cash?
  - Will central banks lose their grip on monetary policy?
  - Will platforms “steal” the seigniorage benefits of governments and private banks?
  - Digital Dollarization and Digital Currency Areas
  - Will CBDC be the answer?
  - Should BigTechs be forced to be “narrow banks” and platforms to be interoperable?

# Roadmap

- Technological trends
- New currency competition
- Monetary Sovereignty
- International Monetary System & Digital Currency Areas

# Technological Trends

- Smart phone
- Digital platforms/ecosystems - “digital lifestyle” (COVID)
- Big data, AI, deep learning, recommender systems
- Smart contracts and value chains:
  - contingent payments to minimize credit risk
- Internet of things: payments from machine to machine
- Token (instead of account-based) – DLT
- Micropayments

 impacts money

# Tech Trends: Inversion of Power - “Inverse Selection”

- Information advantage for customer

- Borrower
- Insurance client, ...

Soon, for seller/platform

- Lender (platform)
- Insurance company
- Asset managers, ...

“will know more about me than I know about myself”

Privacy regulation

- Customer knows her multiple attributes, but platform only platform can connect them

- Traditional example:

- I like a red car
- Insurance companies knows (from big data) that drivers of red cars are more accident prone

From Adverse Selection to “Inverse Selection”  
(with Segura-Rodriguez and Lamba)

# Tech Trends: Big Data, AI, Machine/Deep Learning

- Economies of Scope

- Unstructured data, textual data
- Social media data
- Payment system data
- Diversity

“Bigger is better”

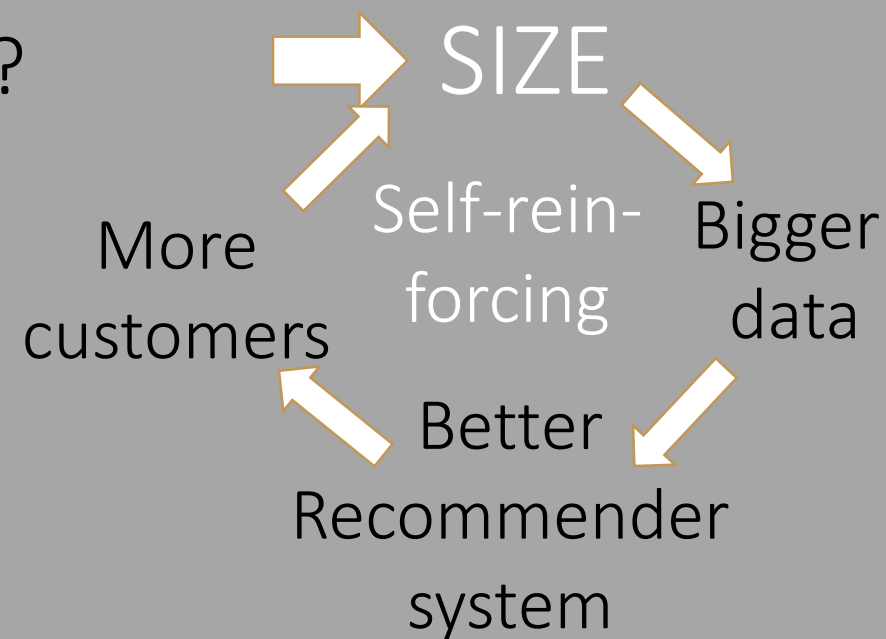


PLATFORMS

(transforms IO of finance)

- Scale

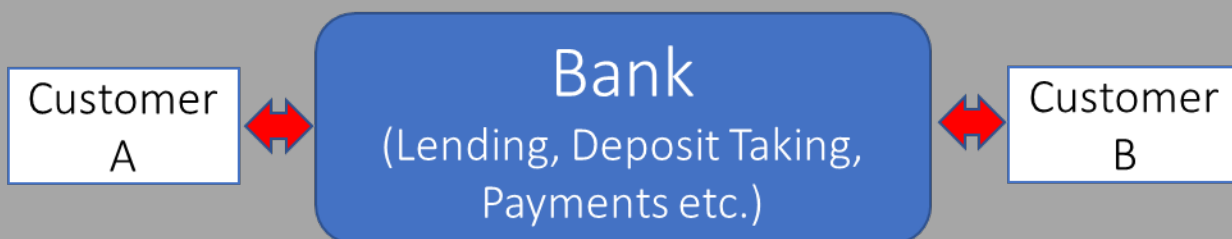
- Diminishing returns to scale?



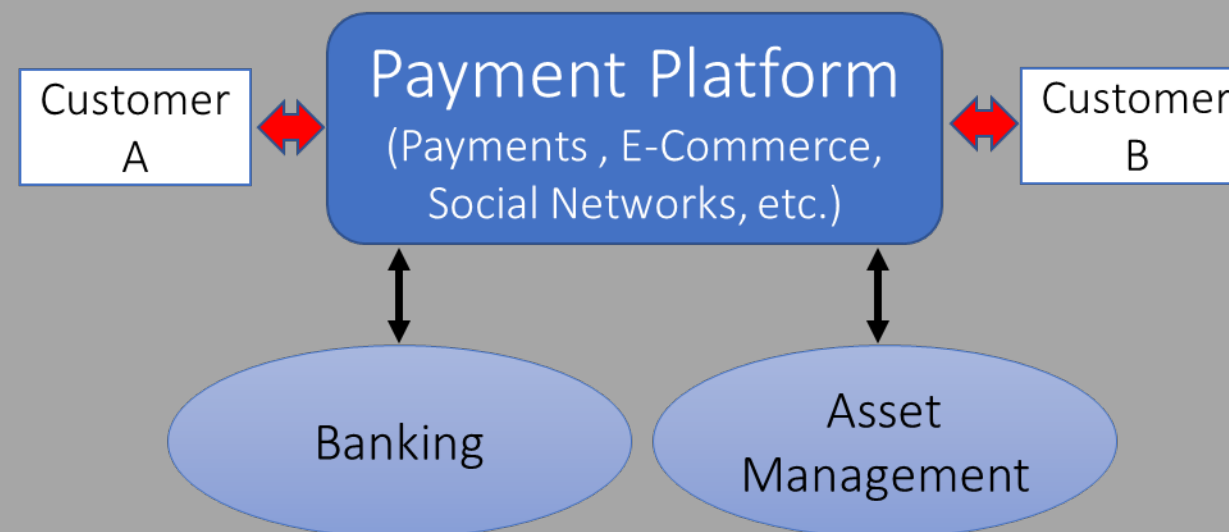
# Technological Trends

- Digital platforms/ecosystems - “digital lifestyle”
  - Data advantage – who controls the data?
  - Change of IO of financial activities

## Bank-centric



## Payment-centric



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# Currency competition

Hayek (1976)

- Bundling reduces competition
- Unbundling the 3 roles of money
  - Unit of account
  - Store of value
  - Medium of exchange
- Convertibility, Gresham's law (gold vs. silver)
- Declining switching costs  $\Rightarrow$  declining network externality
  - Language analogy (speech translation software)
- Re-bundling with platform/ecosystem
  - Discounts on digital eco-system
  - Smart contracts, recommender system
  - "Money product differentiation" (e.g. "privacy currency")

Closed ecosystem (incl. payment instruments)

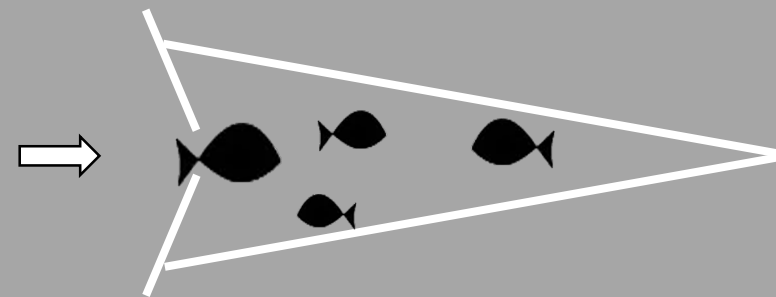
# Private platform/currency competition

- Platforms have greater “control” over digital currencies (better able to monitor, restrict or punish usage)
  - New IO perspective on Money from “environment friction” to “strategic choices by platforms”

With Jonathan Payne

- Platform strategy/design:

- Entry costs/subsidy
- Using costs/subsidy, i.e. trading mark-ups, privacy (possible negative)
- Exit costs (“Berlin wall”)
- Growth rate of money/token supply



“lure you in,  
lock you in, and  
inflate value away”  
(Hotel California)

- Platform/currency competition

- With public money (no digital convenience, no exit cost, MoPo based on macro shocks,...)
  - Digital dollarization (is public money at a disadvantage?)
- Across private platforms/currencies
  - Regulation: interoperability (like EPI), convertibility, narrow banks approach
- Behavioral biases of customers

# “Digital Dollarization”

- Loss of “unit of account” role of money
  - Via medium of exchange (invoicing) vs. store of value (reserves)
  - Sudden and highly non-linear (Chang&Velasco 2006)
- Vulnerable countries: small, socially open
  - Small, open economy, large informal sector (traditional dollarization)
  - Inefficient electronic payment system
  - No own social media presence
- Defense lines:
  - LOLR and taxing power + taxes in local currency
  - CBDC since, (Public) Cash is poor substitute for private digital money
  - Private “stable coins” via 100% narrow bank (whole sale CBDC)
  - Regulation of private platforms: convertibility, interoperability, ...
  - Let private platforms explore and invent and government appropriates later

# Roadmap

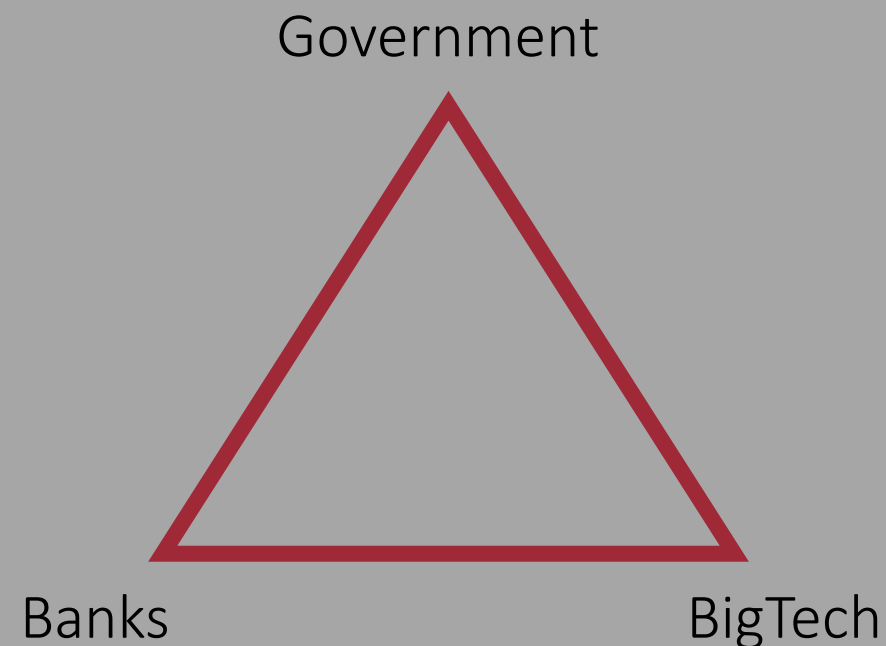
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# Monetary Sovereignty

- Seigniorage rents from money creation
  - **Store of value** role of money
  - Financial repression
- Control of monetary policy to manage macro economy/business cycle  
Should Facebook's MoPo manage the macroeconomy?
  - **Unit of account** role of money
    - Intratemporal                      behavioral
    - Intertemporal                      due to MoPo's redistributive and risk-shifting effects
      - New Keynesian:                      Stickiness in private/public money (invoicing)
      - Financial Frictions:                      Denomination of nominal debt  
MoPo redistributive & risk transfer "The I Theory of Money"
- Power to bail out and to provide liquidity LOLR
  - Connected to taxing power, fiscal space, governance
- Power to exclude from monetary system
  - Weaponizing US dollar

# Public versus Private Money

- Current arrangement: 2 tier system
  - Government      outside-money/unit of account/settlement among banks
  - Private banks      inside money
  
- Future arrangement



- Example: India Stack, PBC imposing narrow bank model

# Seigniorage Rents from Money Creation

- $\max U(x)$  subject to Brunnermeier-Niepelt (2019)
  - Budget constraint  $\mathcal{B} = 0$
  - Liquidity constraint  $\mathcal{L} \leq 0$  Lagrange multiplier  $\lambda$ 
    - Cash in advance, MIU, shopping time, New monetarism

- Any asset price

$$p_t^j = E_t \left[ SDF_{t,t+1} \underbrace{\frac{1}{1 - \lambda_t \frac{\partial \mathcal{L}}{\partial a^j}}}_{:= \Lambda_{t,t+1} \geq 1} (z_{t+1}^j + p_{t+1}^j) \right]$$

$$p_t^j = E_t \left[ \sum_{s=1}^{\infty} SDF_{t,t+s} \Lambda_{t,t+s} z_{t+s}^j \right] + \textit{Bubble}$$

= Fundamental value + liquidity value + bubble

# Seigniorage Rents from Money Creation: Public or Private

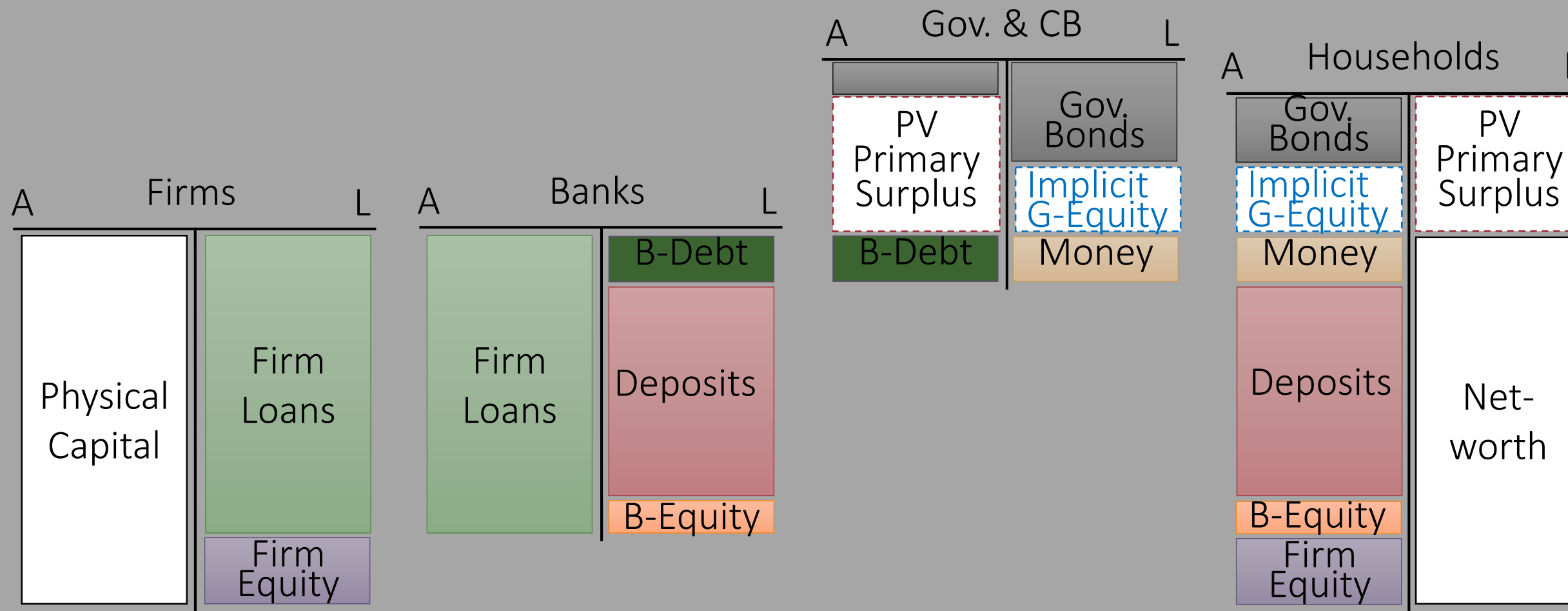
- Extreme form: issue bubbly liquid asset
  - No (social) resource costs Friedman '69
- More general: hold illiquid asset with high cash flow
- issue liquid asset with low cash flow
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A	L
<i>High fundamental value</i>	<i>Low fundamental value</i>
	<i>High liquidity value</i>
	<i>Bubble</i>

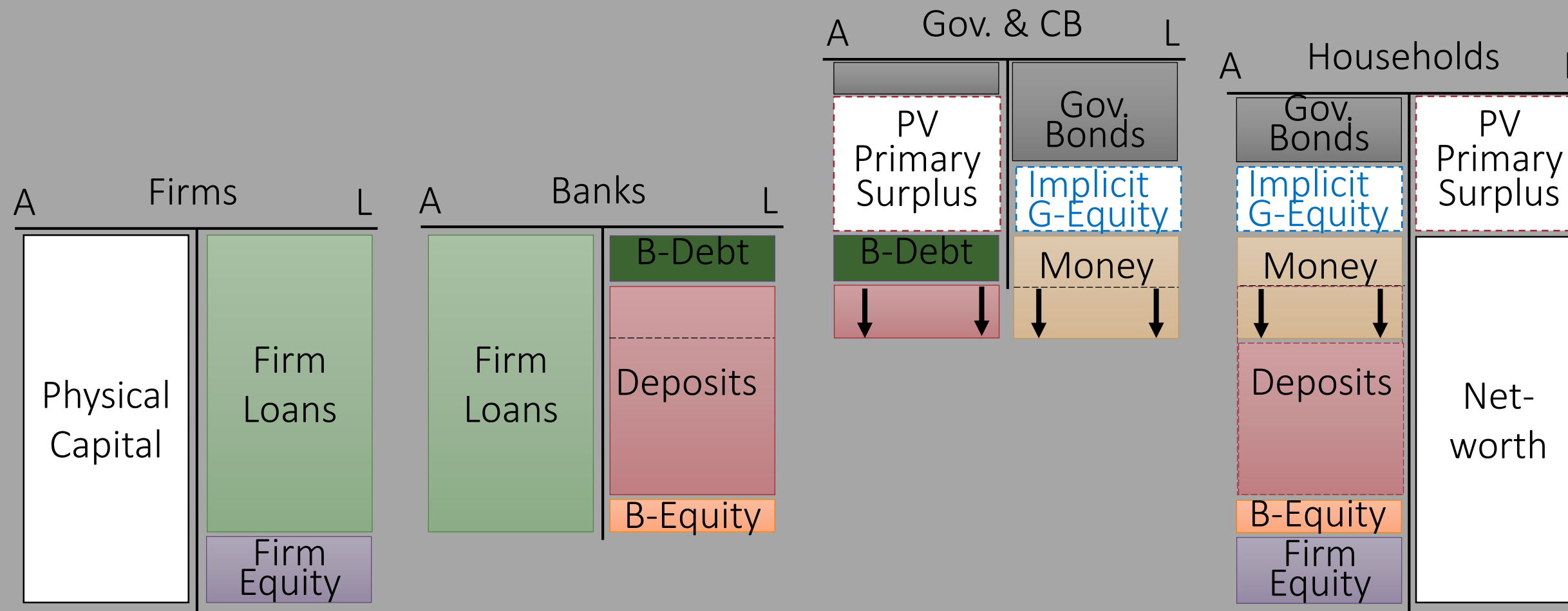
- Rents:
  - “free lunch”
  - Competition
    - Pass on rents to borrowers, but
    - Curse excessive supply, ICOs ⇒ inflation



# Equivalence: CBDC vs. Deposits



# Equivalence: CBDC vs. Deposits



- Key insight: Central bank “passes through” funding
  - If banks are non-competitive, Central Bank’s supply function has to be such that banks set the same deposit rates

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# What defines a (separate) currency?

1. Same unit of account
2. Convertibility

- Convertibility
  - Maintain value
  - Uniformity of money (“singleness”)
- ↔
- Backing of a currency
  - Currency board
  - Stable coin
- Account-based
  - Approval of payments
  - Verification of account owner
- ↔
- Token-based
  - Finality of payment

# International monetary system

- Digital Currency Areas
  - Def.: own unit of account or payment instrument only inside
  - Complementarity with digital platform (not geographic)
    - Price discounts, price discovery, transparency within
  
- Digital Synthetic World Currency
  - Symmetric supply of a safe asset  
(to avoid that flight to safety capital flows become cross border) (Brunnermeier & Huang)

## ... to sum up

- Digital platforms/eco-system, smartphone, tokens
  - Inversion of IO of financial activity
- New currency/platform competition – digital dollarization
  - Unbundling enhances currency competition
  - Re-bundling reduces
    - Interoperability, convertibility, limit product differentiation
- “Monetary Sovereignty” to manage macroeconomy
  - Private vs. Public Money – important role of CBDC/LOLR
- International monetary system – digital currency areas

*Is Bitcoin/Libra is like Napster  
for the music industry?*

# Based on

- The Digitalization of Money
    - With Harold James and Jean-Pierre Landau
  - On the Equivalence of Private and Public Money
    - With Dirk Niepelt
  - Digital Tokens and Platforms
    - With Jonathan Payne
  - Inverse Selection
    - With Rohit Lamba and Carlos Segura-Rodriguez
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