Central Bank Digital Currency and the Bank of Japan's Approach

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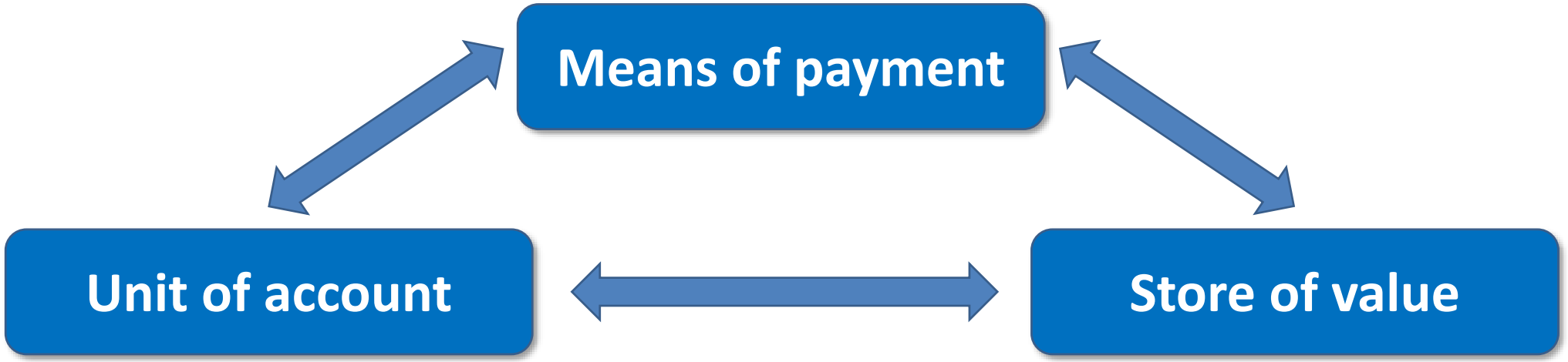
What is CBDC?

Functions of “money”



- As a means of payment, **transfer of money discharges financial obligations** created from transactions of goods and services (i.e., **settlement**)
- So as to ensure **stability of economic activities**:
  - Money should be **safe** (i.e., with minimal credit risk)
  - Transfer of money should become **irrevocable** (i.e., **finality**)
  - Financial obligations should be settled **immediately after transactions**

“Two-tiered system” of money

“Two-tiered system”

- **Central bank** supplies the **base money** (i.e., **banknotes** and **central bank deposits**).
- **Commercial banks** provide **deposits** through **credit creation** based on the base money.

Benefits

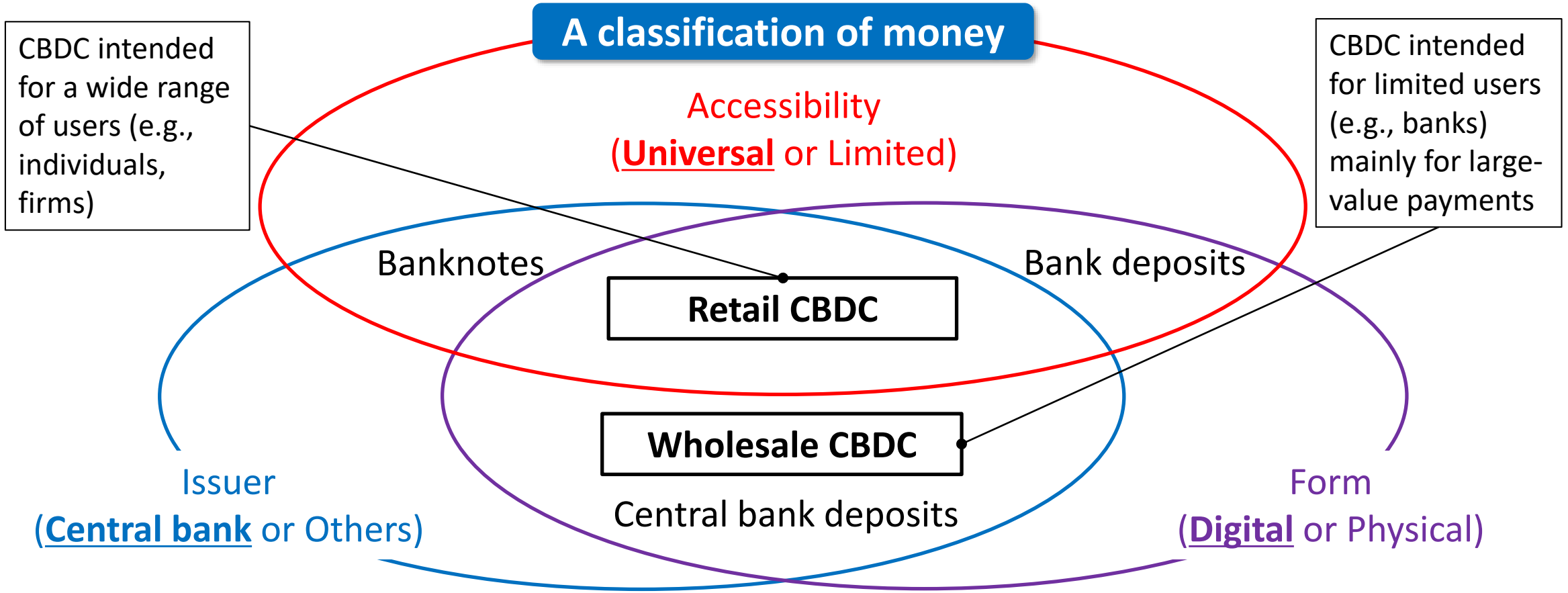
- **No need to evaluate and convert multiple units of currency**
- **Efficient allocation of financial resources** by private-led initiatives

Risk mitigation mechanisms

- Commercial banks' credit creation and maturity transformation could sometimes become a **risk to financial stability**, but:
  - **Deposit insurance** and central banks' **LLR** are in place.
  - “Narrow banking” has been proposed but has not come true.

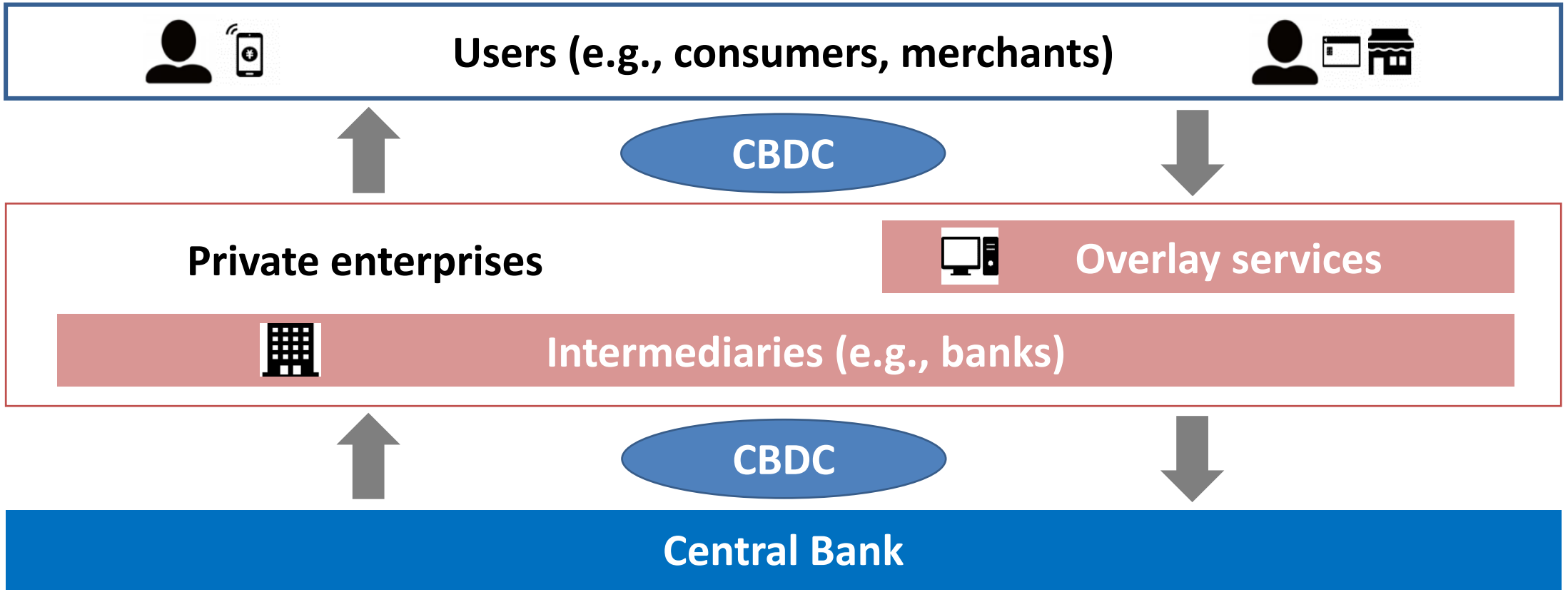
Central Bank Digital Currency (CBDC)

- Central Bank Digital Currency (CBDC) is defined as "a new form of **digital** central bank money that is **different from central bank deposits**, which have been held by banks."
- CBDC is a payment instrument that is a **direct liability of the central bank**.
- CBDC functions as a unit of account as it is **denominated in the fiat currency**.



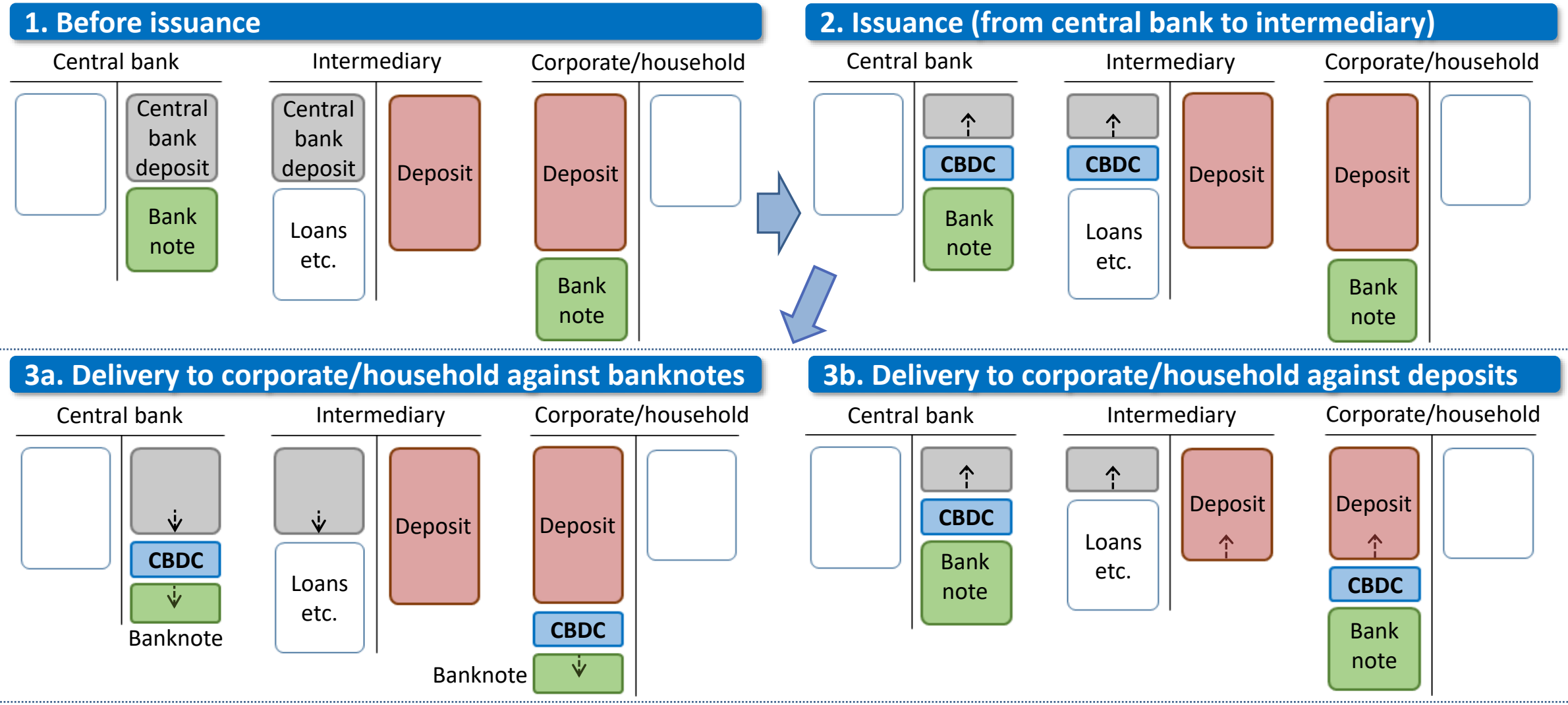
Issuance model

- Most central banks assume **users' CBDC access via intermediaries** (e.g., via banks).
  - Intermediaries and other private enterprises provide **overlay services** in accordance with user needs, leveraging their expertise.
  - The central bank designs and provides a **plain vanilla CBDC** that would serve as the basis or ingredient of such private services.



Direct liability of the central bank

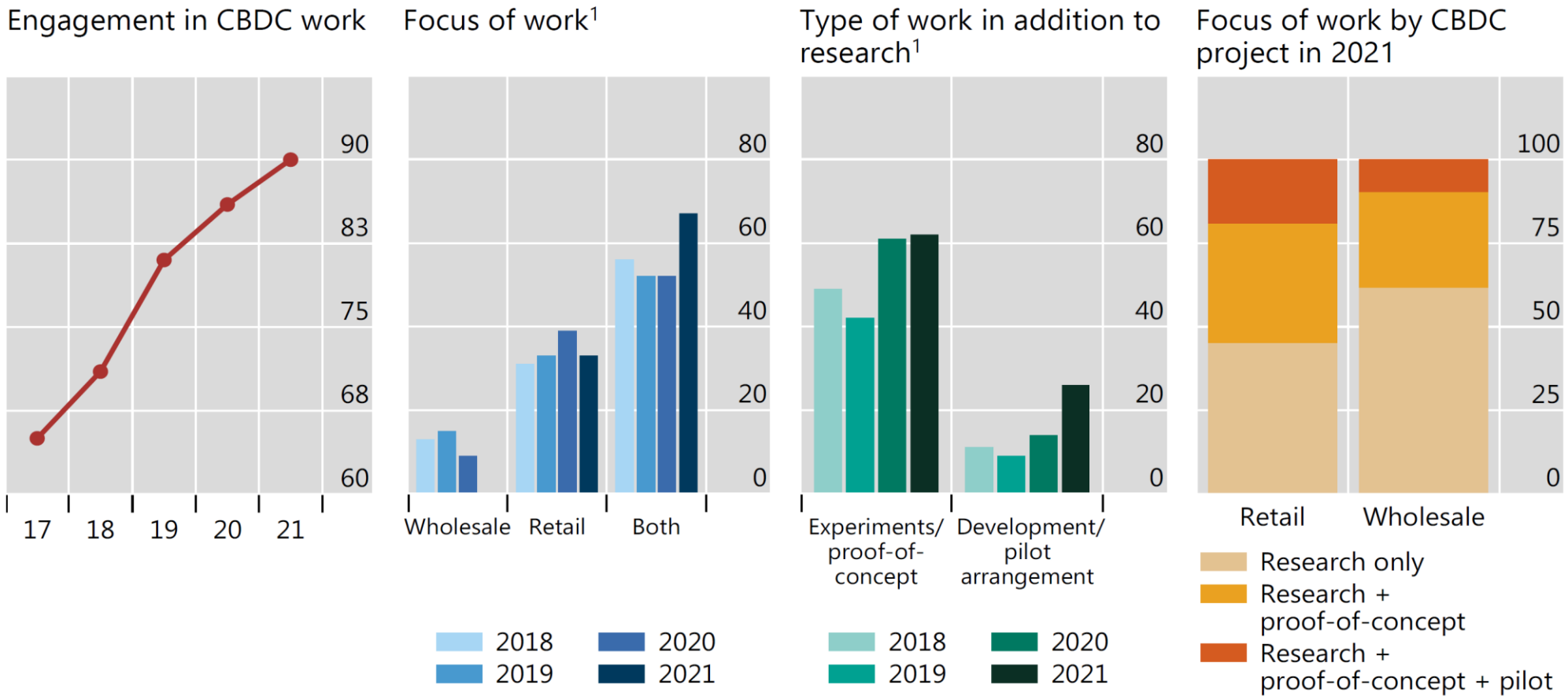
- CBCD will **never be liability of intermediaries, corporates or households**.
- **Intermediary's balance sheet shrinks** when CBDC is delivered against deposits.



Why is CBDC explored?

Central banks' explorations on CBDC

- **90%** of the respondents are engaged in some form of CBDC work.
- Central banks are particularly interested in **retail CBDCs**.
- Central banks in the **more advanced stages** are increasing.



Source: Kosse and Mattei (2022), "Gaining momentum – Results of the 2021 BIS survey on central bank digital currencies."

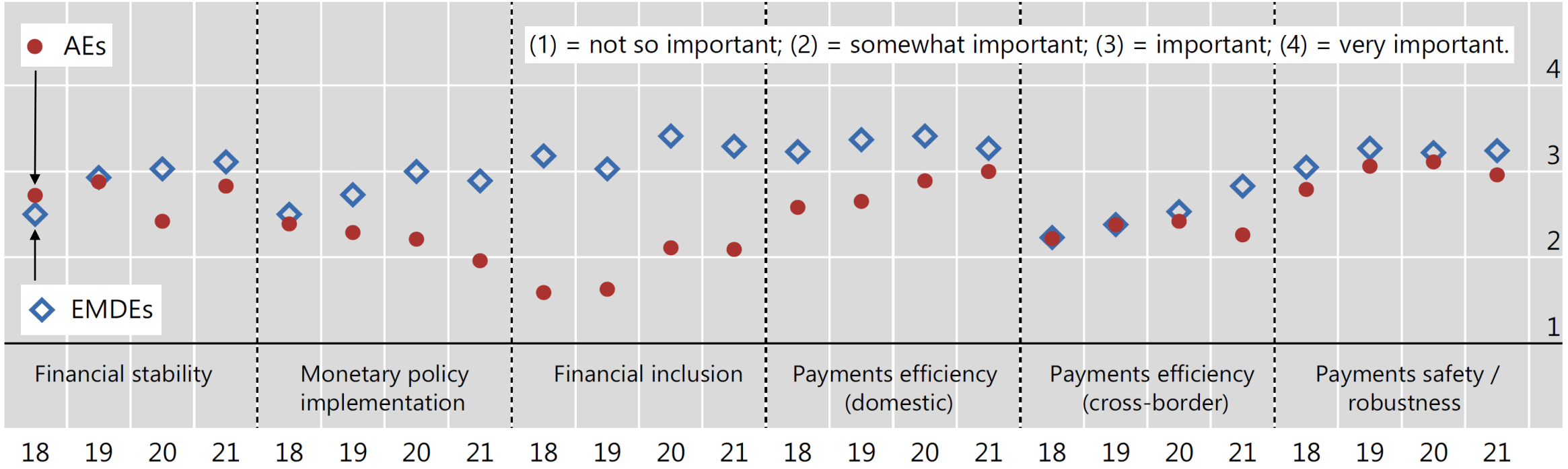
Why have central banks started explorations?

- Recent external factors that might drive central banks' CBDC researches include:
  - **Technological innovations** (e.g., mass adoption of the internet and mobile devices, evolution of computer processors)
  - **New entrants** into payment services and intermediation (e.g., BigTechs)
  - **Declining use of cash** in a few countries (e.g., Sweden)
  - **Tokenization** (e.g., stablecoins, security tokenization)

References: BIS (2018), "Central bank digital currencies"; Auer et al. (2021), "Central bank digital currencies: motives, economic implications and the research frontier."

Central banks' motivations for retail CBDC

- **EMDEs** are driven by **financial inclusion**-related motivations.
- **AEs** are driven by **domestic payments efficiency** and **payments safety**.



Source: Kosse and Mattei (2022), "Gaining momentum – Results of the 2021 BIS survey on central bank digital currencies."

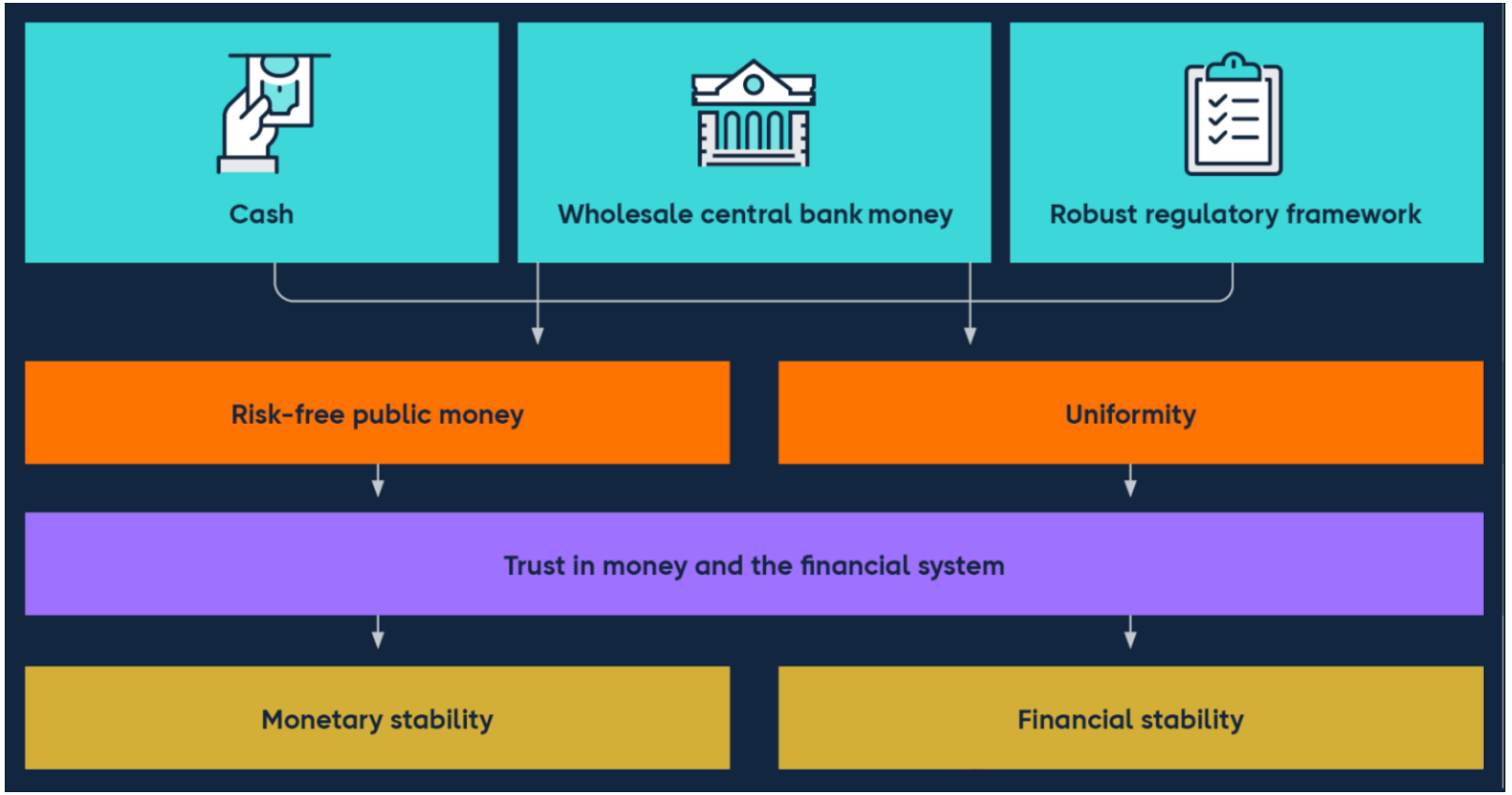
CBDC and financial inclusion

- 1.4B people remain outside the formal financial system.
- Financial inclusion barriers include:
  - **Geographic barriers** (e.g., remote rural areas, islands)
  - **Institutional factors** (e.g., lack of ID)
  - **Economic/market structure barriers** (e.g., exclusion of low income users)
  - **Characteristics of vulnerability** (e.g., age, gender, region, income, disabilities)
  - **Limited financial literacy**
  - **Limited trust in financial institutions** (e.g., bank failures, frauds)
- A CBDC alone may not address financial inclusion challenges, but it could play a **role as part of a broader suite of tools**.
- A CBDC and **other policies** have to grapple with the key reasons for financial exclusion.
- As the barriers to exclusion differ around the world, **clear distinction between pervasive problems for each jurisdiction** is important.

Source: Auer et al. (2022), "Central bank digital currencies: a new tool in the financial inclusion toolkit?"

Central bank money as the monetary anchor

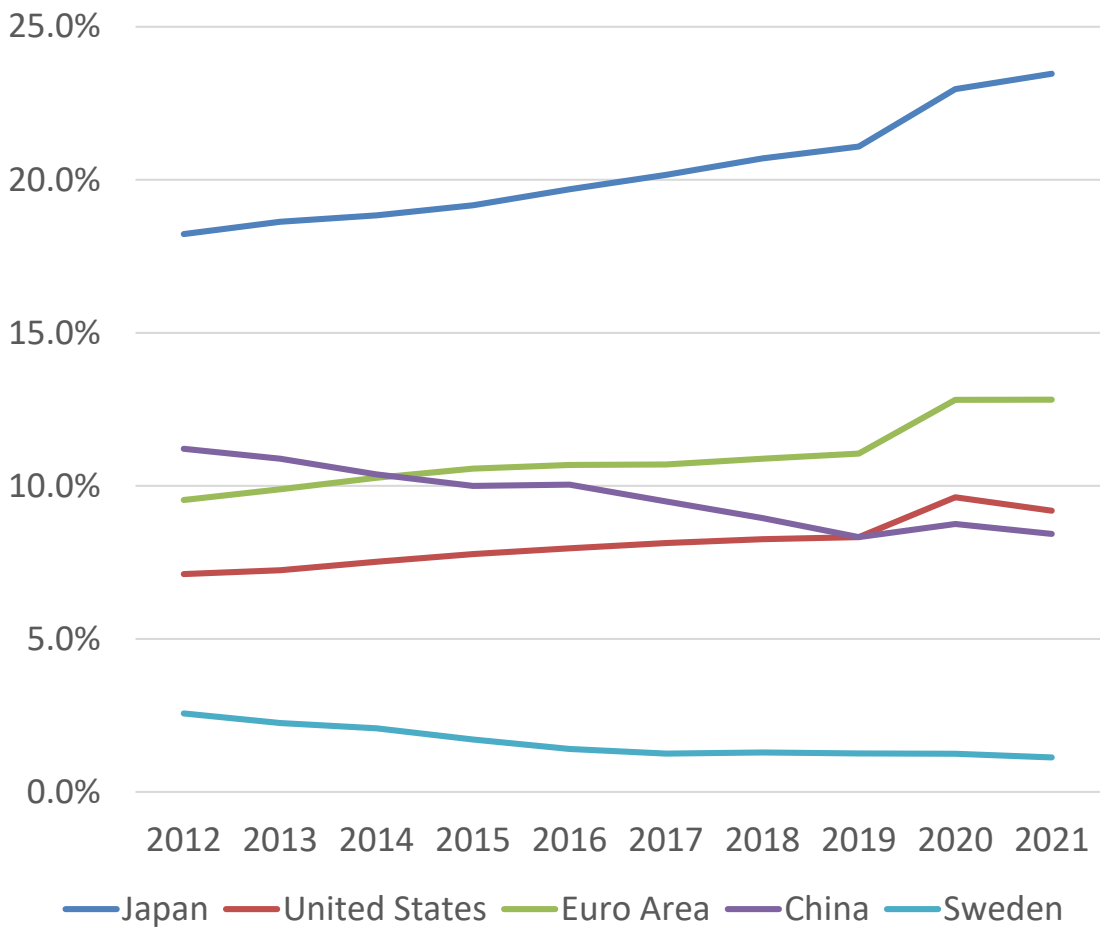
- As use of cash declines, some central banks revisit '**uniformity of money**.'
  - All forms of money (e.g., bank deposits, cash) are **valued equally** ('at par' or 'face value'), **denominated in a common currency** and **convertible with each other**.
  - It is delivered by three pillars including **retail and wholesale central bank money**.



Source: BOE and HM Treasury (2023), "The digital pound: new form of money for households and businesses?"

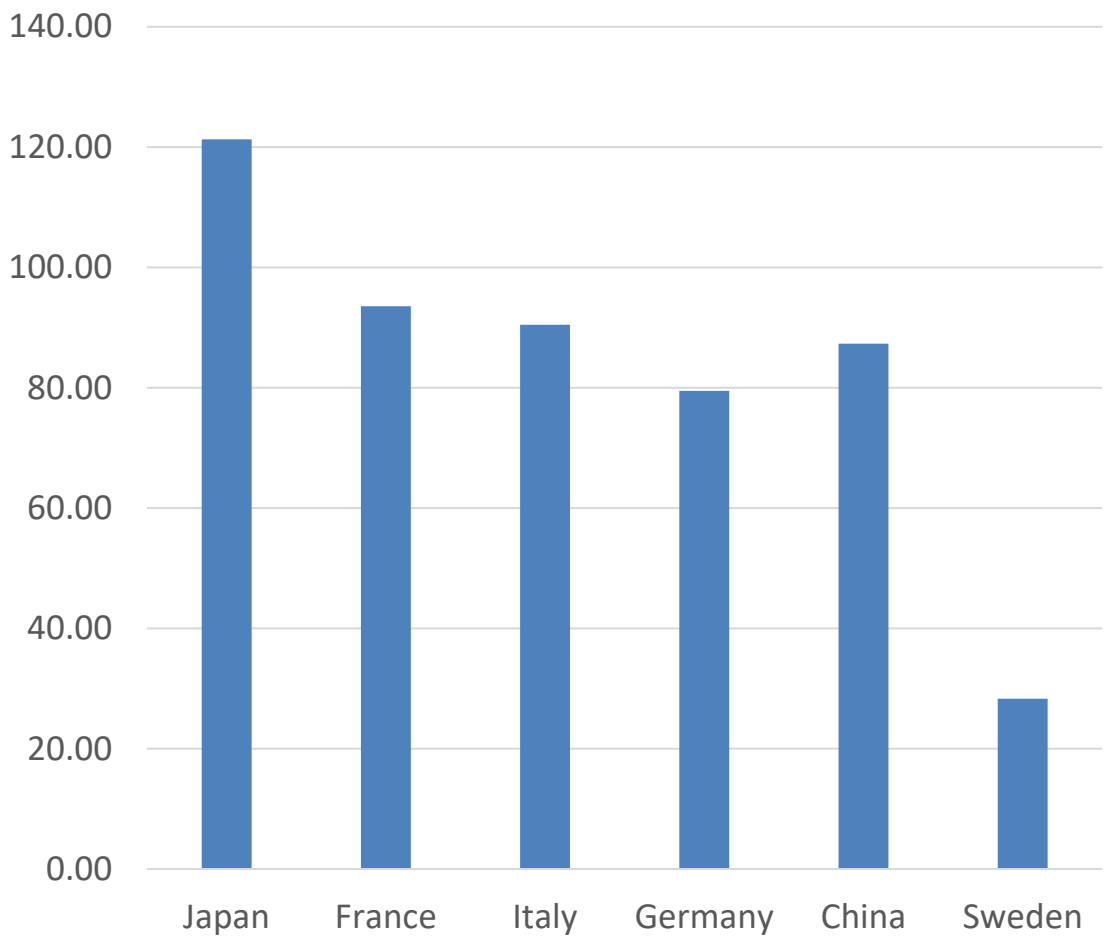
Cash has been King in Japan

Cash in circulation (% of nominal GDP)



Source: BIS, "Red Book statistics for CPMI countries."

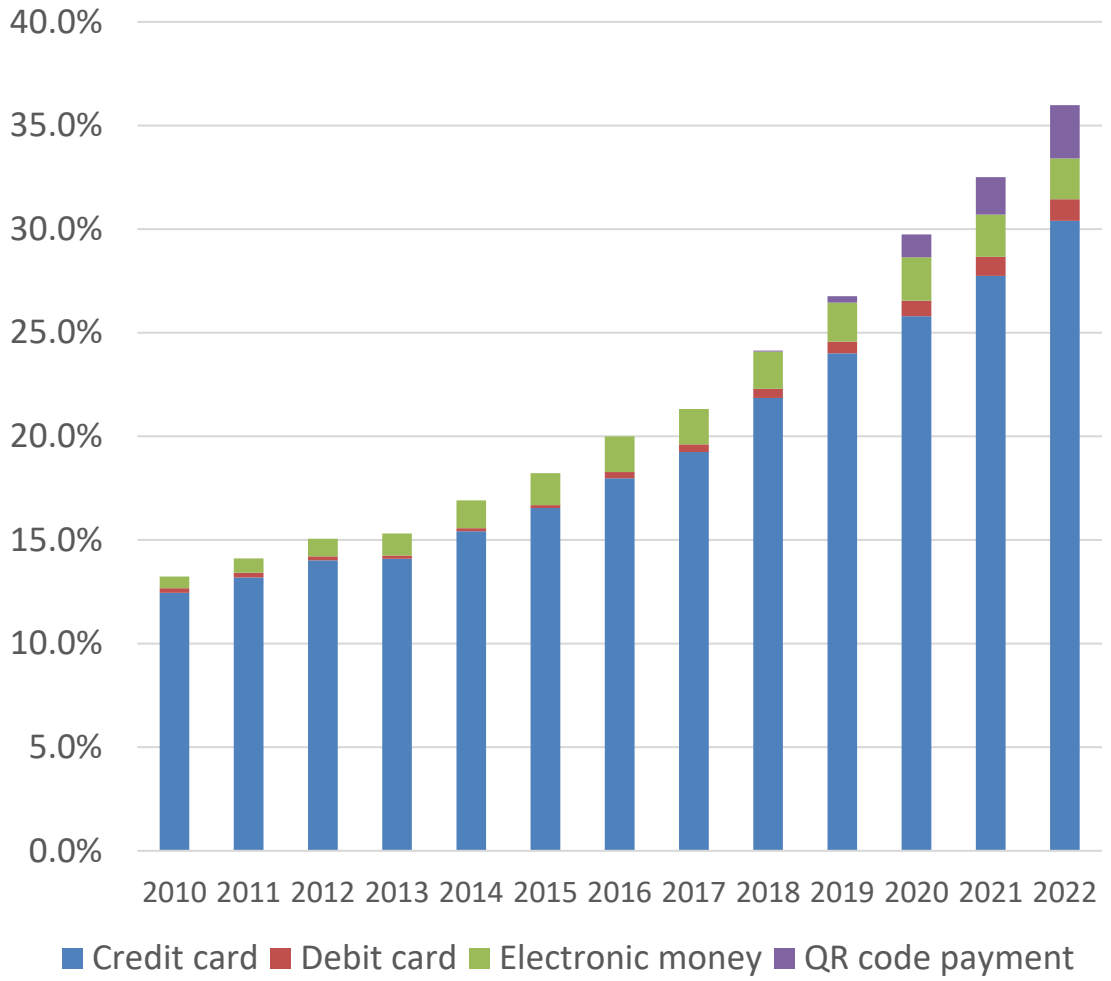
Number of ATMs (per 100,000 adults)



Source: IMF, "Financial Access Survey."

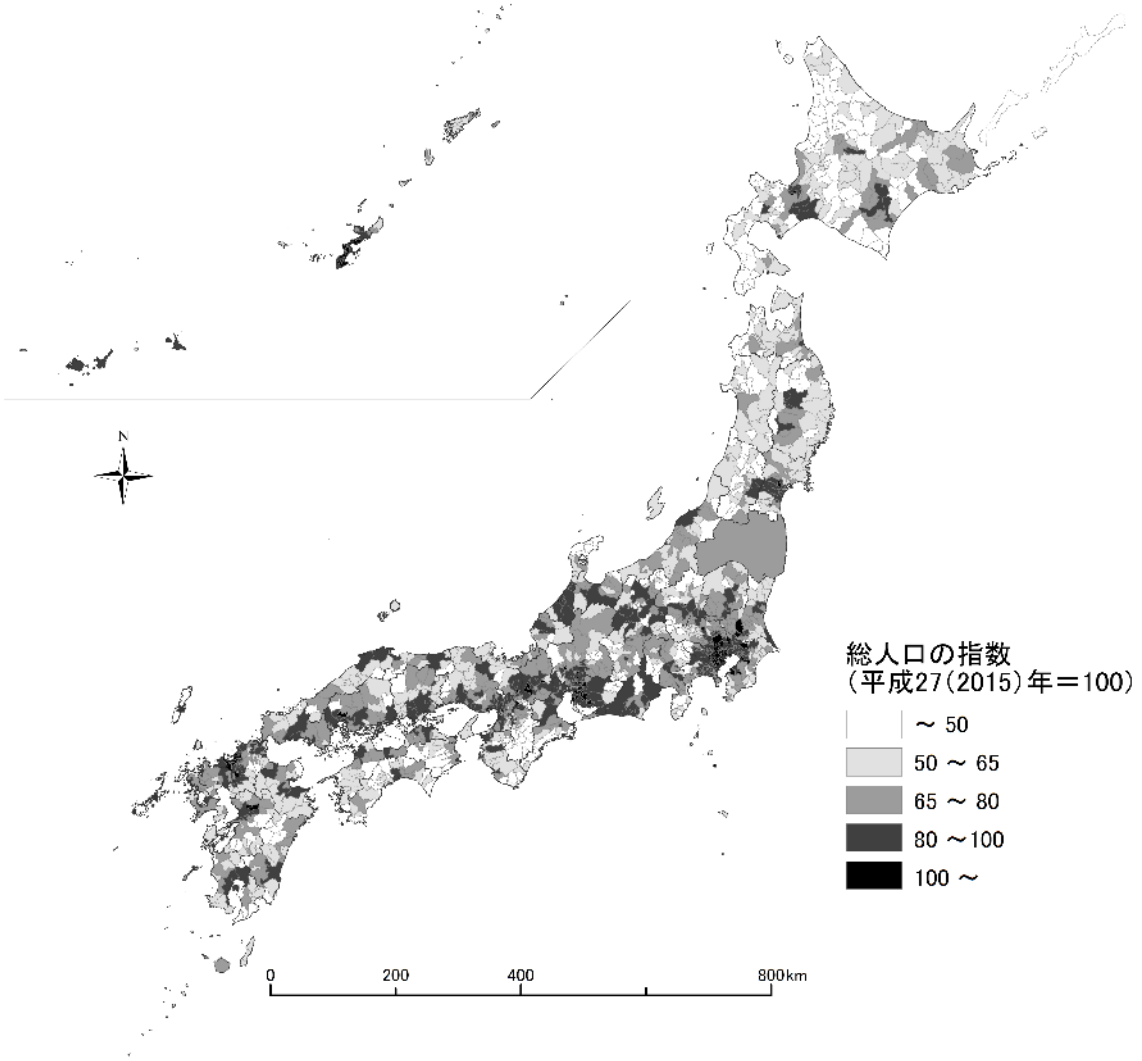
Cash continues to be King in Japan?

Cashless payment ratio (%)



Source: METI

Population in 2045 (index, 2015=100)



Source: National Institute of Population and Social Security Research

Payment market has been competitive in Japan

Source: CrowdCast, Ltd., 2022.

Economics of payment services

- Some characteristics of payment services are likely to make it difficult to achieve the efficient equilibrium by price mechanism.

Demand side: network externalities

  - The more people use a payment service, the more its **utility increases**.
    - Even if a more efficient new service emerges, one is not willing to migrate unless the new service has sufficient other users.
    - If others migrate to a less efficient new service, one is force to migrate to the inefficient service.

Supply side: economies of scale

  - Operating a digital payment service requires a substantial **fixed cost**.
  - The less the number of service providers is, the less total production cost becomes. A **natural monopoly** exists if multi-firm production is more costly than production by a monopoly.

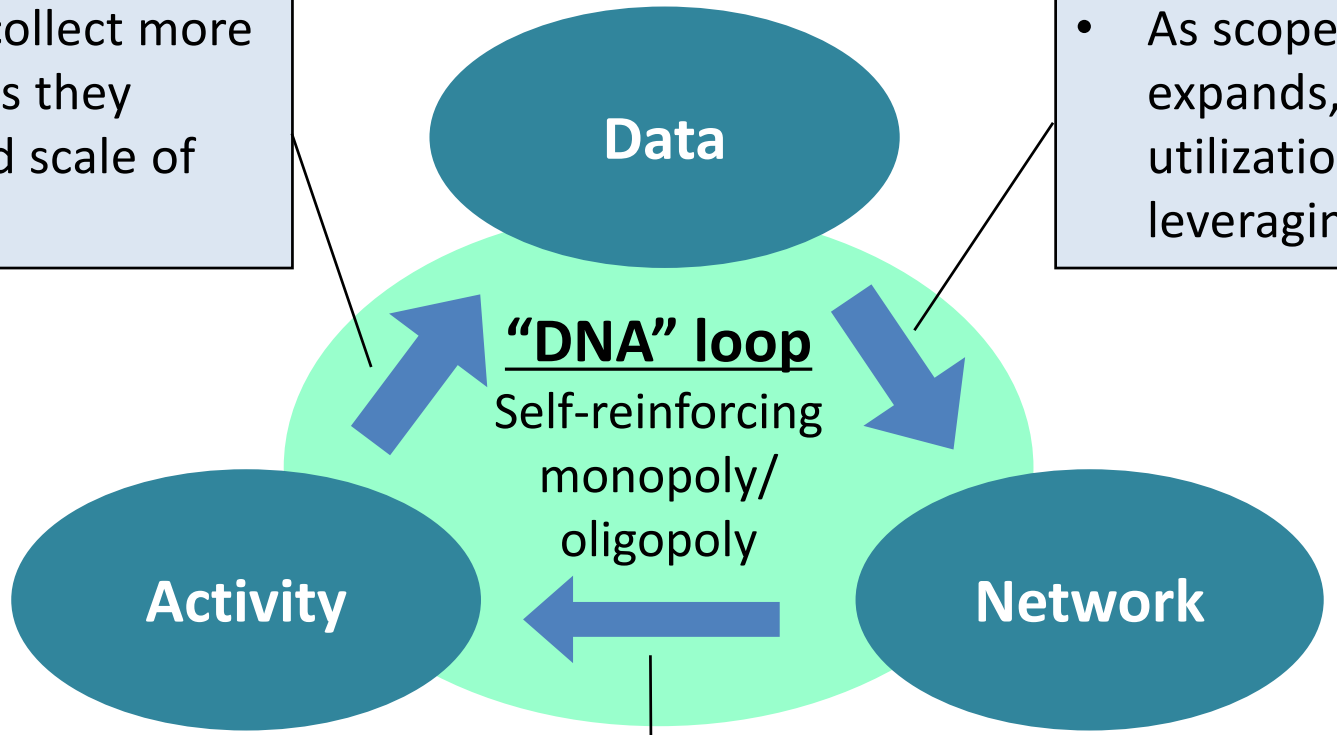
- **Interoperability** across different payment services might mitigate implications of such characteristics.

Data Network Activity Loop

- **Monopoly/oligopoly** driven by "DNA" loop could **impair efficient resource allocation**.
- Consumers could be **forced to provide more personal data for limited rewards**, because of weakened bargaining power.

- Platformers can collect more consumer data, as they expand scope and scale of their services.

- As scope and scale of data expands, the quality of data utilization accelerates, leveraging on network effects.



- Data utilization pushes up revenues, which enable further investments and business expansions.
- Data helps entry to new businesses, which contributes to expansion of product portfolio.

How are CBDCs explored in other jurisdictions?

China: e-CNY pilots

Key developments

- PBOC has launched CBDC **(e-CNY) pilots** since the end of 2019, expanding pilot areas (26 municipalities across 17 provinces at present).
- As of December 2022, CBDC in circulation amounted to 13.61 billion yuan (i.e., **0.13% of M0**).
- PBOC continues to work on: 1) pilot R&D project; 2) institutional arrangements and rules; and 3) research on major issues, with **no timetable for final launch** at present.

Motivations

- To diversify the forms of cash provided to the public by the central bank, **satisfy the public's demand for digital cash** and **support financial inclusion**
- To support **fair competition, efficiency and safety** of retail payment services
- To echo the international initiative and explore the improvement of **cross-border payments**

Source: PBOC (2021), "Progress of Research & Development of E-CNY in China."

Euro Area: digital euro project

Key developments

- ECB launched the **investigation phase** of a digital euro project in July 2021.
  - ECB has published **progress reports** in September 2022, December 2022 and April 2023, carrying out **market research on possible solutions** from January 2023.
- European Commission will adopt **legislative proposal** in the Q2 of 2023.
- ECB will **deliver high-level design** and decide if it will launch the **realization phase** in autumn 2023.

Motivations

- "If cash is used less and less, public money could ultimately lose its **role as the monetary anchor**"
- "**Private providers cannot truly replicate** the role of central bank money"
- "Private sector solutions tend to be **dominated by a handful of providers** that benefit from network effects … it could exacerbate the risk of our European payments market being dominated by **non-European solutions and technologies**"

Source: Lagarde and Panetta (2022), "Key objectives of the digital euro."

United States

Key developments

- **Boston Fed** and **MIT** started **Project Hamilton**, a CBDC prototyping project, in 2020 and completed in December 2022.
- **Federal Reserve** published a **discussion paper** "Money and Payments: The U.S. Dollar in the Age of Digital Transformation" in January 2022.
- **President Biden** ordered on **Ensuring Responsible Development of Digital Assets** in March 2022, followed by reports from the **Treasury** and other government agencies in September 2022.

Potential benefits

- Safely meet future needs and demands for payment services
- Improvements to cross-border payments
- Support the **dollar's international role**
- **Financial inclusion**
- Extend public access to safe central bank money

Developments in other jurisdictions

The Bahamas	In October 2020, Central Bank of the Bahamas announced nationwide launch of **Sand Dollar**.
ECCU	In June 2022, ECCB announced launch of **DCash Pilot** in Anguilla, resulting in adoption in all eight member countries.
Nigeria	In October 2021, Central Bank of Nigeria announced official launch of **eNaira**.
Jamaica	In June 2022, amendments to the Bank of Jamaica Act to authorize CBDC (**JAM-DEX**) issuance passed. The Bank works on the phased national rollout.
India	In March 2022, amendments to the Reserve Bank of India Act to authorize CBDC issuance passed. In October 2022, the Bank published a concept note on CBDC, followed by **digital Rupee-Retail pilot** launched in December 2022.

UK	In February 2023, BOE and HM Treasury published a **consultation paper**.
Canada	In May 2023, BoC published a **consultation paper**.
Sweden	In February 2020, Riksbank launched **e-krona pilot**. In March 2023, the Inquiry to investigate the role of the State in the payment market published a report.

Group of Central Banks: foundational principles

1	**Do no harm to wider policy objectives**	New forms of money supplied by the central bank should continue supporting the fulfilment of public policy objectives and should not interfere with or impede a central bank's ability to carry out its mandate for monetary and financial stability.
2	**Ensure co-existence and complementarity of public and private forms of money**	Central banks have a mandate for stability and proceed cautiously in new territory. Different types of central bank money - new (CBDC) and existing (banknotes, reserve or settlement accounts) - should complement one another. In addition, they should coexist in a wider payment ecosystem that supports public policy objectives and will include and support robust private money (eg commercial bank accounts).
3	**Promote innovation and efficiency**	Without continued innovation and competition to drive efficiency and effectiveness of a jurisdiction's payment system, users may adopt other less-safe instruments or currencies, leading to less reliable payments, economic and consumer harm, and the potential erosion of monetary and financial stability. The payment ecosystem is comprised of public authorities (in particular the central bank) and private agents (eg commercial banks and payment service providers), both of whom have roles to play in ensuring a high-level of innovation.

Source: Group of Central Banks (2020), "Central bank digital currencies: foundational principles and core features."

G7 Public Policy Principles for Retail CBDC

Principle 1.
Monetary and financial stability

Principle 2.
Legal and governance frameworks

Principle 3.
Data privacy

Principle 4.
Operational Resilience and Cyber Security

Principle 5.
Competition

Principle 6.
Illicit finance

Principle 7.
Spillovers

Principle 8.
Energy and Environment

Principle 9.
Digital economy and innovation

Principle 10.
Financial inclusion

Principle 11.
Payments to and from the public sector

Principle 12.
Cross border functionality

Principle 13.
International development

Source: G7 (2021), "Public Policy Principles for Retail Central Bank Digital Currencies (CBDCs)."

How does the Bank of Japan explore CBDC?

Bank of Japan's approach

- While the Bank **currently has no plan to issue CBDC**, from the viewpoint of ensuring the stability and efficiency of the overall payment and settlement systems, the Bank considers it important to **prepare thoroughly to respond to changes** in circumstances in an appropriate manner.
- The Bank will carry out **experiments** and deepen its exploration of **institutional arrangements**, coordinating with stakeholders at home and abroad.
- **The future payment and settlement systems suitable for a digital society** need to be discussed with various stakeholders. CBDC could have more of a function than merely as a payment instrument alongside cash. It could serve as the basis for innovation of private service providers to offer various new payment services.
- As long as there is public demand for **cash**, the Bank will stay committed to supplying it.

Functions and roles

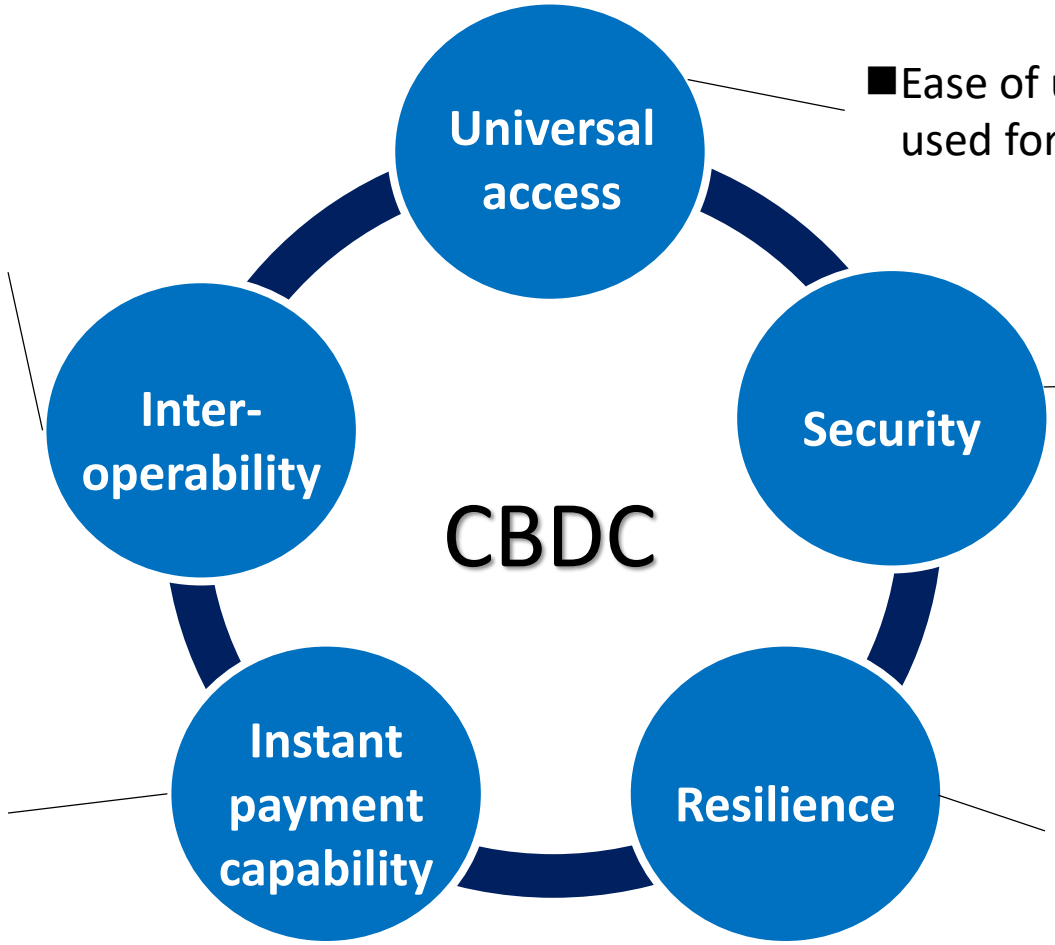
Introducing a payment instrument alongside cash

Supporting private payment services

Developing payment and settlement systems suitable for a digital society

Core features

- If the Bank were to issue CBDC, CBDC would need to have the **following features**.
  - When introducing CBDC, it might be appropriate to implement the features of **universal access and resilience in a phased manner** according to the **use of cash**.

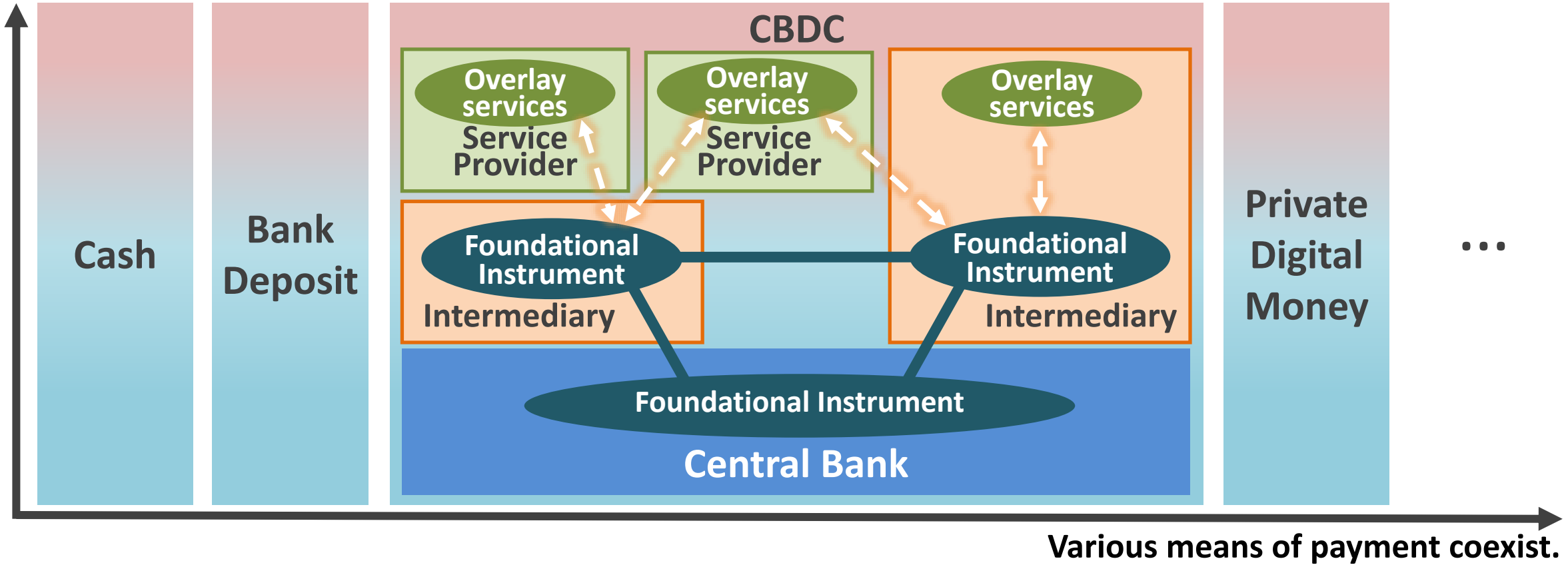


- Ease of use and portability of devices used for transfers/payments
- Counterfeit deterrence technology
- Security to prevent various illicit activities
- 24/7/365 availability
- Offline use support
- Settlement finality
- Instant payment capability
- Sufficient performance
- Scalability for the future
- Interoperability with other payment systems
- Flexible architecture to adapt to changes in the future

Coexistence: horizontal and vertical

- **Convertibility** is critical, but excessive shift to CBDC could cause **disintermediation**.
- CBDC system would be divided into "**foundational instrument**" and "**overlay services**."

Ecosystems develop as diverse players become involved.



Various means of payment coexist.

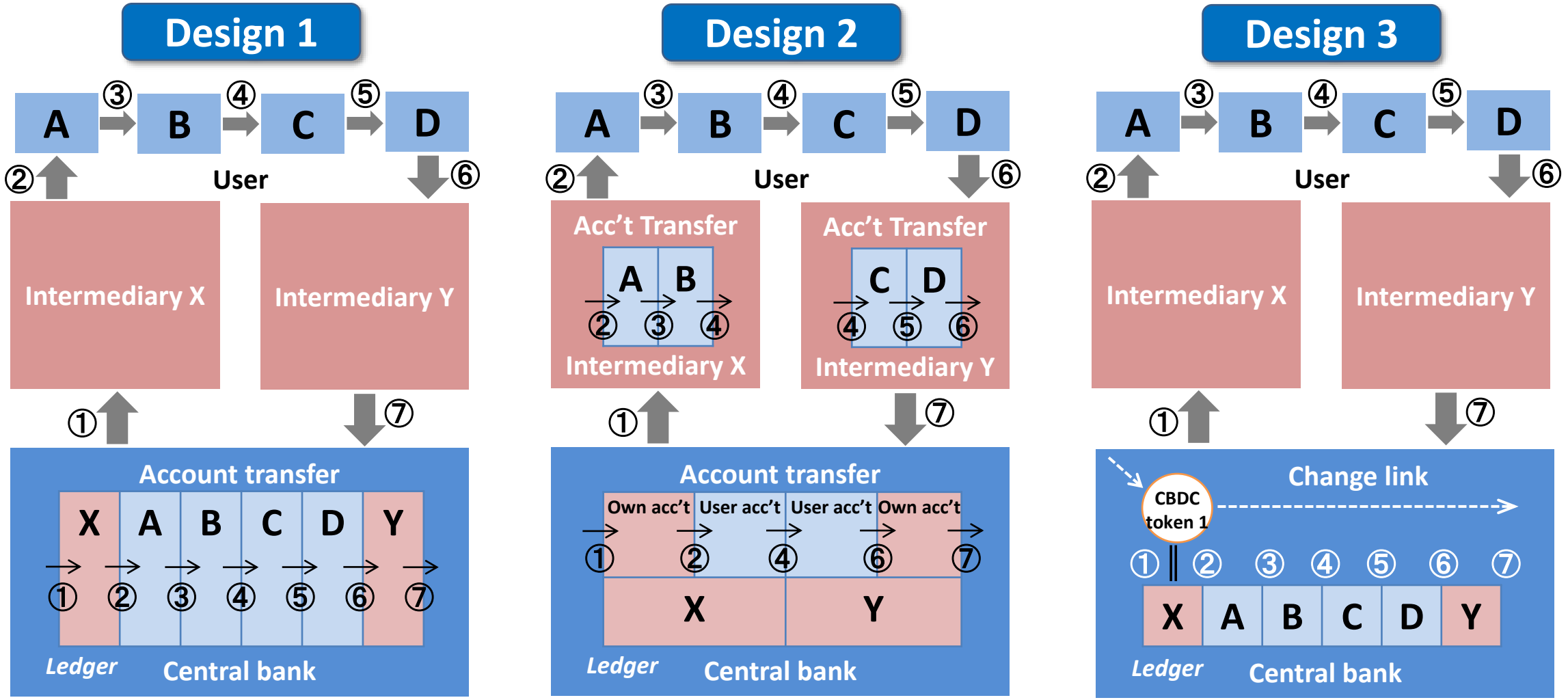
Experiments

- The Bank has been testing **technical feasibilities**.

PoC Phase 1	PoC Phase 2	Pilot Program	
Develop an experimental environment for the CBDC system and conduct experiments on the **basic functions** of CBDC (issuance, distribution, and redemption). **April 2021 - March 2022**	Implement **additional functions** of CBDC in the experimental environment developed in Phase 1 and test their feasibility. **April 2022 - March 2023**	Test the technical feasibility not fully covered by the PoCs; utilize the skills and insights of private businesses in terms of technology and operation. **Started April 2023**	If necessary, expand the scope of the program and of participants in a phased manner.

PoC Phase 1 : setup

- Focusing on the ledger(s), basic functions were tested for three design alternatives, which differ in **ledger structures** and **data formats**.



PoC Phase 2: focus areas

Additional functions

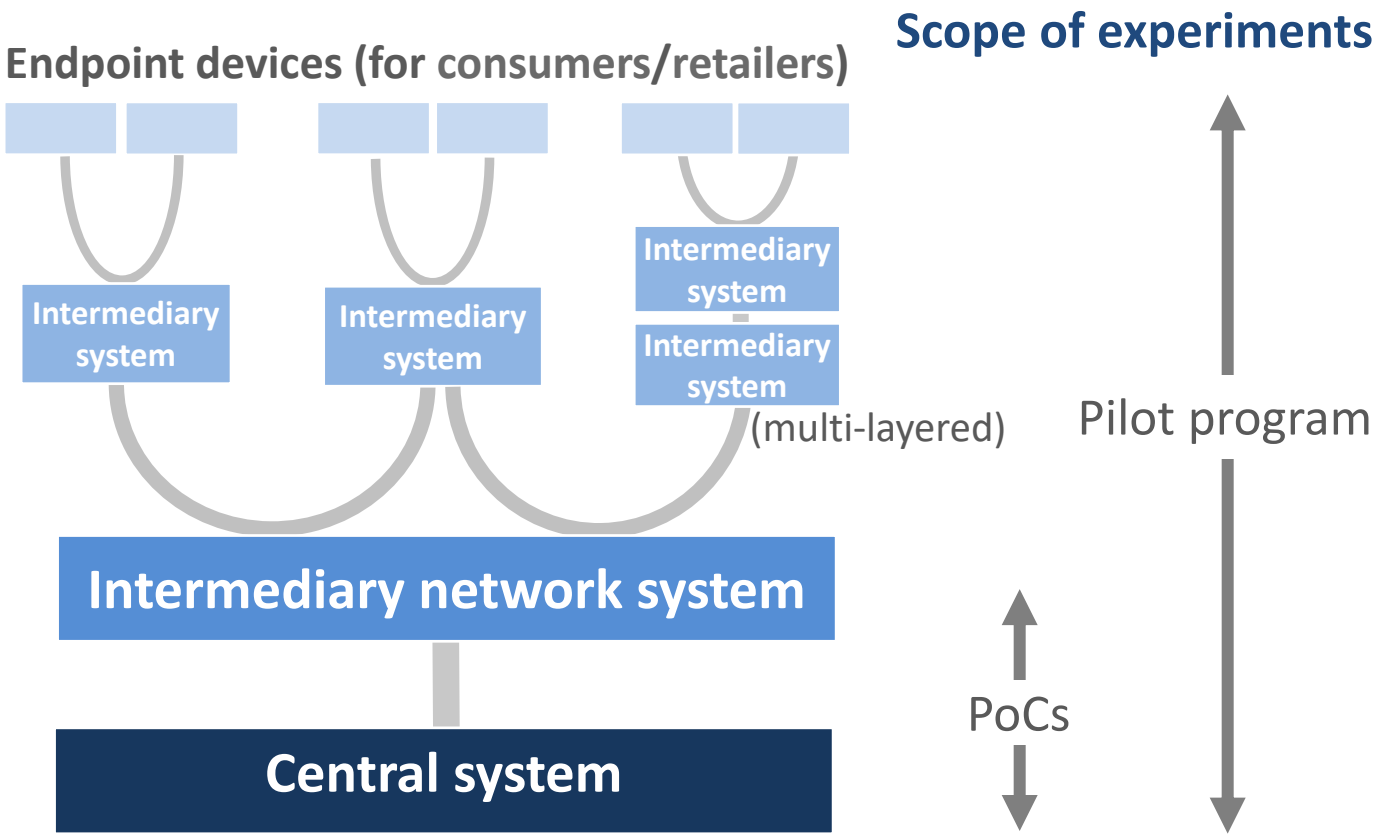
Economic design Safeguards ensuring the stability of the financial system	• Limits on holdings • Limits on amounts and number of transactions • Swing function • Appling interest to holdings
Improving convenience of payment	• Scheduled remittance instruction by users • Batch remittance and pull payment at user request
Communication among intermediaries/Communication with external systems	• Multiple accounts to one user • Limits per user, based on the above assumption • Methods for communication with external systems

New technologies

Flexible-value token model	• Phase 1 evaluated the fixed-value token model in which token's face value is fixed and tokens are converted to small ones as needed. • Phase 2 explored the flexible-value token model in which token's face value fluctuates and tokens are merged or split as needed.
NoSQL database	• Traditional relational databases (RDB) have been used since Phase 1. • Phase 2 explored the potential for using NoSQL (Not only SQL) databases.

Pilot program: system development for experiments

- In April 2023, the Bank launched a **pilot program**.
- The Bank will develop a system for experiments to test the **end-to-end process flow**, while exploring measures for **connection with external systems**.
- At present, **actual transactions** among merchants and consumers are **not assumed**.



Pilot program: CBDC Forum

- So as to proceed with institutional arrangements an appropriate manner, the Bank will establish a **CBDC Forum with private businesses related to retail payments**.
  - The findings of **system development for experiments** and discussions at the **CBDC Forum** are to be **shared**. In addition, the Bank will issue **public updates**.