Digital currency policy economics

Part 2: The industrial organization of payment markets and fintech entry

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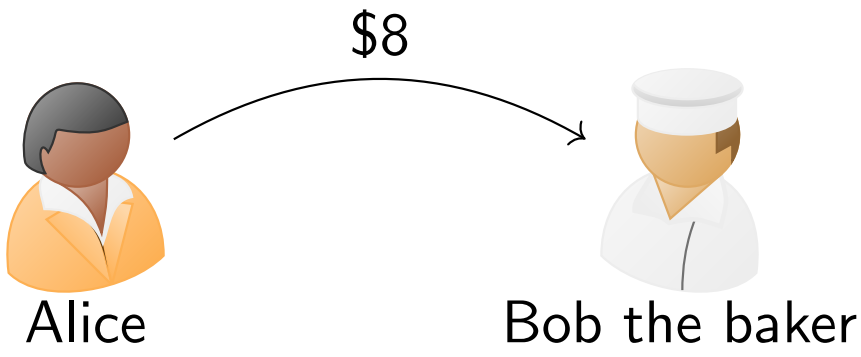
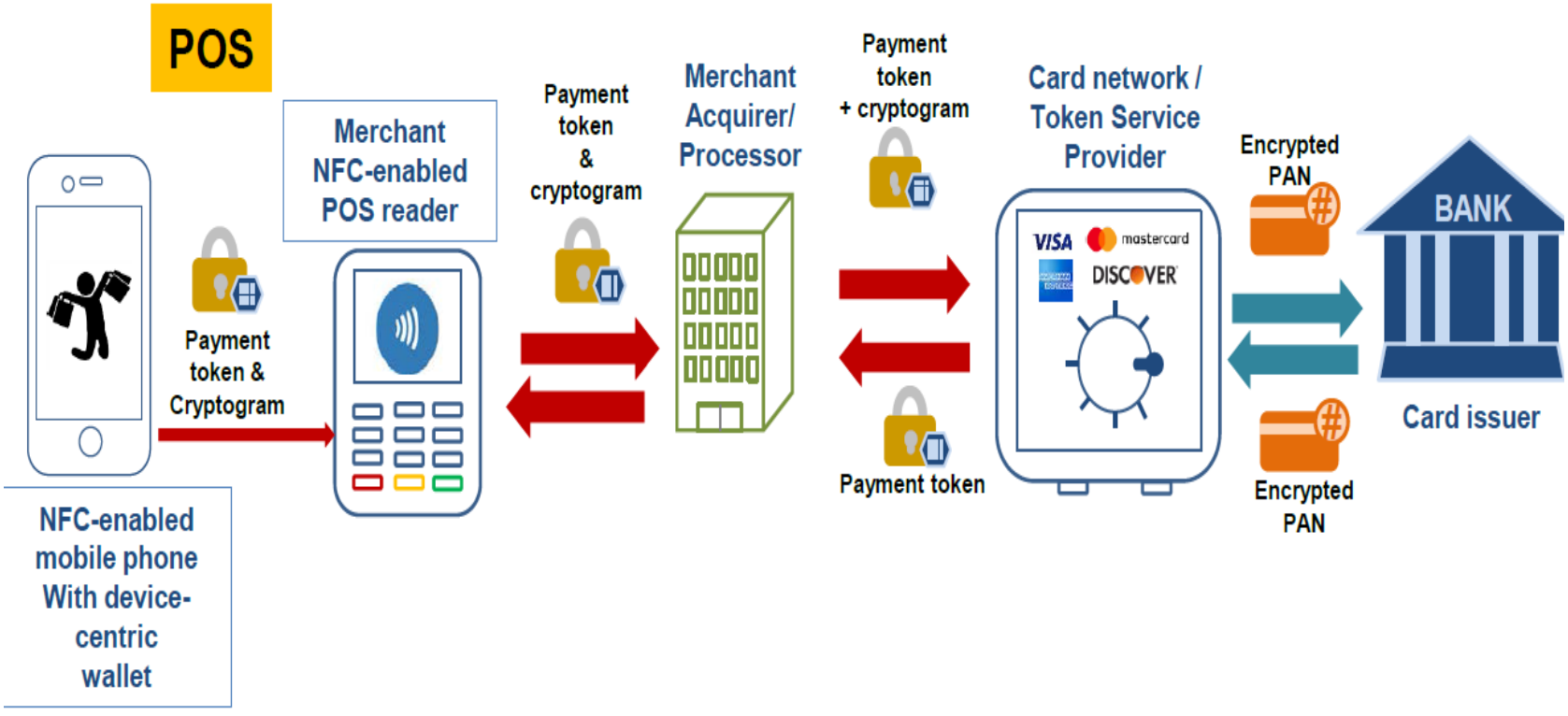
A payment



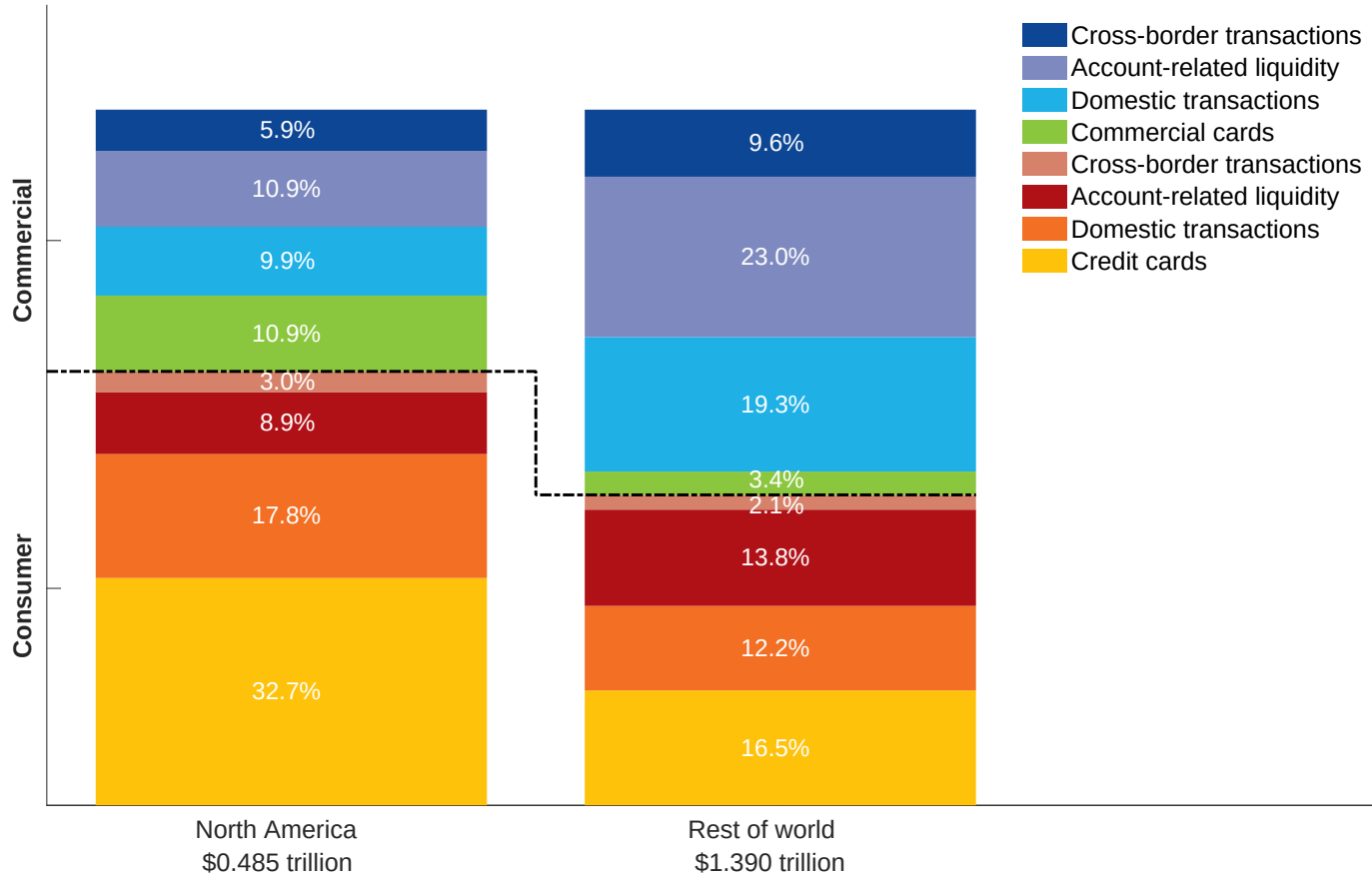
Illustrative cryptographic payment authorization flow



Source: Federal Reserve Bank of Boston, U.S. Payments Forum.

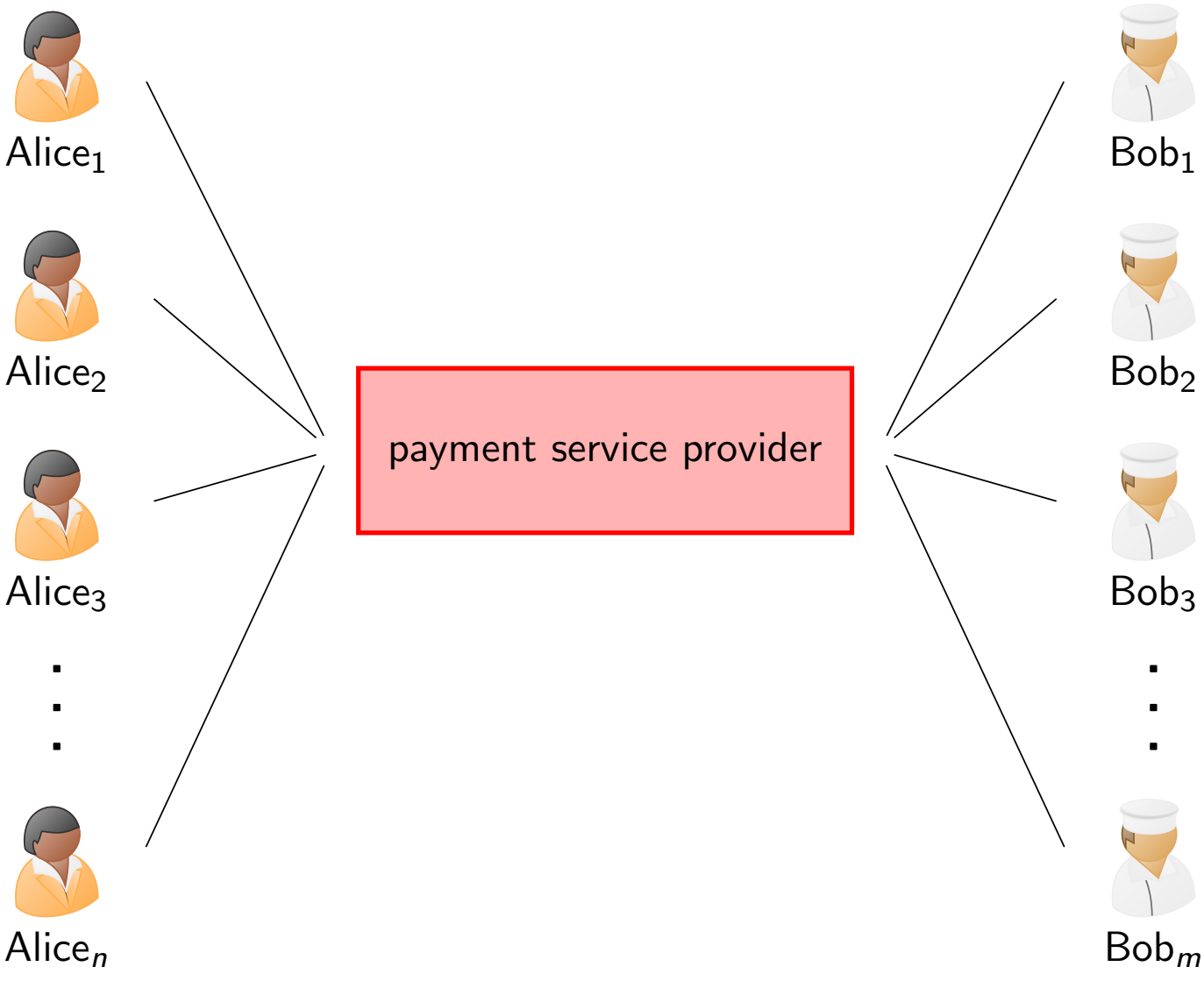
Disruptable bank-based payment system revenues

Ratio of payment revenues to GDP: North America 2.1% versus EMEA: 1.6%



Data source for figure: McKinsey Global Payments Report, October, 2021.

A monopolistic payment service market



Two-sided markets with network effects: monopoly case

- Unit masses of Alice type and Bob type agents.
- Type-i utility $u_i(q_j; v_i, \gamma_i) = v_i + \gamma_i q_j$, with *iid* preference coefficients $(v_i, \gamma_i) \in \mathbb{R}^2_+$.
- Given a type-i total fee of $P_i = p_i + f_i q_j$, the fraction of type-i agents joining the platform is

$$q_i = D(P_i, q_j) \equiv \mathbb{P}(\{(v_i, \gamma_i) : v_i + \gamma_i q_j \geq P_i\}).$$

- With onboarding cost c_i and transaction cost σ, the profit of the platform is

$$\max_{P_1, P_2} \sum_{i=1}^{2} (P_i - c_i) q_i - \sigma q_i q_j.$$

For references, see Jullien, B., A. Pavan and M. Rysman, "Two-sided markets, pricing, and network effects," Toulouse School of Economics, July 2021.

Solving the monopoly case

- The elasticity of demand of type i is

$$\epsilon_i(P_i; q_j) = -\frac{\partial D_i(P_i; q_j)}{\partial P_i} \frac{P_i}{D_i(P_i; q_j)}.$$

- Under mild conditions, the optimal total fee is

$$P_i = c_i + q_j(\sigma - \tilde{\gamma}_j(P_1, P_2)) + \frac{P_j}{\epsilon_i(P_i, q_j)},$$

where

$$\tilde{\gamma}_j(P_1, P_2) = \mathbb{E}\left(\gamma_j \mid v_j + \gamma_j q_i = P_j\right).$$

is the expected interaction benefit experienced by type-j marginal agents.

Compare with the welfare maximizing fees

- Total welfare is

$$\sum_i \mathbb{E}\left[(v_i + \gamma_i q_j - c_i)1_{\{v_i+\gamma_i q_j \geq P_i\}}\right] - \sigma q_i q_j.$$

- The welfare-maximal total fee is

$$\bar{P}_i = c_i + \bar{q}_j(\sigma - \bar{\gamma}_j(\bar{P}_i, \bar{P}_j)),$$

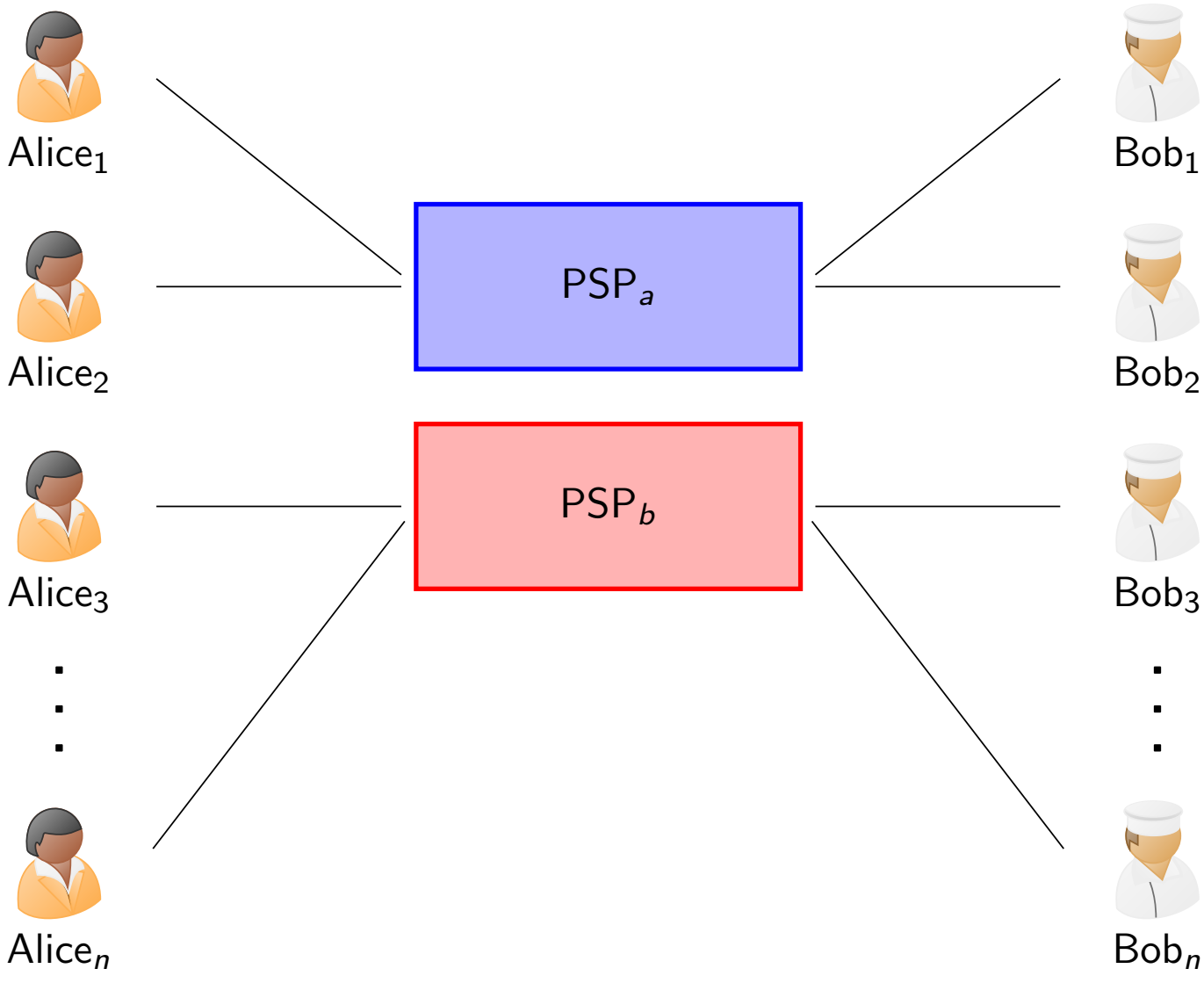
where

$$\bar{\gamma}_j(\bar{P}_1, \bar{P}_2) = \mathbb{E}\left(\gamma_j \mid v_j + \gamma_j \bar{q}_i \geq \bar{P}_j\right)$$

is the expected interaction benefit experienced by *all participating* type-j agents.

- The average-less-marginal participant interaction benefit $\bar{\gamma}_j(\bar{P}_1, \bar{P}_2) - \tilde{\gamma}_j(P_1, P_2)$ is the Spence (1981) distortion.

A duopoly of payment service provision



Some strategic effects

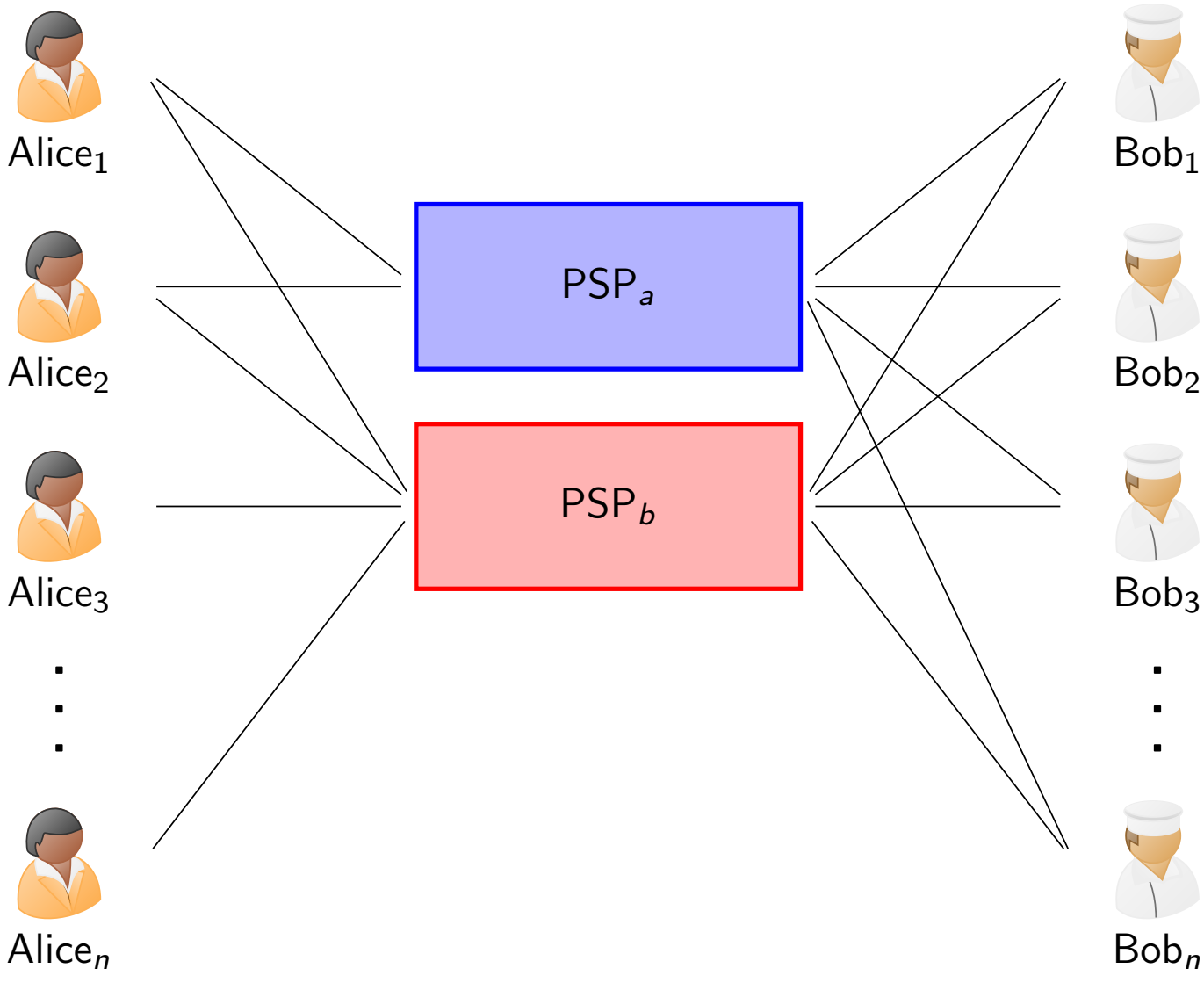
1. The incumbent PSP_a prices to protect; the entrant PSP_b prices to conquer (Caillaud and Jullien 2001, 2003).

2. The incumbent PSP_a can monopolize even if PSP_b is equally efficient, having the same c_1, c_2, and σ.

3. Divide and conquer, by which PSP_b subsidizes Alice to gain entry, works unless PSP_a does the same.

4. Introductory pricing: subsidize initial customers, then increase prices, as explained for one-sided markets by Farrell and Saloner (1986), Katz and Shapiro (1986, 1992).

A duopoly of PSPs with multi-homing



Some strategic effects with multi-homing

1. When agents can multi-home, it is easier to convince them to try an entrant platform.

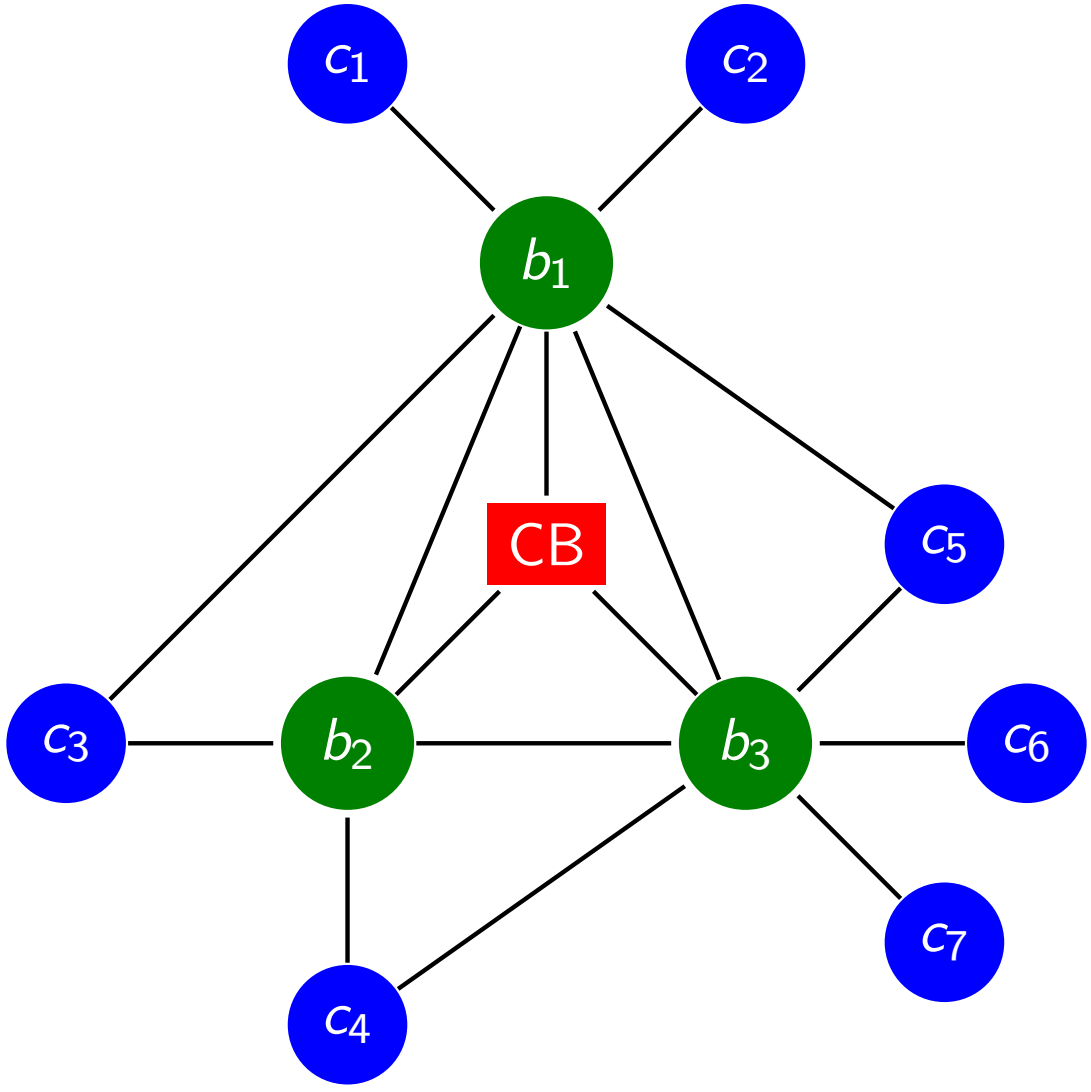
2. Example: Bob can join entrant PSP_b without losing access to Alice at PSP_a.

3. But this does not remove customers from PSP_a, so does not necessarily make firm PSP_a less attractive.

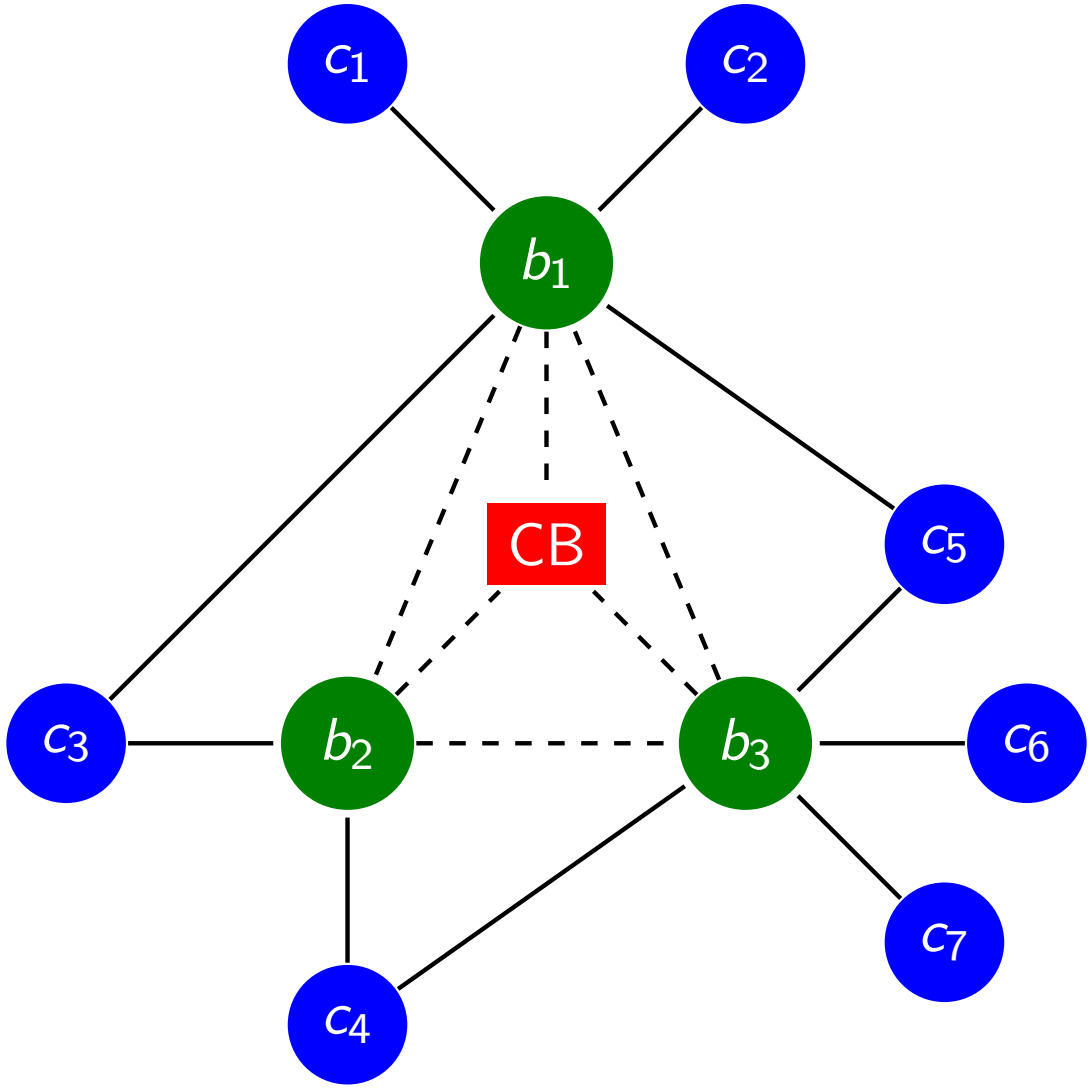
4. PSP_a keeps its incumbency advantage under multi-homing but with a reduced profit.

5. Example: With $v_i = 0$, PSP_a can price each side at $c_1 + c_2$ and make a profit of $c_1 + c_2$.

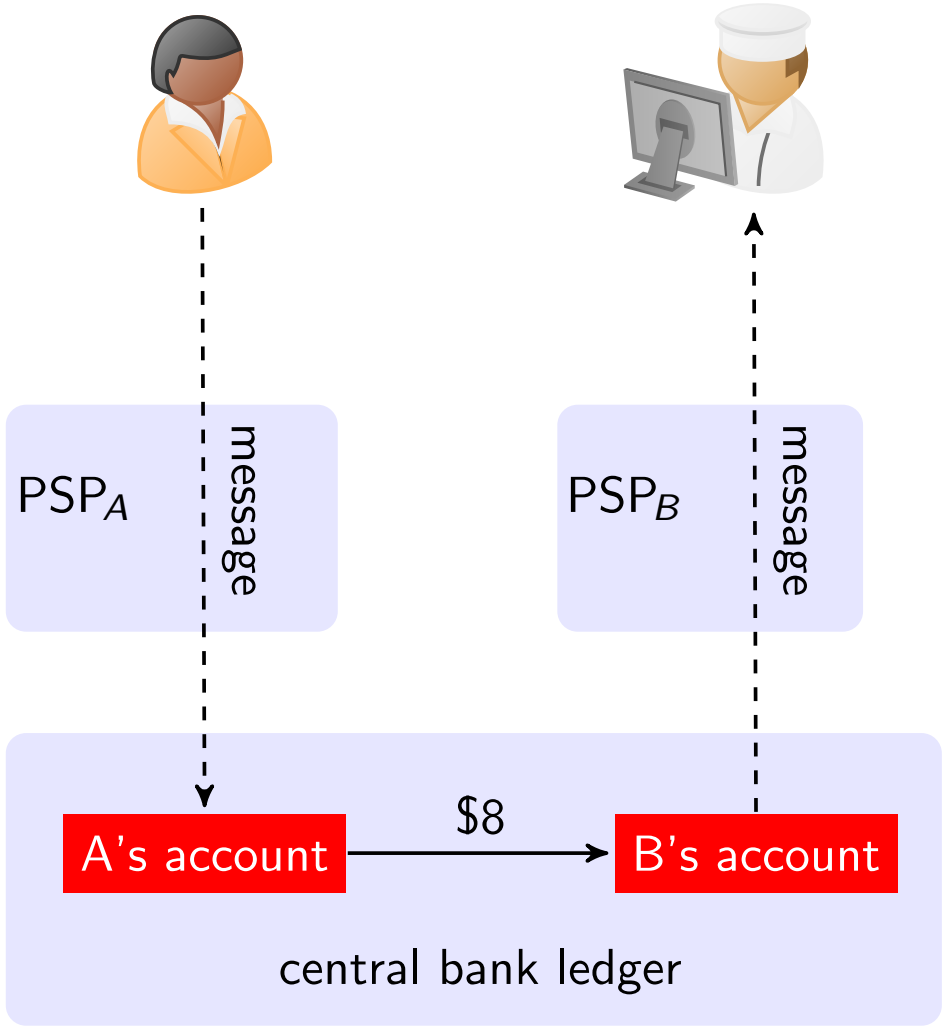
Bank payment rails



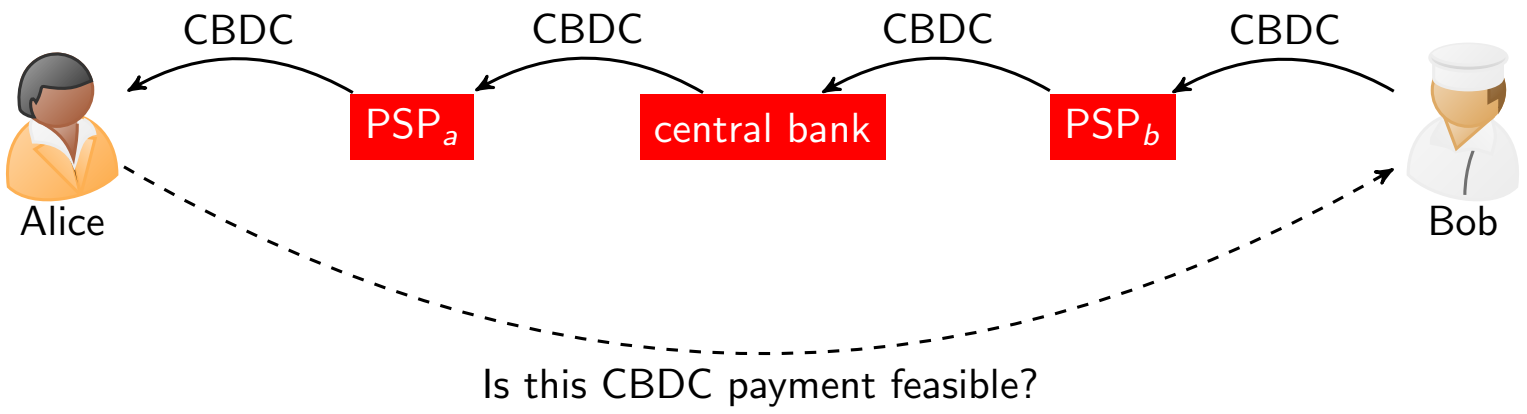
Two-ledger payment system



A CBDC payment



Interoperability of CBDC apps is crucial for competition

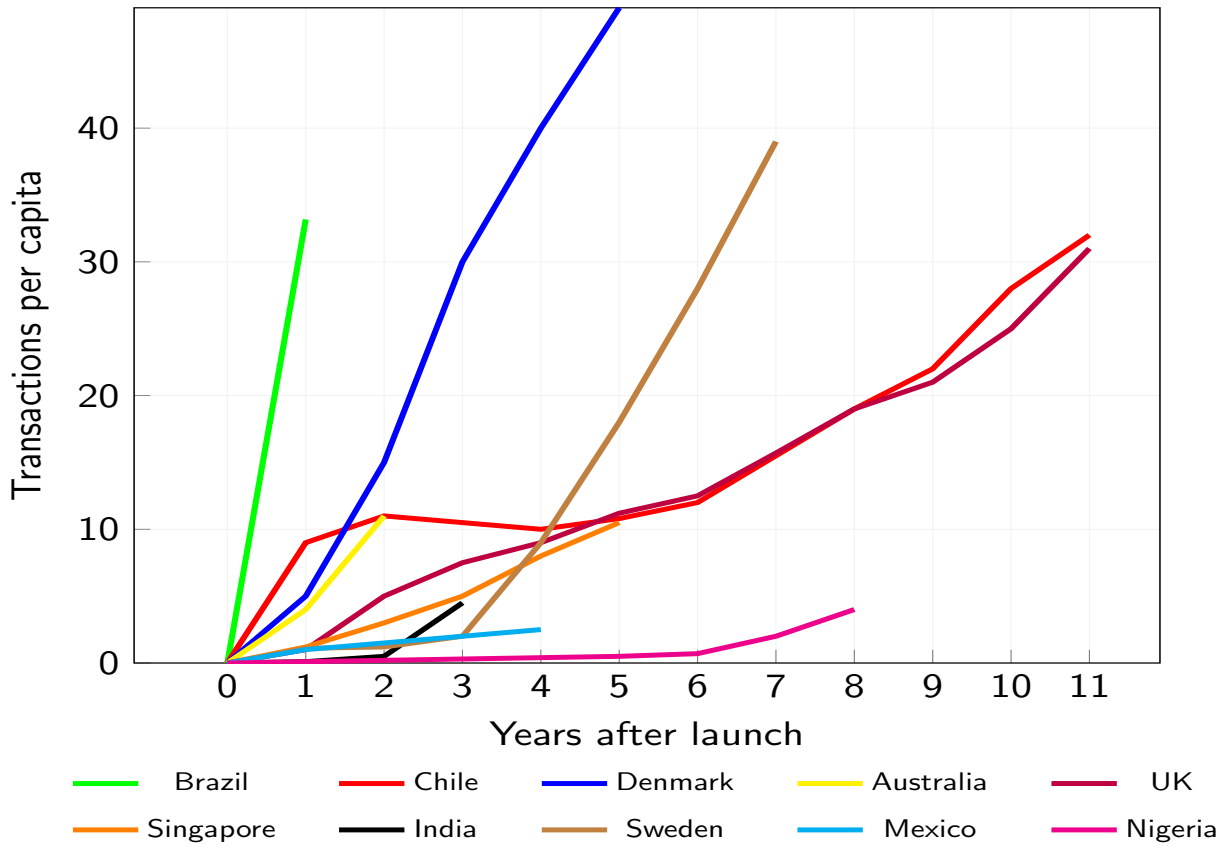


Open-banking rules may force banks to compete

- The EU's Second Payment Services Directive (PSD2):
  - Third-party payment providers now have direct access the customer's payment account information if they have the customer's consent.
  - TPPs can use banks' infrastructure to facilitate payment initiation and account information services.
  - Consent is also subject to General Data Protection Regulation (GDPR), introducing potential rule conflicts.
  - Similar new rules in India, China, Brazil, Australia, ...

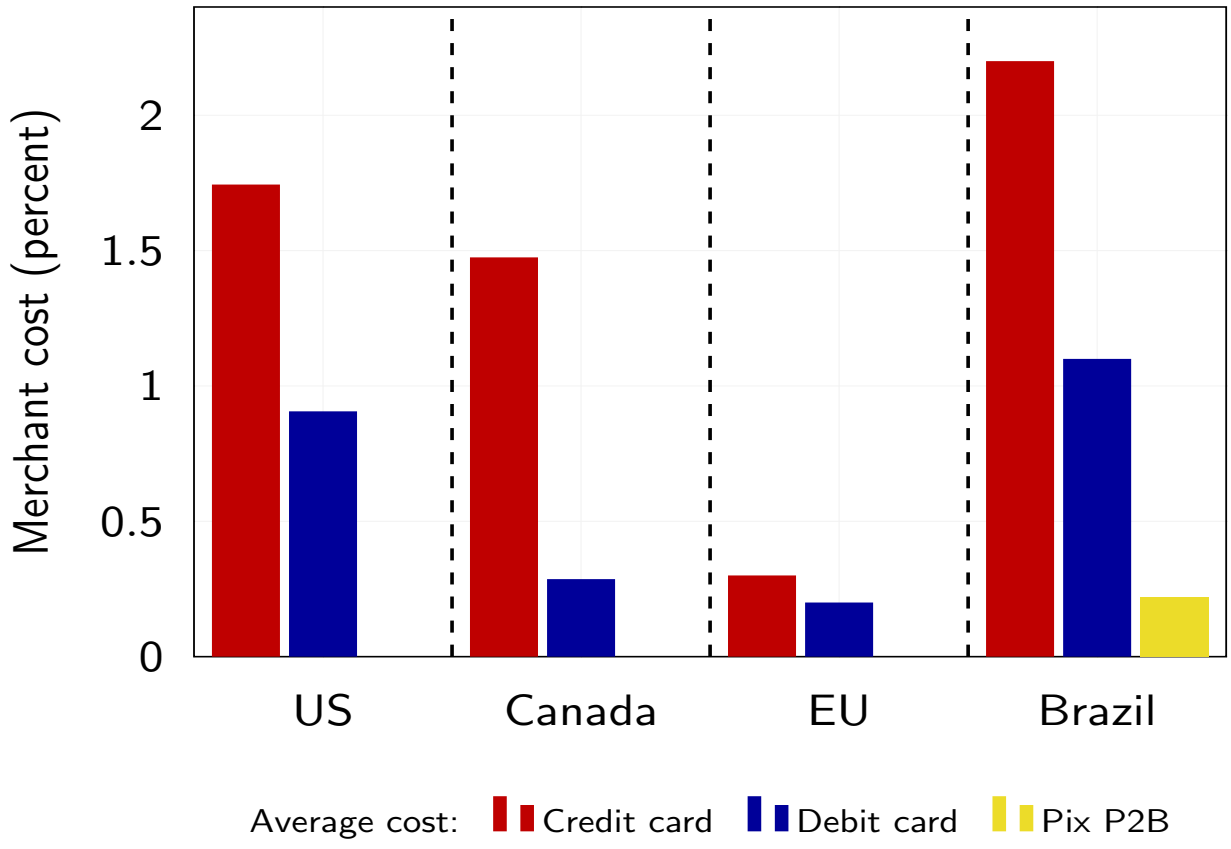
- Forbes (2018): *With open APIs, many of the long-standing barriers to switching providers will dissipate. Big banks face the prospect that many of their customers may seek out the convenience of digital aggregators, taking their accounts, and the profit pools they represent, with them.*

Pix adoption has been rapid



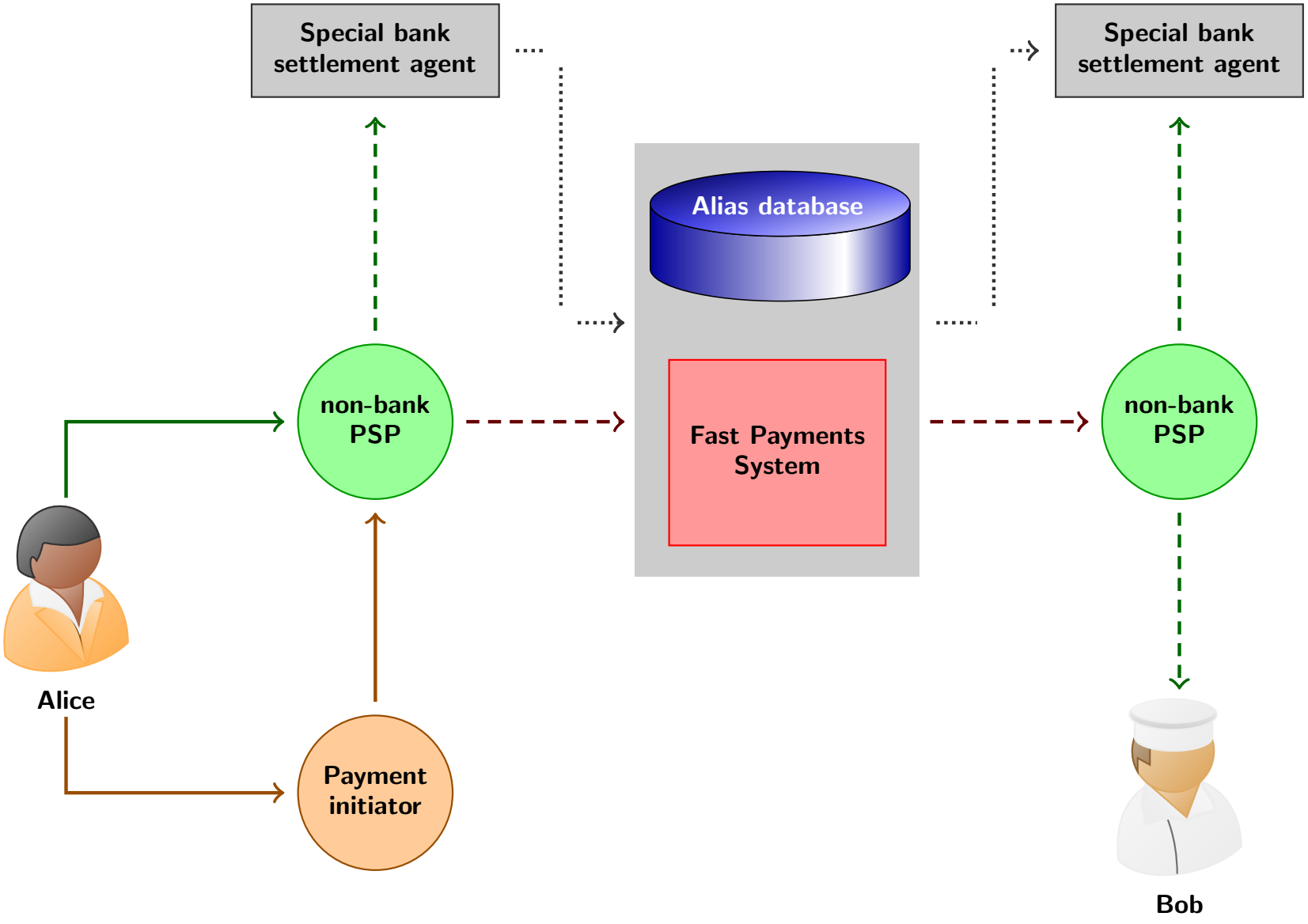
Source: Duarte, Jon Frost, Gambacorta, Koo Wilkens and Shin, Bank for International Settlements, March, 2022.

Merchant costs for cards and Pix

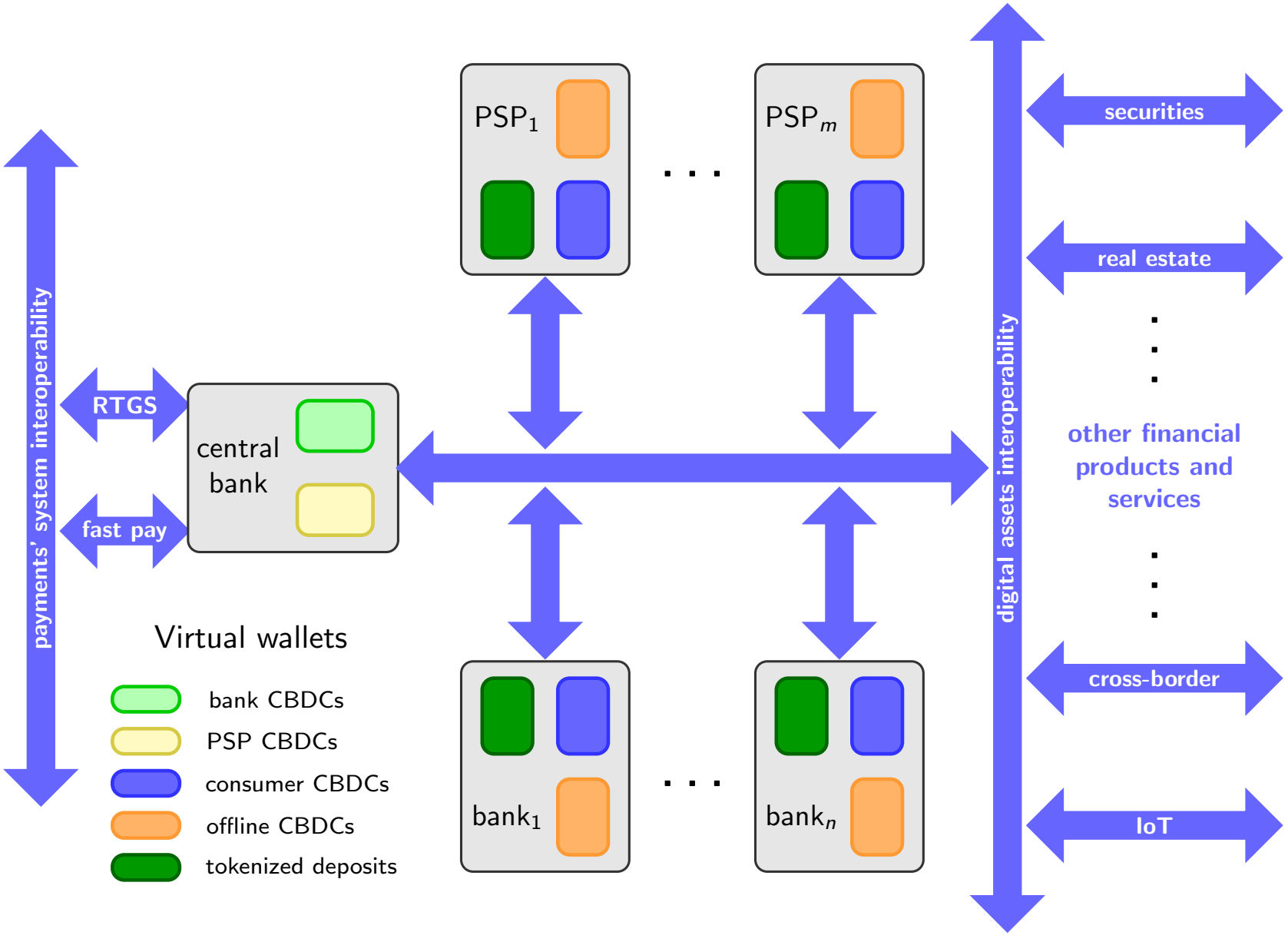


Source: Duarte, Jon Frost, Gambacorta, Koo Wilkens and Shin, Bank for International Settlements, March, 2022.

Fast payments with competition from non-bank PSPs



Imagining the future digital-asset economy



Adapted from Araujo (2022)