The Interoperability of Financial Data

Elif Cansu Akoguz[1], Tarik Roukny[1], Tamas Vadasz[1]

[1]Faculty of Economics and Business, KU Leuven

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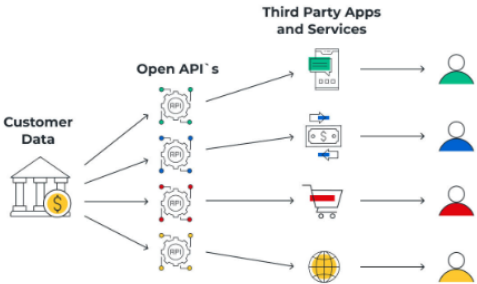
Motivation

"Too many Americans are stuck in financial products with lousy rates and service. Today's action will give people more power to get better rates and service on bank accounts, credit cards, and more."

"Letting consumers share financial information will spur more competition among financial institutions, which benefits consumers"

— Rohit Chopra, CFPB Director, 2024



Open Banking is a policy framework that enables bank customers to share their payment data with third party entities by means of application programming interfaces.

Motivation

Information has an ambiguous role:

- access to information increases the efficiency of information intensive services (e.g. credit, insurance) ✅;
- exclusivity of access: creates information rents (asymmetric information) ❌.

Policies promoting data-sharing aim to

- lower barriers to entry;
- facilitate innovation & competition, and ultimately
- enhance consumer welfare.

This paper:

- Rigorously study how third-party access to financial data affects competition and welfare;
- ... when cross-market spillovers are considered.

Cross-market information spillovers

- We study the joint pricing of **payment** and **credit** services:
  - Banks subsidize payment services...
  - *if* they can leverage that data for rent collection in subsequent credit markets.

- Data interoperability (e.g. Open Banking) $\rightarrow$ *redistributes* credit market surplus toward firms:
  - This reduces the bank's incentive to cross-subsidize...
  - but raises demand for the interoperable service.
  - This allows the bank to raise the price of its payment service.

- Main results: Total surplus increases, but...
  - *narrow* (asymmetric) data interoperability *may* benefit banks and possibly even hurt consumers.
  - *broader* (symmetric) regimes (=open finance): diminish banks' capacity to monetize their data, reallocating surplus toward firms and rival lenders.

Literature

Role of information in banking:

- Information spillovers from payment services to lending (Nakamura et al. (1992), Black (1975), Fama (1985),Norden and Weber (2010),Mester et al. (2007), Puri et al. (2017)).
- Information acquisition as a strategic tool for banks (Hauswald and Marquez (2006))
- Information sharing as a strategic tool for banks (Pagano and Jappelli (1993))
- Credit rationing induced by borrower moral hazard (Holmstrom and Tirole, 1997)

Impact of data interoperability:

- Interaction of Open Banking with maturity transformation (Goldstein et al. (2022))
- Open Banking when creditor have asymmetric screening technologies (He et al. (2023)),
- Empirical evidence for a positive feedback loop between cashless payments & lending (Ghosh et al. (2021))
- OB enhances credit market efficiency but hurts bank customers by raising payment fees and high-risk borrowers by improving screening capacity (Parlour et al. (2022),Babina et al. (2024)).

Cross-market information spillovers: illustration

Market for *payment services*

Market for *credit*

Cross-market information spillovers: illustration

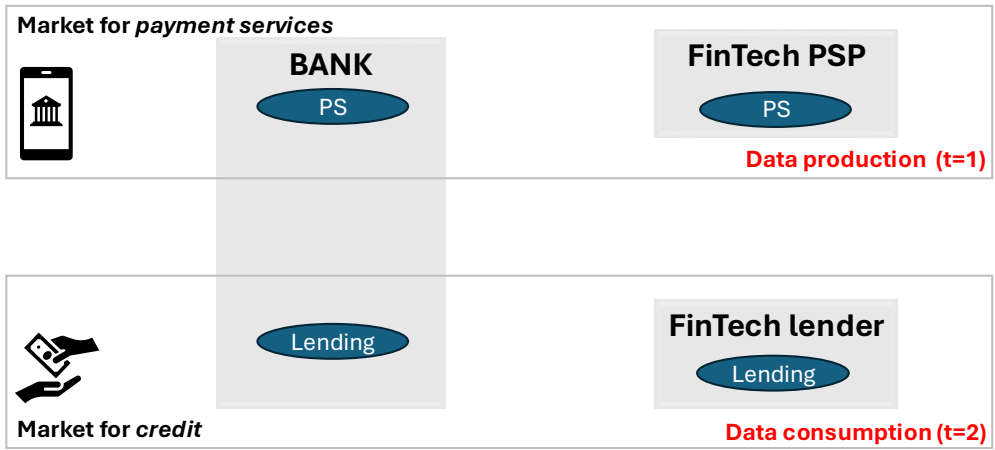
Market for *payment services*

Data production (t=1)

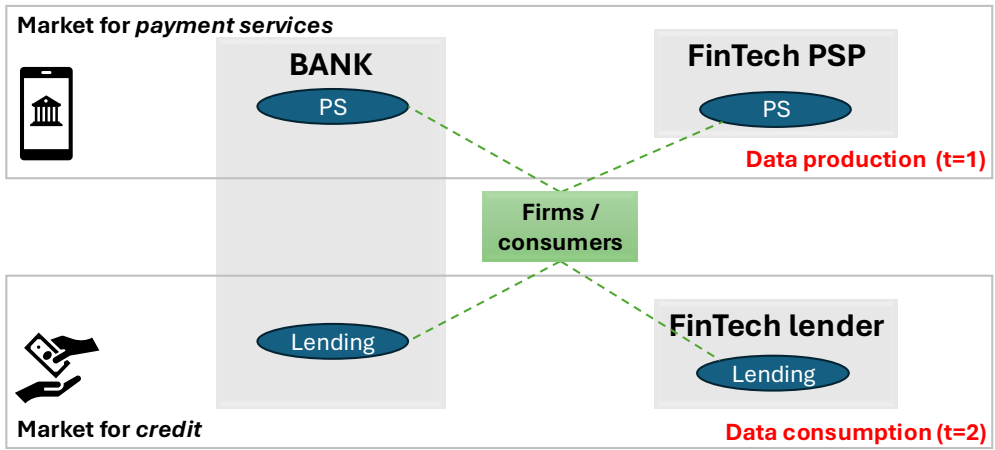
Market for *credit*

Data consumption (t=2)

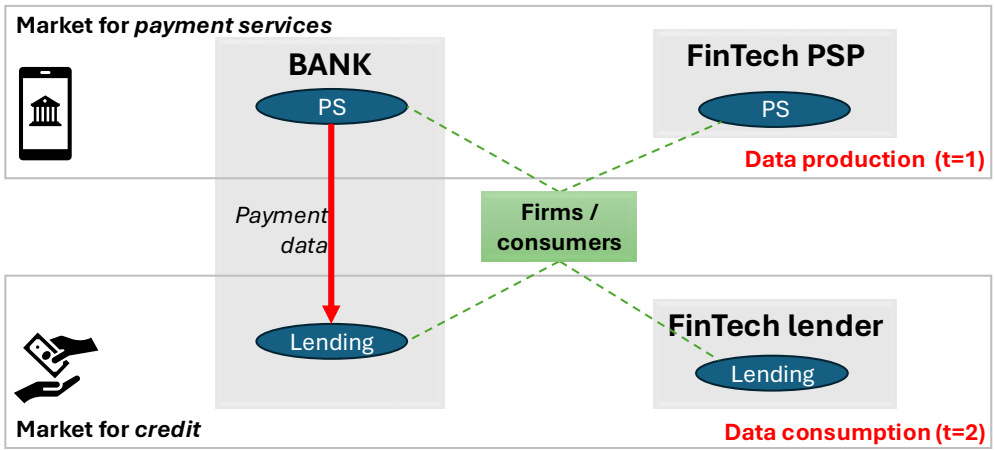
Cross-market information spillovers: illustration



Cross-market information spillovers: illustration

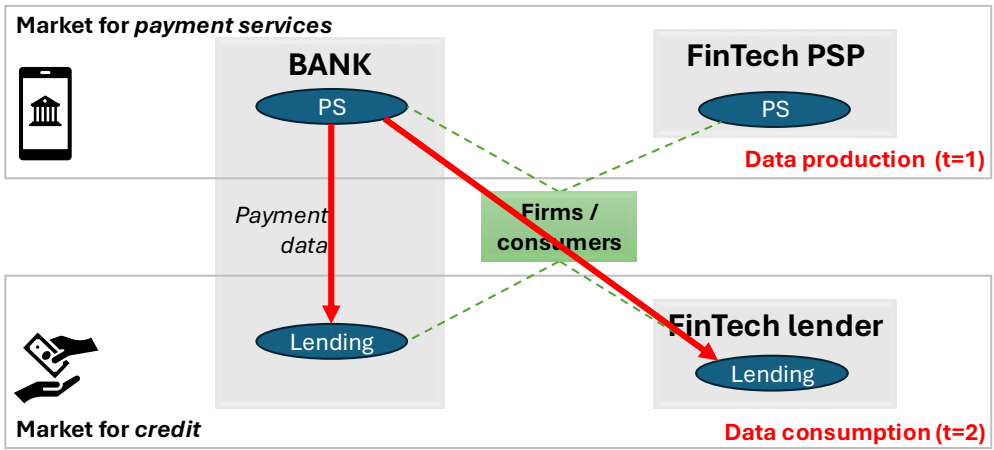


Cross-market information spillovers: illustration



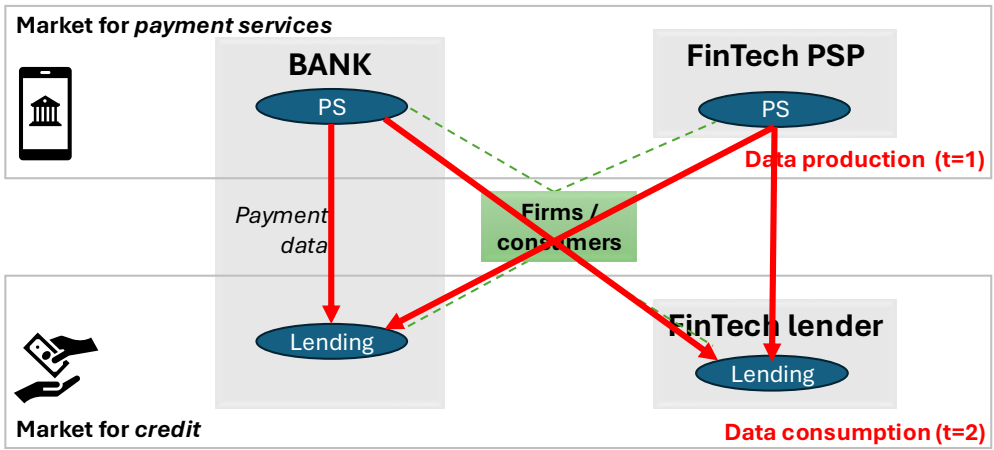
Benchmark

Cross-market information spillovers: illustration



Open Banking

Cross-market information spillovers: illustration



Open Finance

Model setup

- **Firms**
  - are heterogeneous in payment preferences (x Hotelling-location with τ transport cost);
  - have identical investment projects that require a unit funding, and heterogeneous equity endowments ($k < 1$);
  - are subject to *moral hazard* (i.e. they get private benefits b_m when shirking on the project, $s = 1$).
- **Projects**
  - have a probability of success that increases with firm effort ($\rho_H|_{s=0} > \rho_L|_{s=1}$);
  - bring positive net surplus only if the firm does not shirk ($\rho_H\phi - 1 - M > 0 > \rho_L\phi - 1$).
- **Loan monitoring** ($m \in \{0, 1\}$)
  - reduces the firm's private benefit from shirking ($b_1 < b_0$) at a cost M to the creditor;
  - is possible *only when* the lender can access the borrower's payment data.

Equilibrium concept: Perfect Bayesian Nash. Solve the model backward.

Benchmark: no data interoperability

Credit market (t=2) without data interoperability

Firm's problem *a'la Holmstrom-Tirole*

Given loan $\{m, r\}$, a firm with equity k exerts high effort if

$$\underbrace{\rho_H(\phi - (1-k)r)}_{\text{expected return work}} \geq \underbrace{\rho_L(\phi - (1-k)r)}_{\text{expected return shirk}} + \underbrace{(b_0 - m\Delta b)}_{\text{private benefit}}$$

$\rightarrow$ *IC* prevents shirking, *IR* ensures non-negative return:

$$IC : r < \boldsymbol{r_m^{IC}(k)} = \frac{1}{1-k}\left(\phi - \frac{b_0 - m\Delta b}{\Delta\rho}\right)$$

$$IR : r < \boldsymbol{r^{IR}(k)} = \frac{1}{1-k}\left(\phi - \frac{k}{\rho_H}\right)$$

$\Rightarrow$ Upper boundary interest rate $\bar{r}_m(k) := \min\{r_m^{IC}(k), r^{IR}(k)\}$

$s \in \{0,1\}$: shirking decision
$k \in [0,1]$: firm equity
ϕ: Gross return on the project when successful
$b_0 > b_1$: private benefit to shirking (w/ and w/o monitoring)
$m \in \{0,1\}$: whether the bank monitors
$\rho_H > \rho_L$: project success prob. with/without shirking
$\Delta\rho = \rho_H - \rho_L,\ \Delta b = b_0 - b_1$

Creditor's problem

$$\max_{m,r} \pi(k,\theta) = \underbrace{\rho_H(1-k)r - (1-k)}_{\text{net repayment}} - \underbrace{m \cdot M}_{\text{monitoring cost}}$$

$$\text{s.t.} \quad r \leq \boldsymbol{\bar{r}_m(k)} = \min\{r_m^{IC}(k), r^{IR}(k)\}$$

$$\boldsymbol{Bank: m = 0 \text{ if } \theta \neq b}$$

$$\boldsymbol{FinTech: m = 0}$$

$$\pi(k,\theta) \geq 0 \iff r > \boldsymbol{\underline{r}_m(k)} = \frac{1}{\rho_H} + \frac{m \cdot M}{(1-k)\rho_H}$$

That is:

- Creditors maximize profit by choosing interest rate *and* whether to monitor;
- Monitoring only if access to payment info;
- By respecting firm IC and IR.

Credit market (t=2): no data interoperability (benchmark)

Figure: **Equilibrium loan rate**

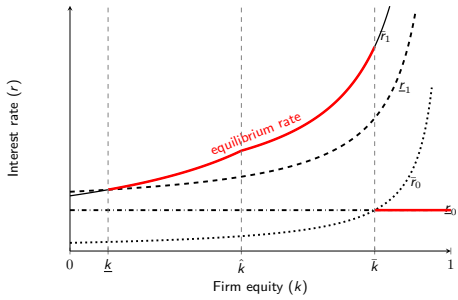
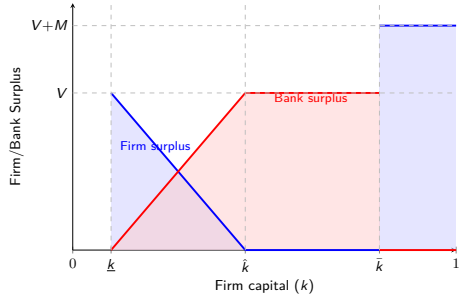


Figure: **Surplus allocation**



- **Highly constrained firms** $[0, \underline{k}]$ $\Rightarrow$ subject to credit rationing
- **Moderately constrained firms** $[\underline{k}, \overline{k}]$ $\Rightarrow$ financed **with monitoring** if and only if they use the bank's payment service.
  - $[\underline{k}, \hat{k}]$: the bank has to leave some skin in the game to prevent shirking; $[\hat{k}, \overline{k}]$: the bank keeps the entire project surplus
- **Unconstrained firms** $[\overline{k}, 1]$ $\Rightarrow$ financed **without monitoring** and retain the complete project surplus

Payment market (t=1): no data interoperability (benchmark)

Firm's problem *a'la Hotelling*

A firm with equity k located at γ is indifferent between the two payment service offers if and only if

$$u - p_b - \tau\gamma + \pi_f(k, b) = u - p_{ft} - \tau(1-\gamma) + \pi_f(k, ft)$$

It follows that

$$\gamma(k) = \frac{1}{2} + \frac{p_{ft} - p_b}{2\tau} + \frac{\pi_f(k)}{2\tau}$$

where

$$\pi_f(k) := \pi_f(k, b) - \pi_f(k, ft)$$

Payment providers' problem

$$\max_{p_\theta} \pi = \int_0^1 (p_\theta - c + \pi_\theta(k))\, \gamma_\theta(k)\, dF(k)$$

Solving PSPs' optimization problems simultaneously gives

$$p_b = \underbrace{c}_{\text{cost}} + \underbrace{\tau}_{\text{market power}} + \underbrace{\frac{\Pi_f}{3}}_{\text{extra demand}} - \underbrace{2 \cdot \frac{\Pi_b}{3}}_{\text{subsidy}}$$

$$p_{ft} = c + \tau - \frac{\Pi_f}{3} - \frac{\Pi_b}{3}$$

Π_f = firm's share of project surplus from monitored loans

Π_b = bank's share of project surplus from monitored loans

Bank has to cross-subsidize payment prices to attract more clients and obtain the credit market surplus.

Data Interoperability I: Open Banking

Creditor's *new* problem

$$\max_{m,r} \pi(k,\theta) = \rho_H(1-k)r - (1-k) - m \cdot M$$

$$\text{s. t.} \quad r \leq \bar{r}_m(k) = min\{r_m^{IC}(k), r^{IR}(k)\}$$

$$\textbf{Bank}: m = 0 \text{ if } \theta \neq b$$

$$\textbf{FinTech}: m = 0 \text{ if } \theta \neq b$$

$$\pi(k,\theta) \geq 0 \iff r > \underline{r}_m = \frac{1}{\rho_H} + \frac{m \cdot M}{(1-k)\rho_H}$$

- Previously: only the bank can monitor
- With open banking: both bank and FinTech lender can monitor (level playing field)...
- ...but *only if* the firm uses the *interoperable* service (i.e., bank).

Credit market (t=2): Open Banking

Figure: **Equilibrium loan rate**

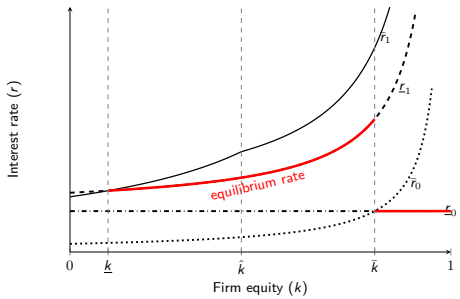
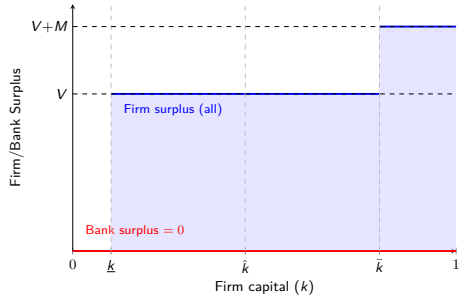


Figure: **Surplus allocation**



- **Highly constrained firms** $[0, \underline{k}]$ $\Rightarrow$ subject to credit rationing (no change)
- **Moderately constrained firms** obtain **financing at a lower interest rate** $\Rightarrow$ surplus shifts towards firms.
- **Unconstrained firms** $[\overline{k}, 1]$ $\Rightarrow$ – no change.

Open Banking: Payment market

Under Open Banking, the prices of payment services are:

$$p_b^{OB} = c + \tau + \frac{\Pi}{3}$$
$$p_{ft}^{OB} = c + \tau - \frac{\Pi}{3} \tag{1}$$

where $\Pi := \Pi_b + \Pi_f$ = total project surplus from monitored loans.

Intuition

- Bank stops directly cross-subsidizing the upstream payment service; (no more incentives to attract more clients).
- But *direct* demand for payment service increases.
- Bank's payment service price increases; FinTech price remains unchanged.

Open Banking: aggregate surplus

- Total economic surplus increases by

$$\Delta S = \frac{var(\pi_b(k))}{4\tau}$$

Where is the positive surplus coming from?

Intuition

- Price discrimination on the credit markets only; uniform pricing on payment markets.
  - Ideally, bank would want to cross-subsidize payment services on a case-by-case basis; this is not possible due to pricing constraint.
  - Ex-post decrease of the monopoly credit price is not credible.
- Without data interoperability, some (positive NPV) projects left unfinanced.
- Open Banking removes incentives to cross-subsidization $\rightarrow$ pricing inefficiency is *less binding*.
- Extra surplus created by OB depends on the ex-ante *heterogeneity* among firms.

Total surplus increases because data interoperability induces a more uniform distribution of project surplus.

Open Banking: who benefits?

Open Banking leads to the following change in total **bank profit**:

$$\Delta S_b = -\frac{1}{2\tau} cov(\pi_b(k), \pi_f(k))$$

Profits of the FinTech lender and FinTech Payment Service Provider are not affected.

Intuition

- Firms attach higher value to monitoring $\rightarrow$ willing to pay more.
- Bank loses its monopoly as data *user*, but gains market power as data *producer*.
- Rent extraction transferred from credit to payment services.
- Covariance tend to be negative $\Rightarrow$ bank tends to gain from OB.

Data Interoperability II: Open Finance

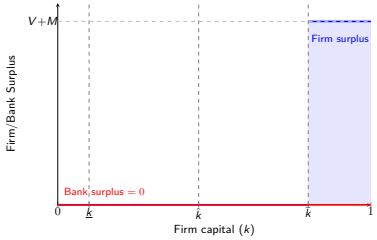
Creditors' new problem:

$$\max_{m,r} \pi(k,\theta) = \rho_H(1-k)r - (1-k) - m \cdot M$$

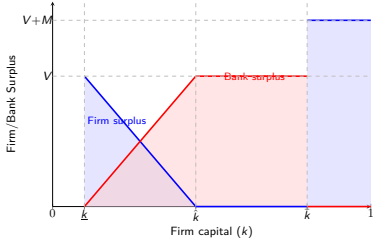
subject to $\quad r \leq \overline{r}_m(k) = min\{r_m^{IC}(k), r^{IR}(k)\}$

$$\pi(k,\theta) \geq 0 \iff r > \underline{r}_m(k) = \frac{1}{\rho_H} + \frac{m \cdot M}{(1-k)\rho_H}$$

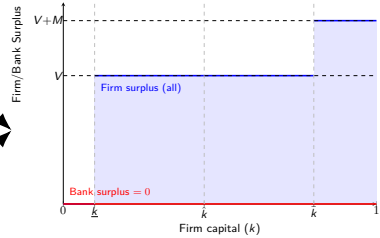
- Each lender can monitor...
- ...using either of the payment service provider data.



FinTech clients



Bank clients



All clients

Open Finance: overall equilibrium

- **Prices of payment services** become the standard Hotelling-price:

$$p_b^{OF} = p_{ft}^{OF} = c + \tau \tag{2}$$

- **Total economic surplus** increases:
  1. More projects are realized $\rightarrow$ credit market surplus $\uparrow$
  2. There are no price distortions $\rightarrow$ all firms choose their favourite PSP $\Rightarrow$ payment market surplus $\uparrow$
     Note the full service assumption. Welfare loss comes from distortive pricing.

- **Effect on bank profit** and firm surplus remains ambiguous relative to no-interoperability benchmark:
  1. Credit market becomes perfectly competitive $\Rightarrow$ bank surplus $\downarrow$, firm surplus $\uparrow$
  2. Payment service *may* become more expensive $\Rightarrow$ bank surplus $\uparrow$, firm surplus $\downarrow$

Open Banking vs. Open Finance

- **Total surplus and firm surplus increases with Open Finance** compared to Open Banking.
  - Open Finance enables all firms to access monitoring while Open Banking only partially does so.
  - Open Finance exhibit symmetric non-distortative payment pricing.
- **Banks are better off with Open Banking** compared to Open Finance.
  - With Open Banking, the bank becomes **the gatekeeper** to better loan terms $\Rightarrow$ bank's collection of information rents shift to the payment market.
  - With Open Finance, a firm accesses the same loan terms regardless of its choice of PSP $\Rightarrow$ No PSP can collect information rents.
- **Neither approaches provide a Pareto-improvement.**
  - Firms that have little to nothing to gain from sharing their data necessarily lose out due to increased costs of payment services.

Thank you!

Q&A

Elif Cansu Akoguz
elifcansu.akouz@kuleuven.be

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