The Interoperability of Financial Data

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Motivation

Policies promoting data sharing, in particular for financial data, are gaining global traction.

- *Open banking* enforces banks to share customers' payment data, upon request, with third-party providers (TPP) by means of an application program interface (API).
- Around half the countries have government-led open banking efforts at least at a nascent stage (Babina et al., 2022), including the EU (PSD2, 2016) and most OECD countries (OECD, 2023).
- Transition from *open banking* (payment data) to *open finance* (financial data) and beyond (non-financial data)

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What will be the **overall** effect of data-sharing? Let us look at the implications for markets where data is produced (e.g. digital payment services):

- mandatory & uncompensated data-sharing $\rightarrow$ will banks lose incentive for supplying data-producing services and high-quality data-sharing interfaces? (EU Commission, 2023)

This paper

Research question: How would a mandate for *data interoperability* on bank's payment data affect the economy in the presence of *information spillovers* from payment services to loan provision?

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Data interoperability:

- a type data sharing protocol where **up-to-date data** can be retrieved, processed and operated by any authorized third-party **continuously**
- not to be confused with *data portability*
- enables **third-party loan monitoring**

This paper

- the first analysis on the effect of a mandate for **payment data interoperability** accounting for spillovers between data-producing and data-driven markets.
  (previous studies focus on payment data-*portability* (see Ghosh et al. (2021), Parlour et al. (2022), Babina et al. (2022))

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- extends H&T with a payment service market at the first-period where
  - payment data is used as input for loan monitoring,
  - data-interoperability enables banks to monitor borrowers that use a digital payment service, regardless of the bank providing the service.

Summary of results

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4. credit allocation becomes more efficient,
5. the effect on total surplus - on banks' side, on firms' side and for the overall economy - is ambiguous.

Model setup

A two-period dynamic game where **a unit mass of firms** and **two banks** interact, first, at a **payment service market** and, then, at a **loan market**.

- **Firms**
  - heterogeneous preferences in payment services
  - endowed with *heterogeneous equities* (**K**) and identical investment projects that require a unit funding.
  - subject to *moral hazard* (i.e. they get private benefits (**b**) when shirking on the project (**s=1**).

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- **Projects:**
  - the probability of project success increases with firm effort (**s=1** $\rightarrow \rho_L$, **s=0** $\rightarrow \rho_H > \rho_L$).
  - realizing a project is socially desirable only when the firm does not shirk.

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A two-period dynamic game where **a unit mass of firms** and **two banks** interact first at a **payment services market** and then at a **loan market**.

- **Two banks:**
  - provide differentiated payment services at t=1
  - provide identical loans at t=2
  - by monitoring loans, banks reduce firms' private benefits to shirking ($\boldsymbol{m = 0 \rightarrow b_0}$, $\boldsymbol{m = 1 \rightarrow b_1 < b_0}$)
  - loan monitoring is possible *only when* the lender can access the borrower's payment data

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- **no data-interoperability**: a firm's payment data can be accessed **exclusively** by the bank that provides the firm the payment service

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- **no data-interoperability**: a firm's payment data can be accessed **exclusively** by the bank that provides the firm the payment service

- **data-interoperability**: a firm's payment data can be accessed by both banks, **regardless of the bank that provides the payment service**

Timeline

- **At t=1**
  - Banks provide digital payment services.
  - Firms choose either one of these services or use cash.

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  - Banks provide digital payment services.
  - Firms choose either one of these services or use cash.
- **At t=2**
  - Firms seek loans.
  - For each borrower, banks decide
    - whether or not to extend a loan,
    - what loan interest rate to charge,
    - whether or not to monitor the loan.
  - Firms, if they receive any offers, accept the best offer and realize their projects.
  - Projects succeed or fail.

Credit market: Firm's problem

$$\mathbb{E}[\Pi] = (s\rho_L + (1-s)\rho_H)(\Phi - (1-K)r - K + s(mb_1 + (1-m)b_0)$$

subject to

$$IC : r \leq r_m^{IC}(K) = \frac{\Phi - \frac{mb_1 + (1-m)b_0}{\Delta\rho}}{1-K},$$

$$IR : r \leq r^{IR}(K) = \frac{\Phi - \frac{K}{\rho_H}}{1-K}$$

$s \in \{0,1\}$: *shirking decision*
$K \in [0,1]$: *firm equity*
Φ: *Gross return on the project when it is successful*
$b_0 > b_1$: *private benefit to shirking for the firm with (1) and without monitoring (0)*
$m \in \{0,1\}$: *whether the bank monitors the firm (1) or not (0)*
$\rho_H > \rho_L$: *success probability of the project with (L) and without (H) shirking*
$\Delta\rho = \rho_H - \rho_L$

Credit market: Bank's problem

$$\mathbb{E}[\Omega_j(K)] = \rho_H(1-K)r - (1-K) - m * M$$

subject to

$$r \leq min\{r_m^{IC}(K), r^{IR}(K)\}$$

and

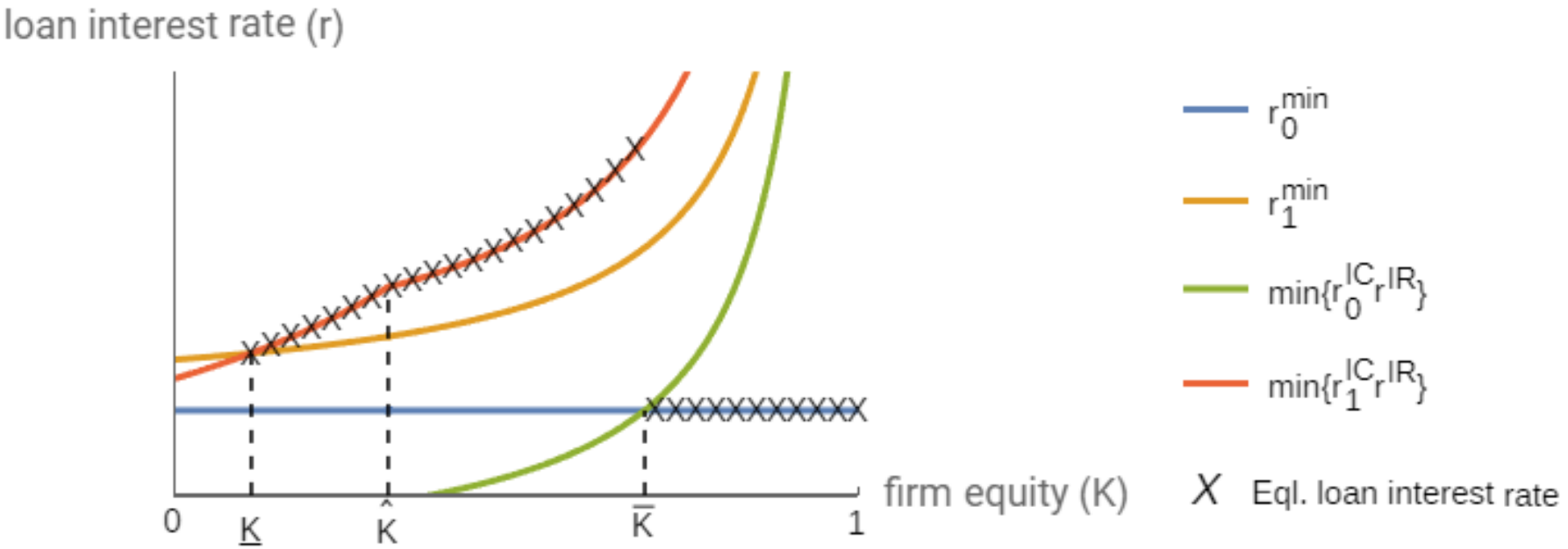
$$m = 0 \text{ if } \theta \neq j \textbf{ without data-interoperability}$$

or

$$m = 0 \text{ if } \theta \neq C \textbf{ with data interoperability}$$

M: monitoring cost
θ: firm's choice of payment method
C: cash

Credit market equilibrium: without data interoperability

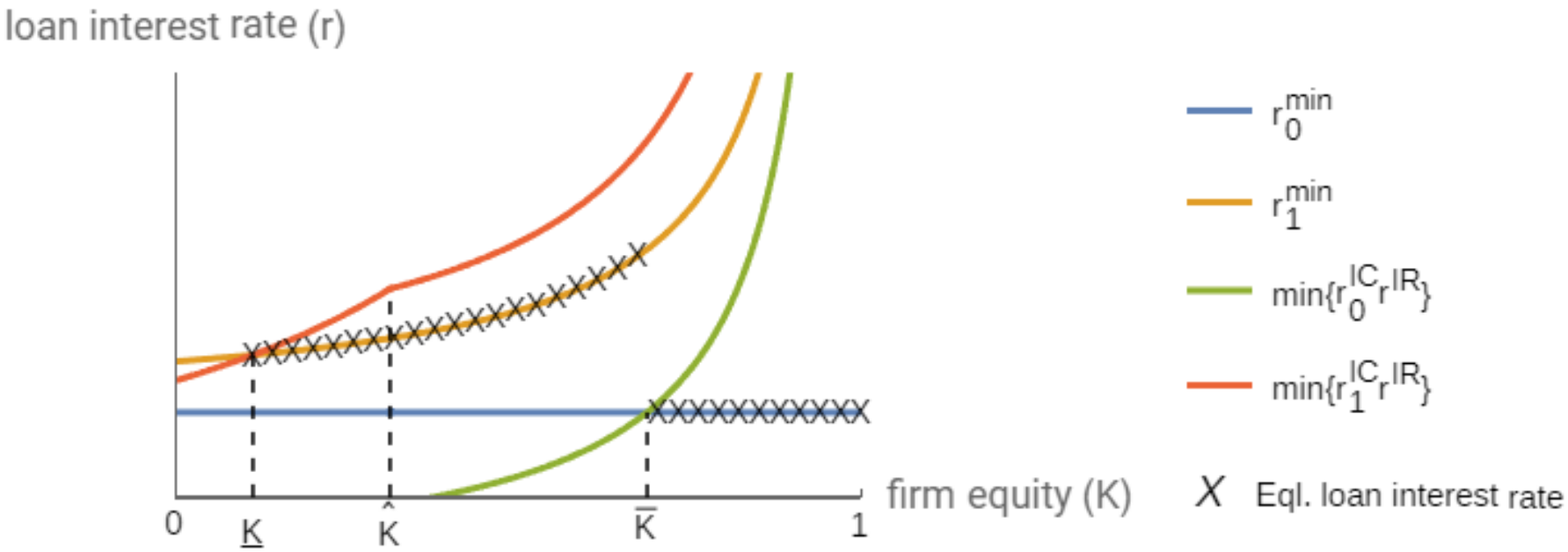


$[0, \underline{K}]$ →subject to credit rationing.
$[\overline{K}, 1]$ →funded without monitoring at the competitive interest rate
$[\underline{K}, \overline{K}]$ →funded with monitoring **cond. on using a digital payment service**

- $[\underline{K}, \hat{K}]$ →funded at the highest loan rate that does not induce shirking.
- $[\hat{K}, \overline{K}]$ →funded at the monopolistic loan rate

Credit market equilibrium: with data interoperability

1. **Loan market becomes more competitive**



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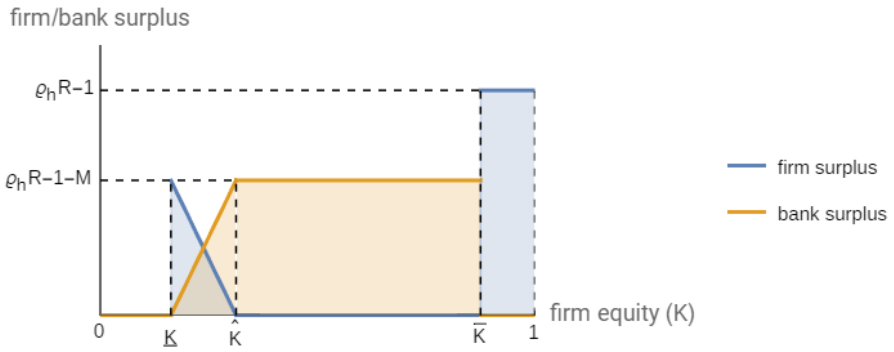
$[\overline{K}, 1]$ →funded without monitoring at the competitive interest rate

$[\underline{K}, \overline{K}]$ →funded at the competitive interest rate with monitoring **cond. on using a digital payment service**

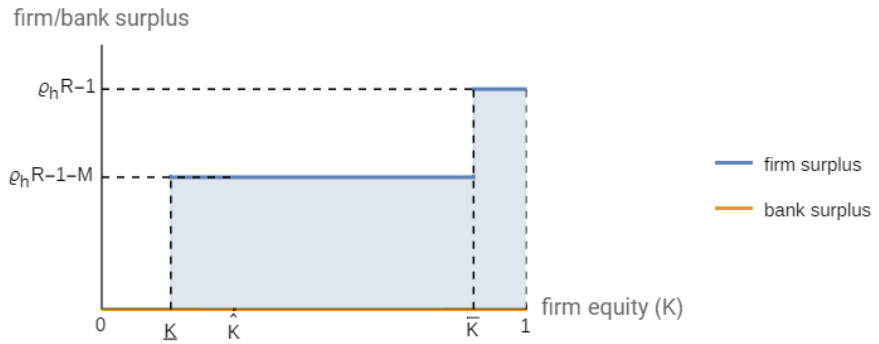
Credit market equilibrium: Allocation of project returns

2 Payment services become more expensive

- Banks no more gain monopoly rents from lending their payment service customers $\rightarrow$**p** $\uparrow$
- Using a digital payment service brings more gains in the loan market for some firms $\rightarrow$**p** $\uparrow$



(a) without data interoperability



(b) with data interoperability

Payment market: Firm's problem

A firm chooses between using a digital payment service and receiving

$$U - p - \tau d + \mathbb{E}[\Pi(K)|\theta \neq C]$$

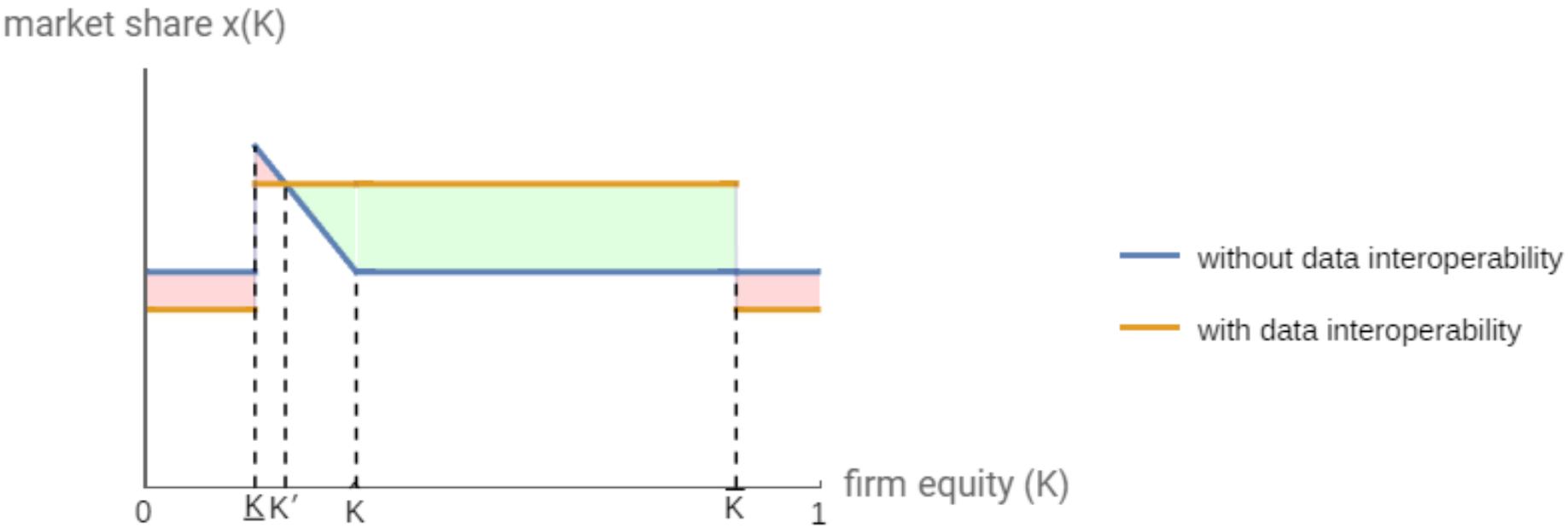
or using cash and receiving

$$\mathbb{E}[\Pi(K)|\theta = C]$$

U: payment service utility
p: payment service price
τ: transportation cost
d: the distance between a firm and the closest bank

Payment market equilibrium: The changing composition of payment service users

3. **Firms are affected heterogeneously**
   - For $[K', \overline{K}]$: using a digital payment service becomes more attractive
   - For $(0, K')U(\overline{K}, 1)$: using a digital payment service becomes less attractive



The effect on credit rationing

4. **Credit allocation becomes more efficient**

$$\Delta Z = -\frac{2(1-(F(\overline{K})-F(\underline{K})))((F(\overline{K})-F(\underline{K}))(\rho_H \Phi - 1 - M) - \int_{\underline{K}}^{\hat{K}} (\hat{K}-K) f(K) dK)}{\tau} < 0$$

The effect on firm, bank and overall surplus

5. **the effect on total surplus - on banks' side, on firms' side and for the overall economy - is ambiguous**

$$\Delta E[\Pi_{tot}] = \frac{(F(\overline{K}) - F(\underline{K}))(1 - (F(\overline{K}) - F(\underline{K})))(\rho_H R - 1 - M)^2}{\tau} + \frac{(\int_{\underline{K}}^{\hat{K}} (\hat{K} - K))^2 - \int_{\underline{K}}^{\hat{K}} (\hat{K} - K)^2}{\tau}$$

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$$\Delta E[\Omega_{tot}] = \frac{2\left(\int_{\underline{K}}^{\hat{K}}(\hat{K}-K)^2 f(K)dK - \left(\int_{\underline{K}}^{\hat{K}}(\hat{K}-K)f(K)dK\right)^2\right)}{\tau}$$
$$- \frac{2(1-(F(\overline{K})-F(\underline{K})))(\rho_H R - 1 - M)\int_{\underline{K}}^{\hat{K}}(\hat{K}-K)f(K)dK))}{\tau}$$

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$$\Delta W = \frac{(1-(F(\overline{K})-F(\underline{K}))(\rho_H R-1-M)\left((F(\overline{K})-F(\underline{K}))(\rho_H R-1-M)-2\int_{\underline{K}}^{\hat{K}}\hat{K}f(K)dK\right)}{\tau}$$
$$+\frac{\int_{\underline{K}}^{\hat{K}}(\hat{K}-K)^2-(\int_{\underline{K}}^{\hat{K}}(\hat{K}-K))^2}{\tau}$$

Main takeaways

We investigated the effect of a mandate for payment data-interoperability in an economy with firm moral hazard and spillovers from payment services to loan provision.

Our findings indicate that

1. Banks may benefit from data-sharing even without compensation

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We investigated the effect of a mandate for payment data-interoperability in an economy with firm moral hazard and spillovers from payment services to loan provision.

Our findings indicate that

1. Banks may benefit from data-sharing even without compensation
2. Data-sharing does not necessarily increase overall consumer welfare
3. Data-sharing has distributional implications

Thank you!

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