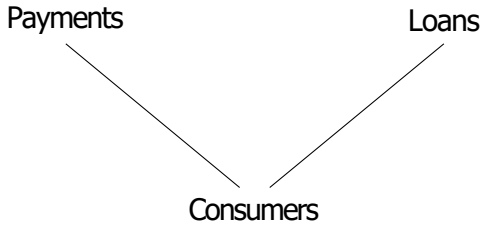
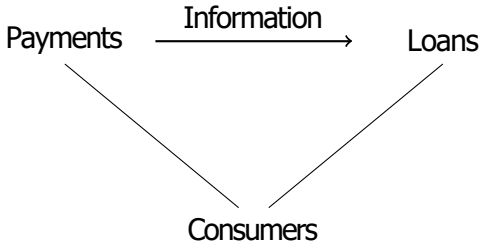
When FinTech Competes for Payment Flows

Christine Parlour (Berkeley Haas)
Uday Rajan (Michigan Ross)
Haoxiang Zhu (MIT Sloan and NBER)

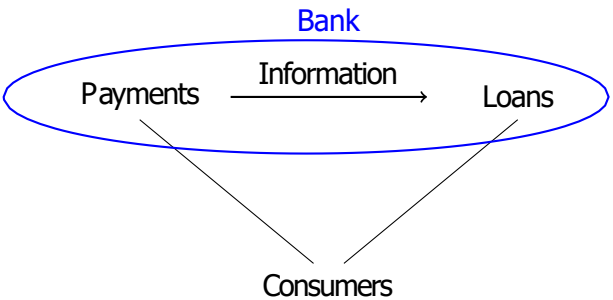
Main idea



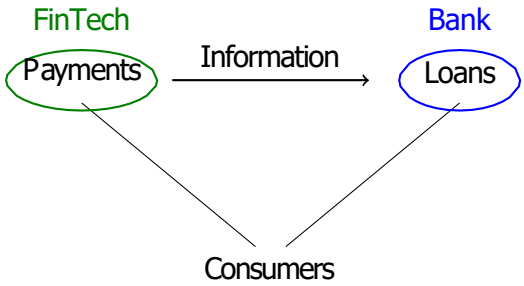
Main idea



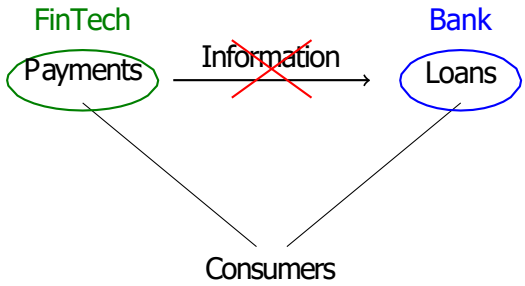
Main idea



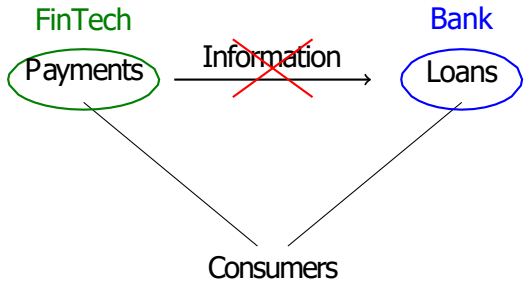
Main idea



Main idea



Main idea



- How does FinTech competition in payments affect
  (i) consumer welfare, (ii) loan contracts, and (iii) pricing of payment services?
- What happens if information from payments can flow back into loan screening?
  (i) FinTech data sales (ii) Consumer porting data (PSD2, GDPR) ?

Main results: Payments Market

- FinTech competition in payments affects consumer welfare in three ways:

1. Financial inclusion.
   - Competition from FinTechs gives consumers low-cost access to electronic payments.
2. Price of payment services.
   - FinTech may increase or decrease bank's own pricing of payment services.
3. Loan market surplus.
   - Change in bank's information set affects total loan surplus and split between bank and consumers.

Main results: Adding a data market

If information in payments flows back into the loan market:

- All loans are priced with payment information. Total surplus goes up.

- If there is a data market, some agents are better off, and some are worse off
- If consumers own their data (data portability) bank can partially infer type (data externality)
- $\Longrightarrow$ Consumer welfare is higher with a data market than data portability.

Literature: Payment data are informative about credit quality

- Black (1975): "if the individual routes most of his receipts and payments through his loan account, they can serve as a continuing source of credit information."
- German data: Norden and Weber (2010): activities in bank account are informative about consumers' default probability. Puri, Rocholl, and Steffen (2018): customers with checking accounts default less.
- Canadian data: Mester, Nakamura and Renault (2007): banks monitor firms via information in transactional accounts.
- Chinese data: Hau, Huang, Shan, and Sheng (2019): transaction data of online vendors enable Ant Financial to give credit to vendors.
- U.S. data: Liberti, Sturgess, and Sutherland (2020): lenders who have access to detailed payment histories of borrowers (via business credit bureau) gain market share relative to other lenders.

Literature: Banking

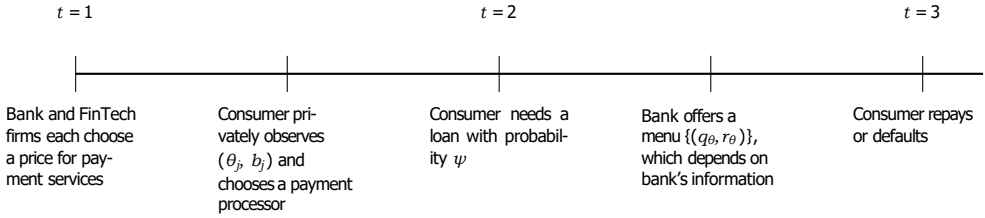
- Banking and Payments
  - Ghosh, Vallee, Zeng (2021)
  - He, Huang, Zhou (2021)
- Competition may increase prices
  - Theory: Chen and Riordan (2008), Gabaix et al. (2016)
  - Empirical: Sun (2019)
- Separate large literature on FinTech lending

Model- Firms

- A representative bank offers payment processing and loans.
  - "Bank" = any entity that offers this bundle of services
- Two identical FinTech firms only offer payment services.
  - "FinTech" = Big Tech, independent FinTech firms

Model-Consumers

- A unit mass of consumers.
- Each receives the same utility $v > 0$ from access to electronic payment services.
  - A mass m_j of consumers have repayment probability θ_j, $j \in \{h, \ell\}$.
  - Conditional on each credit type θ_j, consumers have i.i.d. "bank affinity" $b \sim F(b \mid \theta)$, an extra utility for using the bank to process payments
  - Affinity captures developing/developed countries, demographics, etc.



- $t = 1$: Each consumer picks a payment provider, given her θ and b. Type equation here.
- If the consumer choses the bank for payment at $t = 1$, the bank obtains a signal on θ at $t = 2$ (informed). Otherwise bank is uninformed.
- $t = 2$: With a constant probability ψ, a consumer needs a loan.
- $t = 2$: The bank offers a menu $\{(q_\theta , r_\theta)\}$, which depends on the bank's information. Consumer accepts or rejects.
- $t = 3$: Consumer repays the loan plus interest or defaults (zero recovery value).

Payments are Informative about type

- The payments data of a consumer gives the bank a signal $s \in \{s_\ell, s_h\}$ of the consumer's credit type.
- For some $\alpha \geq 1$,

$$\begin{aligned} P(s = s_h \mid \theta_h) &= P(s = s_\ell \mid \theta_\ell) = \frac{\alpha}{1+\alpha} \\ P(s = s_h \mid \theta_\ell) &= P(s = s_\ell \mid \theta_h) = \frac{1}{1+\alpha}. \end{aligned}$$

- So, α captures the bank's ability to extract useful information from the payment signal.
- If $\alpha = 1$, the additional signal from payments is pure noise, and as $\alpha \to \infty$, the signal perfectly reveals the credit type.

- An uninformed bank receives a signal uncorrelated with the credit type, i.e., a signal with $\alpha = 1$.

Loan market, First Best

- If a consumer of type θ_j accepts a contract (q, r), their loan market utility is

$$w_j(q,r) = \theta_j \{Aq - q(1+r)\} - (1-\theta)\frac{\lambda}{2}q^2. \quad (1)$$

- The conditional profit of the bank is

$$\pi_j(q,r) = \theta_j q(1+r) - q - \frac{\gamma}{2}q^2. \quad (2)$$

- First best maximizes $w_j(q,r) + \pi_j(q,r)$ so

$$q_j^f = \frac{\theta_j A - 1}{\gamma + \lambda(1-\theta_j)}. \quad (3)$$

Bank's loan business

- Bank does not observe the customer's type:
- Offers two screening contracts (a menu) which depends on its beliefs
- Beliefs determined by
  - Set of types who chose to use it for payments
  - The signal the customer generated

Uninformed bank's screening of consumers

- Suppose that μ_j is the posterior the customer is type j when they apply for a loan. The uninformed bank's problem is:

$$\max_{q_h, r_h, q_\ell, r_\ell} \sum_{j=h,\ell} \mu_j [\theta_j q_j (1 + r_j) - q_j - \tfrac{\gamma}{2} q_j^2] \tag{4}$$

subject to :

$$w_h(q_h, r_h) \geq w_h(q_\ell, r_\ell), \tag{5}$$

$$w_\ell(q_\ell, r_\ell) \geq w_\ell(q_h, r_h), \tag{6}$$

$$w_h(q_h, r_h) \geq 0, \tag{7}$$

$$w_\ell(q_\ell, r_\ell) \geq 0. \tag{8}$$

How the contract works

- IR-ℓ binds: $w_\ell(q_\ell, r_\ell) = 0$.
- IC-h binds: $w_h(q_h, r_h) = w_h(q_\ell, r_\ell)$.
- High type's loan quantity is the same as first-best:

$$q_h^* = \frac{\theta_h A - 1}{\gamma + \lambda(1 - \theta_h)}. \tag{9}$$

- Low type's loan quantity is distorted downward:

$$q_\ell^* = \frac{\theta_\ell A - 1}{\gamma + \lambda(1 - \theta_\ell) + \lambda K}, \qquad \text{with } K \equiv \frac{\mu_h}{\mu_\ell}\left(\frac{\theta_h}{\theta_\ell} - 1\right) > 0. \tag{10}$$

- We can rule out the other possibility, i.e., IR-h and IC-ℓ binding.

Loan Market Summary

- Low types obtain zero surplus.
- Low types' quantity is distorted down from first best and the interest rate is chosen to satisfy the IR constraint.
- High types obtain first best quantity and interest rate is chosen to obtain to satisfy IC constraint.
- The higher the chance a customer has high creditworthiness, the more profitable it is to ensure that their IC constraints binds, and so the bigger the distortion in the quantity offered to the low types.
- Banks who are informed are more profitable than uninformed banks.

Payments

- Bundling of payments and loans leads to a wide variety of market outcomes.
- Price of processing payments is direct revenue to the bank and cost to the consumer.
- Indirect effects on both as bank's information set affects the screening contracts.
- Consumers choose to go to the bank or not based on the screening contracts.

The bank's pricing of payment services

- Bank's price for payment processing is p(fees and interest spread) on all consumers.
- Use superscript I to denote informed bank and U to denote uninformed bank.
- If a consumer with type j and bank affinity b_j uses the bank, she earns total expected profit

$$W_j^b = v - p + b_j + \psi w_j^I. \tag{11}$$

- If the same consumer uses cash, she gets

$$W_j^a = \psi w_j^U. \tag{12}$$

- The consumer prefers bank to cash if and only if her bank affinity is at least

$$b_j^m = p^m - v - \psi \underbrace{(w_j^I - w_j^U)}_{\Delta_j^w}. \tag{13}$$

Bank's Problem

The bank's total profit is

$$\Pi = \sum_j m_j[(1 - F_j(p^m - v - \psi\Delta_j^w))p^m + \psi\pi_j^I - \psi F_j(p^m - v - \psi\Delta_j^w)\Delta_j^\pi], \tag{14}$$

where $\Delta_j^\pi = \pi_j^I - \pi_j^U$ is the incremental profit that the bank makes in the loan market if it is informed.

- Determine a similar problem for the bank if competing with FinTechs
- A consumer prefers the bank to a FinTech for payment services if and only if

$$b \geq b_j^c(p) \equiv p - \psi\Delta_j^w(p, 0) \tag{15}$$

FinTech competition could increase or reduce price for payment services

- Chen and Riordan (2008) show in discrete choice models, there is a robust tradeoff between market share and price sensitivity
- In our model, payment services price can also increase or decrease.
- The consumers who stay with the bank may be worse off in the payments market.

Impact of FinTech competition on loan quantity and quality

- Higher price in payments affects welfare directly.
- Higher price in payments affects welfare indirectly by changing the banks' information/loan contracts.
- High type's loan volume is not distorted, but bank's information can affect their information rent.

(a) The expected loan surplus obtained by high credit type consumers may increase or decrease after FinTech entry.
(b) The total surplus from loans to low credit consumers may increase or decrease after FinTech entry.

Summary of implication so far

When FinTech enters, it affects consumer welfare in three aspects:

- Financial inclusion. FinTech gives low-affinity (high-bank-cost) consumers access to electronic payments.
- Price of payment services. Under some conditions, FinTech reduces bank's price of payment services, in which case bank customers benefit. In other cases, bank's payment prices can go up and bank customers suffer.
- Loan market surplus. With FinTech, consumers with high credit quality can avoid giving bank data. Equilibrium impact on high credit type's loan surplus is ambiguous.

FinTech's impact on loan volume (i.e., total loan market surplus) is also ambiguous.

Payment data flows to lending market

- Data sales.
  - Bank purchases consumer data from FinTech so that the bank is informed about all consumers.
  - Bank remains the only lender.
- Data portability.
  - Consumers own their data and can choose to port payment data from FinTech to bank.
  - Bank remains the only lender.

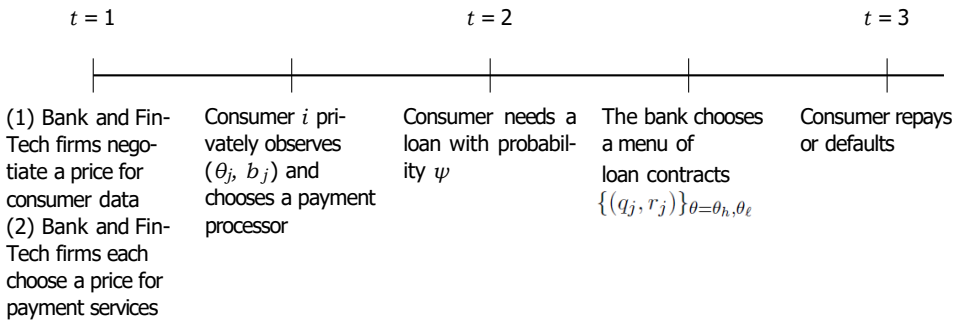


Figure: **Timing of Events with Data Sales**

Data sales

- When a FinTech payment customer approaches the bank to borrow, the bank can potentially buy data from the FinTech.
- Payment data create additional positive surplus for low type's loans (less distorted quantity).
- Bank and FinTech bargain over split of surplus.
- Competitive FinTech reimburses their data sales revenue to consumers in terms of subsidized payment services.
- Bank becomes informed about all consumers and strictly benefits from data sales.
  - Regardless of the choice of payment provider, consumer gets same expected surplus in the loan market.

Comparing FinTech sales of data to the base model with FinTech competition but no data sales:

(i) Overall expected surplus from the loan market is greater.

(ii) Consumers with low bank affinity and the low credit type are strictly better off if FinTech sells data.

(iii) Any of the following consumer groups, {high bank affinity, high credit type}, {high bank affinity, low credit type}, and {low bank affinity, high credit type}, may be better off or worse off.

Data portability

- Consumers port data from FinTech to bank if needed.
- Unraveling: the low type receives zero loan surplus anyway and would be happy to port their data if bank given any positive incentive.
- Then any consumers who use FinTech and refuse to port data are inferred as high type.
- This is a **data externality**
- If unraveling happens, bank becomes informed about everyone for free (except the tiny incentive paid to low type).

- Data portability is equivalent to data sales with zero price $\Longrightarrow$ Customers prefer data markets to data portability
- Consumer welfare depends on their bargaining power relative to the bank when data transfer happens.
- Data sales is equivalent to the FinTech firm negotiating with the bank on behalf of a block of consumers
- With data porting the bank is able to "divide and conquer" consumers in one-on-one negotiations by generating an unraveling via data externality.

Summary

- Payment data contain information about credit.
- When FinTech competes for consumers in payment market, it also reduces bank's information in credit market and improves the loan terms obtained by high credit consumers from the bank. A possible microfoundation of privacy concerns.
- FinTech also promotes financial inclusion for consumers with low bank affinity (high bank cost). FinTech entry has ambiguous impact on the price of bank's payment services.
- Data sales and data portability all imply the use of full payment data in lending. If FinTech is competitive in payment market, data portability is dominated, in terms of consumer welfare, by data sales.