Borrowing from a Bigtech Platform

Jian Li[1] Stefano Pegoraro[2]

[1]Columbia Business School
[2]University of Notre Dame, Mendoza College of Business

FDIC Bank Research Conference
September 29, 2023

Bigtech vs Fintech Firms

- ⋆ Bigtech
  - "Technology companies with an established presence in the market for digital services" (Frost et al., 2019; Stultz, 2019)
  - Amazon, Alibaba, Tencent
- Fintech
  - "Specialized firm that challenges a specific product line of banks" (Stultz, 2019)
  - Affirm, CashApp, Robinhood
- ⋆ Bigtech credit booming globally (Cornelli et al., 2021)
  - $572bn in 2019 vs fintech's $223bn non-mortgage credit

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Empirical Patterns

- Platforms lend to merchants
  - Payments: PayPal, Stripe, Toast
  - Marketplaces: Amazon, Alibaba, Doordash
- Short-term, uncollateralized, small business loans
  - PayPal: *"$1,000 to $150,000 for first-time borrowers"*
  - Doordash: *"typically $5,000 to $15,000 or more"*
- No (or minimal) conventional credit checks
  - Platforms look at revenues and transactions
  - PayPal: *"Your loan is based primarily on your PayPal account history, meaning no credit check is required"*
- Revenue-based repayment
  - Higher transaction fees used as loan repayment
  - PayPal: *"You repay with a share of your PayPal sales"*

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- ⋆ Model that explains these patterns

- ⋆ A bigtech platform controls access to a marketplace or payment system
  - Merchants need to pay required fees or sell elsewhere at a loss

- ⋆ Increased fees for borrowing merchants
  - Enforce partial loan repayment
  - ⋆ Banks do not control access to a source of revenues

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Questions

Q: What is the advantage of a platform as a lender?

A: The platform controls access to a marketplace

⋆ Better enforcement of loan repayments

Q: What are the equilibrium implications of its competition with banks?

- In equilibrium, menu of contracts with different enforcement

⋆ The platform benefits from advantageous screening at the expense of banks

Q: How does welfare change when it enters the credit market?

A: Improves for merchants rationed by banks

A: Possibly declines when competing with banks

- Negative effects of equilibrium screening

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Contribution

- ⋆ Enforcement as a key advantage of a bigtech platform and its equilibrium implications
  - Not only information, convenience, and regulation

  cf. Boualam and Yoo (2022), Ghosh, Vallee, and Zeng (2021), He, Huang, and Zhou (2020), Huang (2021), Parlour, Rajan and Zhu (2020)

- ⋆ Superior information may lower the platform's profits
  - In equilibrium, lower surplus extracted from enforcement

  cf. Broecker (1990), Goldstein, Huang, and Yang (2022), Hauswald and Marquez (2003), Hausch (1987), He, Huang, and Zhou (2023), Kagel and Levin (1999), Milgrom and Weber, (1982)

- ⋆ Credit with limited commitment and industrial organization
  - A platform can relax financial constraints

  cf. Alvarez and Jermann (2000), Kehoe and Levine (1993), Kocherlakota (1996), Ligon, Thomas, and Worrall (2002)

  cf. Armstrong (2006), Bouvard, Casamatta, Xiong (2022), Jullien, Pavan, and Rysman (2021), Rochet and Tirole (2002), Weyl (2010

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Players

- Merchant
  - Needs to borrow one unit of capital to produce for two periods
  - Sells goods on or off the platform
- Competitive banks
  - Lend to merchant at rate R_B
  - Cost of capital: R_D
- Platform
  - Provides marketplace or payment service
  - Lends to merchant at rate R_P
  - Cost of capital: $\bar{R} \geq R_D$

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Merchant and Fees

- Merchant's revenues on the platform: c_θ
- Revenues off the platform: $(1-\eta)c_\theta$
  - Relative revenues: $\eta \leq 1$
  - Value of the platform for the merchant
- Merchant's transaction fees: fc_θ
  - We focus on merchants joining the platform: $\eta \geq f$
- We study lending after transaction fees are set
  - Platform design taken as exogenous

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Timing

- $t = 0$: Lending
  - The merchant borrows from a bank or the platform
  - Loan due at $t = 1$
- Between 0 and 1: First production period
  - The merchant produces revenues c_θ
  - Pays fees to the platform (if selling on the marketplace)
- $t = 1$: Strategic default
  - Repay the loan and continue production or default and abscond
- Between 1 and 2: Second production period (if not defaulted)
  - Same as the first production period
- $t = 2$: Game ends

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Financing Frictions

- ⋆ Asymmetric information and moral hazard

- Asymmetric information
  - Merchant is privately informed about her future revenues c_θ

$$c_H > c_L$$

  - Credit quality $p \in [0, 1]$: probability the borrower is high-revenue
- Moral hazard as limited commitment
  - Strategic default if remaining loan balance exceeds future net revenues
  - Low-revenue merchant more likely to default
- Frictions in equilibrium
  - The low-revenue merchant defaults on banks: $c_L < R_D$
  - The high-revenue merchant does not default on banks if rates are low enough: $(1 - f)c_H > R_D$

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Repayment Fees and Enforcement

- The platform charges an additional fee f_P as partial loan repayment
  - Paid when the merchant generates sales, before loan maturity

⋆ An optimal response to the risk of strategic default

⋆ The platform has an advantage in enforcing repayment
  - Based on its control of the marketplace

- Banks cannot exclude merchants from a marketplace
  - Cannot charge repayment fees: $f_B = 0$

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Limited Commitment and Incentive Compatibility

- IC-θ: The merchant of type θ repays the loan
  - $\star$ $R_J \uparrow$ if $f_J \uparrow$

$$\underbrace{R_J - f_J c_\theta}_{\text{remaining loan balance}} \leq \underbrace{(1-f)c_\theta}_{\text{future net revenues}} \quad , \quad J \in \{B, P\}$$

  - $\star$ Repayment fees f_P as optimal solution for the limited-commitment problem
    - Recover some payment ahead of default
    - Lower ex-post incentives to default

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Sale Diversion and Incentive Compatibility

- PayPal: *We'll monitor accounts for unexpected drops in PayPal sales volume, and your loan will be in default if you move your sales away from PayPal to avoid repayment*

- IC-f_P: The merchant remains on the platform and pays the fees
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$$\underbrace{f_P}_{\text{cost of remaining on platform}} \leq \underbrace{\eta - f}_{\text{cost of leaving the platform}}$$

⋆ Better enforcement for merchants with high relative revenues η

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Benchmark: Borrowing from Banks Only

- Banks charge a break-even rate $R_B = \frac{R_D}{p}$

- Lend only if high-revenue merchants are willing to repay (IC-H): $\frac{R_D}{p} \leq (1-f)c_H$

- Banks lend based on credit quality

$$p \geq \frac{R_D}{(1-f)c_H}$$

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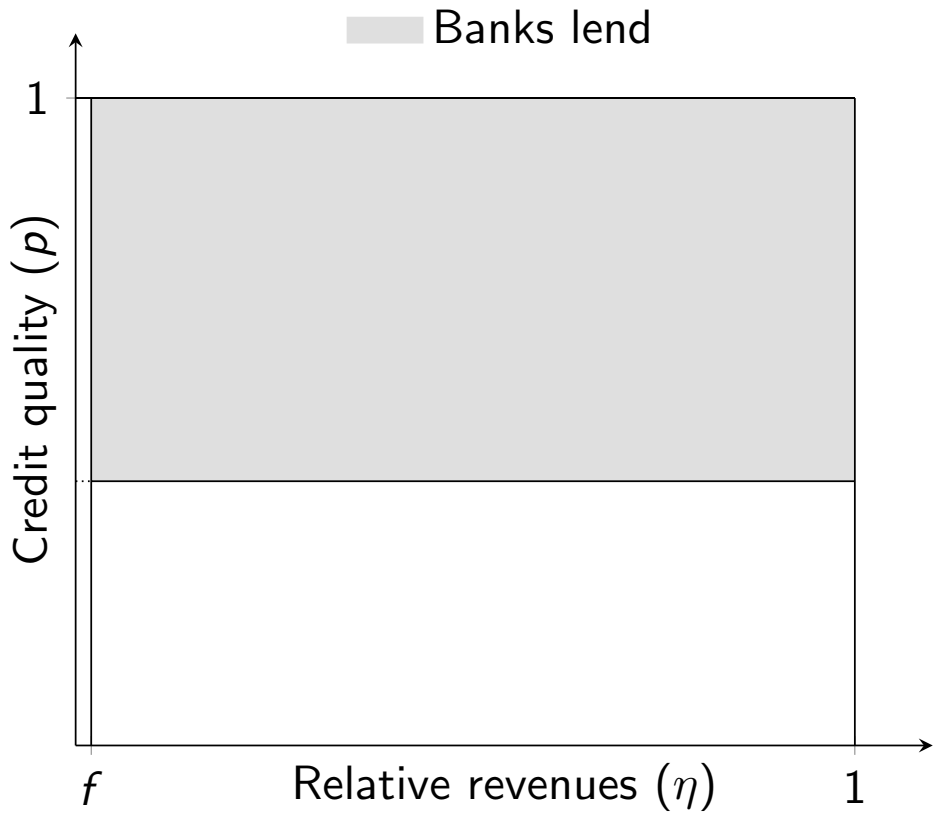

Benchmark: Borrowing from the Platform Only (1)

- The platform sets incentive-compatible repayment fees (IC-f_P): $f_P = \eta - f$

- Two options to set R_P as a monopolist
  - Only the good merchant repays (IC-H): $R_P = (1 - 2f + \eta)c_H$

$$\text{Revenues} = \underbrace{p(1 - 2f + \eta)c_H + (1 - p)(\eta - f)c_L}_{\text{loan}} + \underbrace{[p2c_H + (1 - p)c_L]f}_{\text{transactions}}$$

  - Both merchants repay (IC-L): $R_P = (1 - 2f + \eta)c_L$

$$\text{Revenues} = \underbrace{(1 - 2f + \eta)c_L}_{\text{loan}} + \underbrace{2[pc_H + (1 - p)c_L]f}_{\text{transactions}}$$

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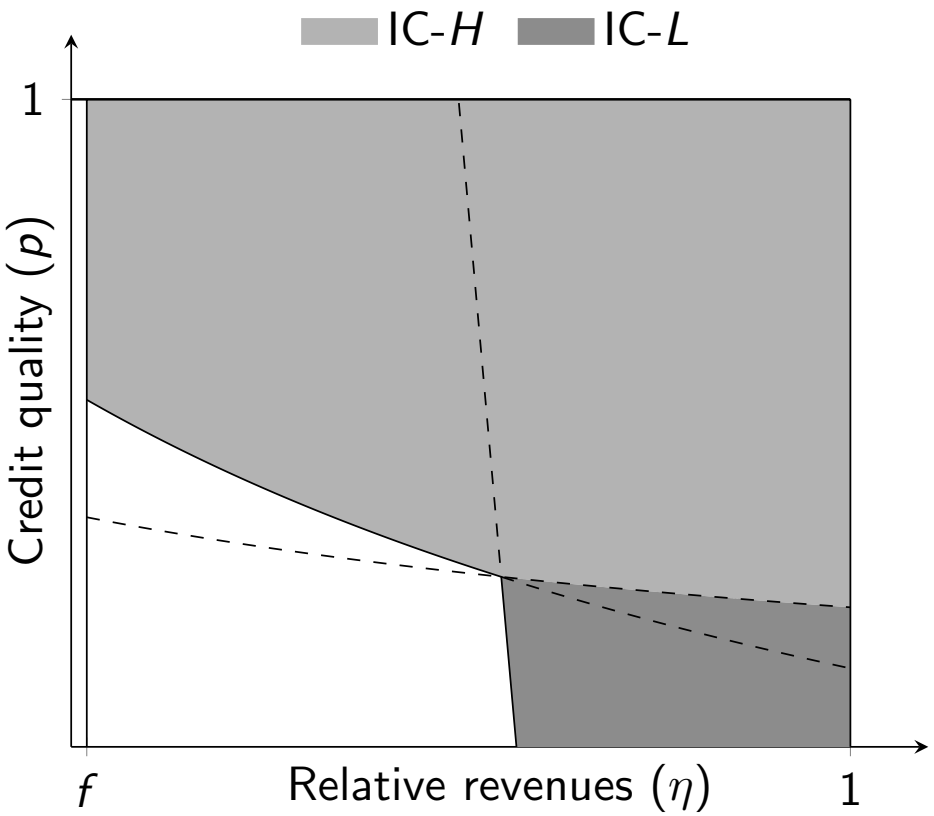

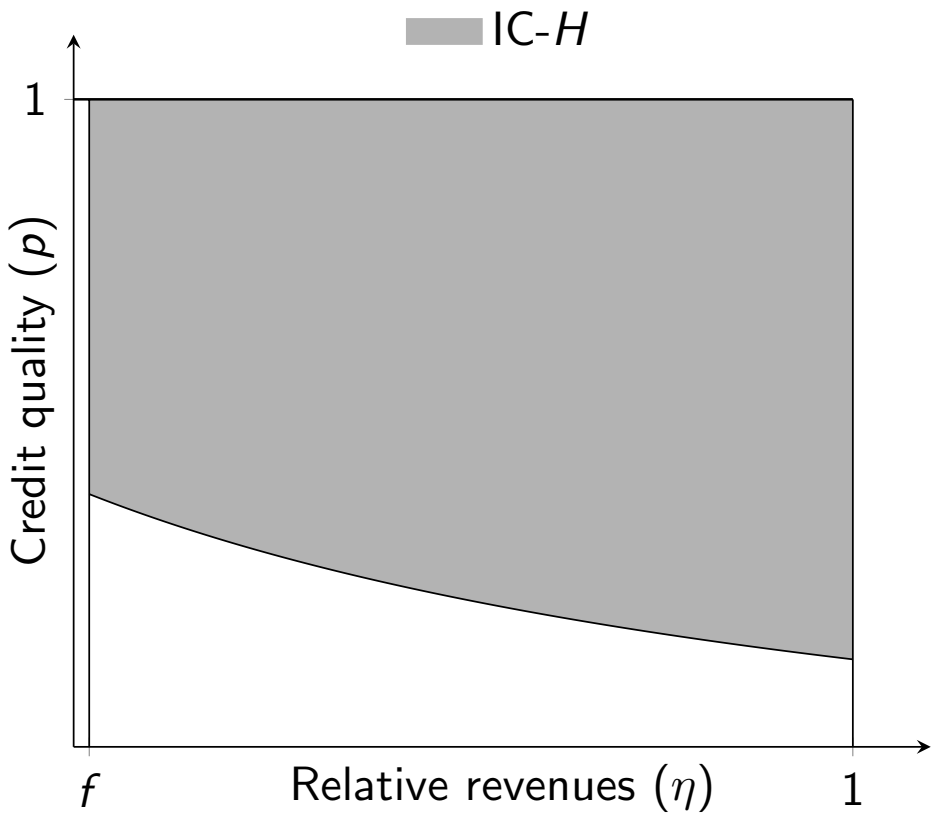

Platform alleviates financial frictions when $\eta \uparrow$

Competition

- Platform and banks compete in the credit market
  - Contemporaneously decide whether to lend and at what rate
  - Merchant picks the best offer
- Contract terms similar to benchmark models
  - Same maturity and repayment fees
- Welfare
  - Compare social welfare to a benchmark where banks are the only lenders

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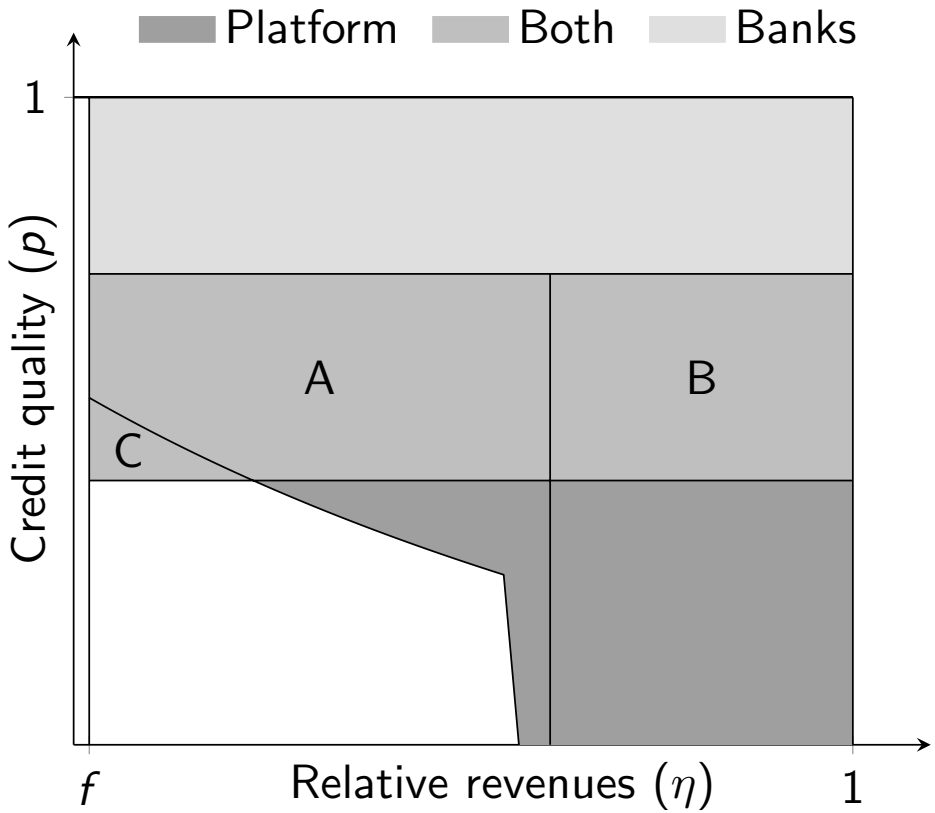
▸ Bank profits ▸ Platform profits ▸ Equilibrium

Segmentation by Credit Quality

- ⋆ Only banks lend to high-quality merchants
  - Banks' competitive rate is too low for the platform to beat
  - Welfare $\sim$
- ⋆ Only the platform lends to low-quality merchants
  - Welfare $\uparrow$
- ⋆ Competition for intermediate-quality merchants
  - Ambiguous welfare effects
  - The platform lends even when monopolistic revenues $< \bar{R}$ (case C)



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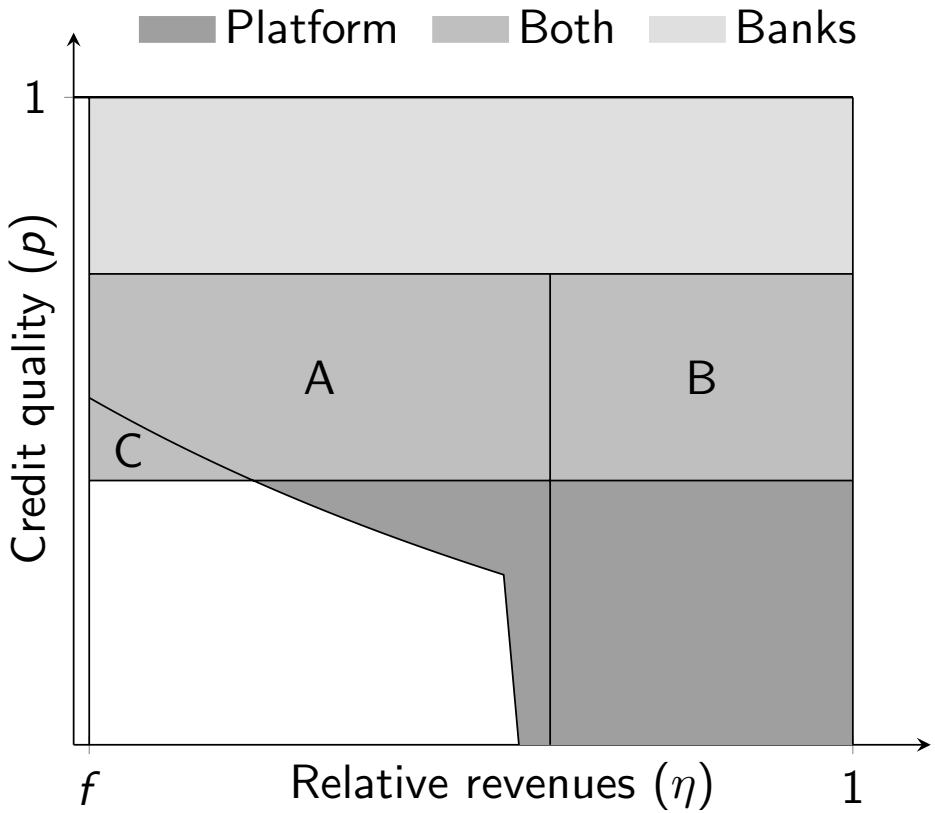

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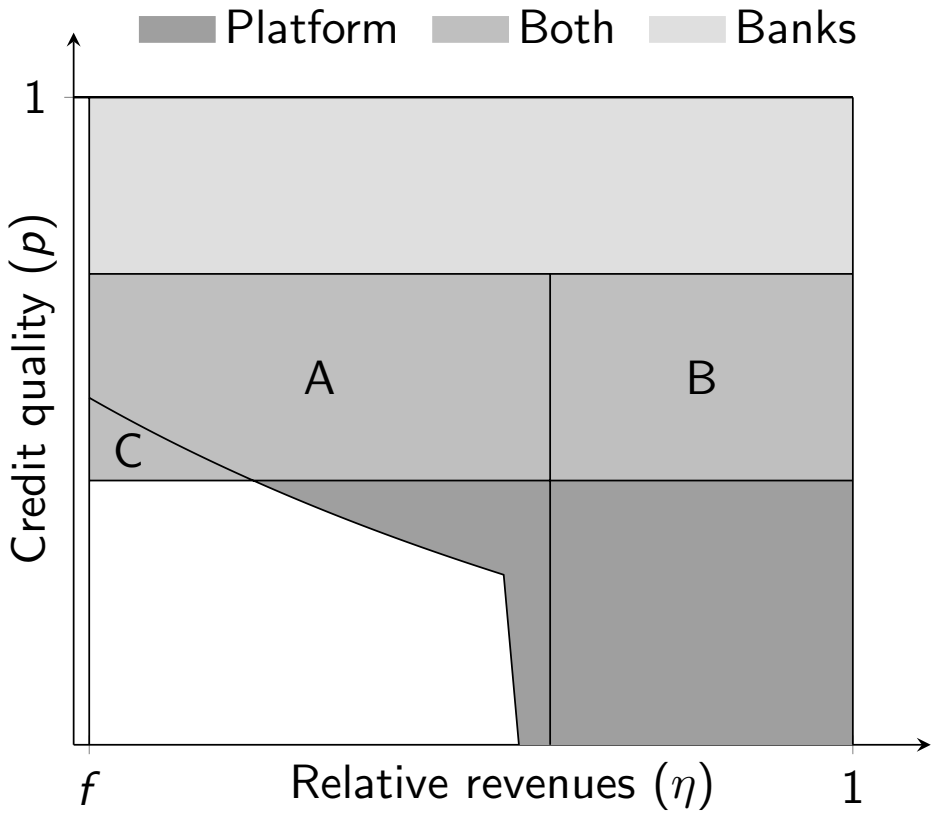

Equilibrium Screening

- ⋆ The platform benefits from advantageous screening in equilibrium
  - Conditional on observables, the platform lends to a better pool of borrowers than banks
  - ⋆ The platform extracts rents from banks
- ⋆ Jointly, the platform and banks offer a menu of screening contracts
  - The good merchant picks the lender offering the lowest rate
  - The bad merchant self-selects into bank loans to avoid enforcement
- Banks tighten lending standards
  - ⋆ Will deny credit with positive probability
  - ⋆ Will increase rates up to $(1 - f)c_H$

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Why Does the Platform Enter the Credit Market?

1. Internalization of fees f
   - $\star$ Relaxes financial constraints

2. Enforcement
   - More income can be credibly pledged to the platform
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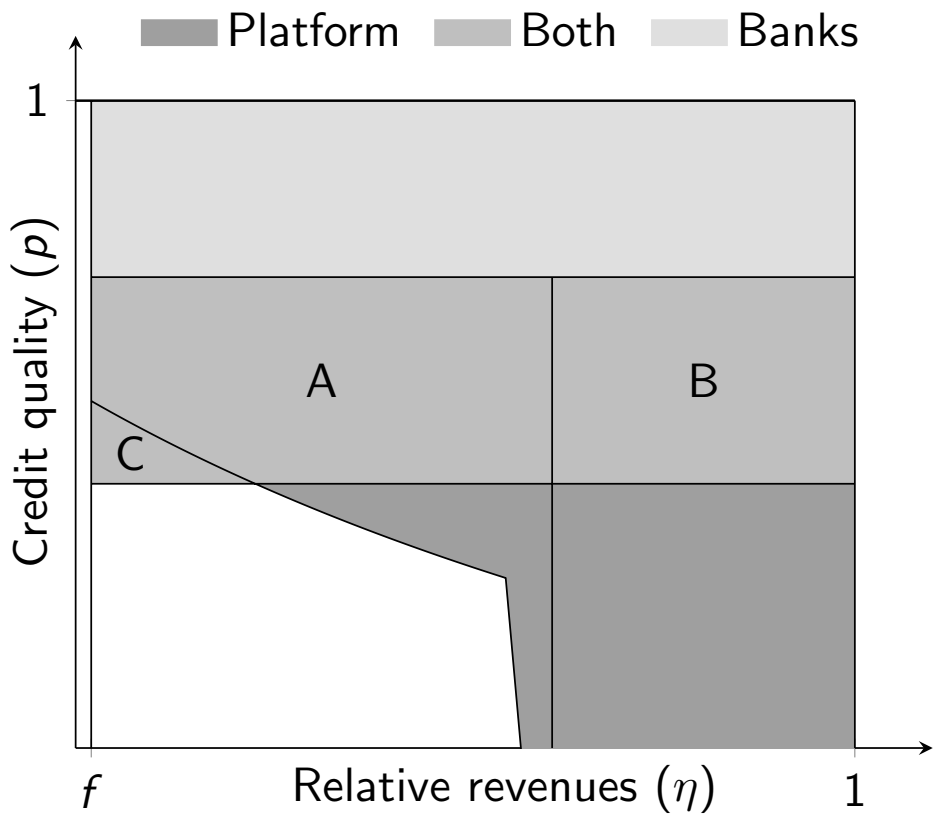
Borrowing with Competition: Cases

- Cases A and B
  - Monopolistic revenues $\geq \bar{R}$
- Case B
  - Loans satisfying IC-L are profitable: $\bar{R} \leq (1 - 2f + \eta)c_L$
- Case C
  - The platform lends only because of advantageous screening



▸ Welfare

Welfare with Direct Competition

$$\Delta\text{Welfare} = -\Delta\text{Credit rationing} - \Delta\text{Cost of capital} + \Delta\text{Enforcement}$$

- Case A
  - Cost of capital ↑ iff $\bar{R} > R_D$
- Case B
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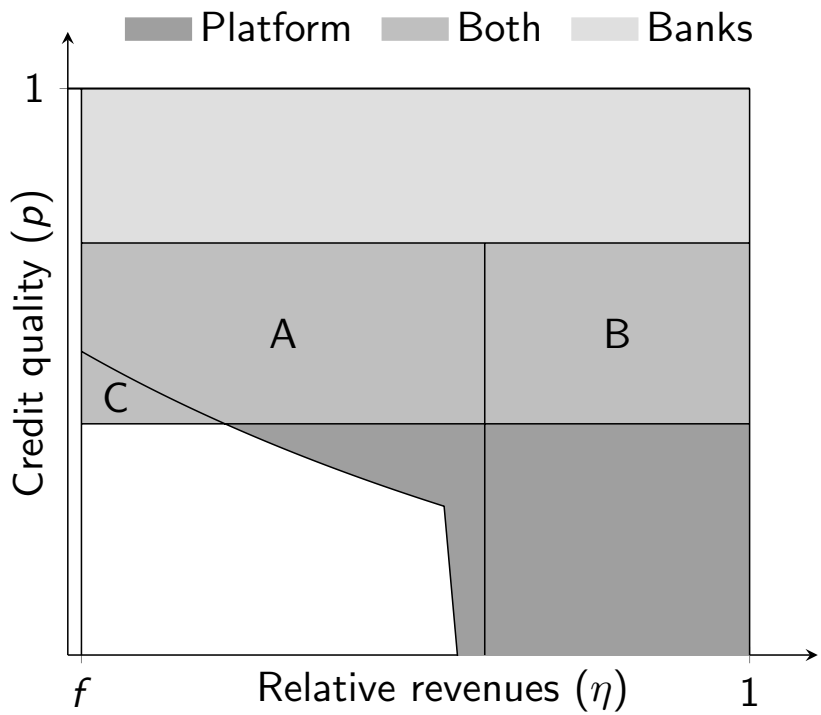

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Details Conclusion

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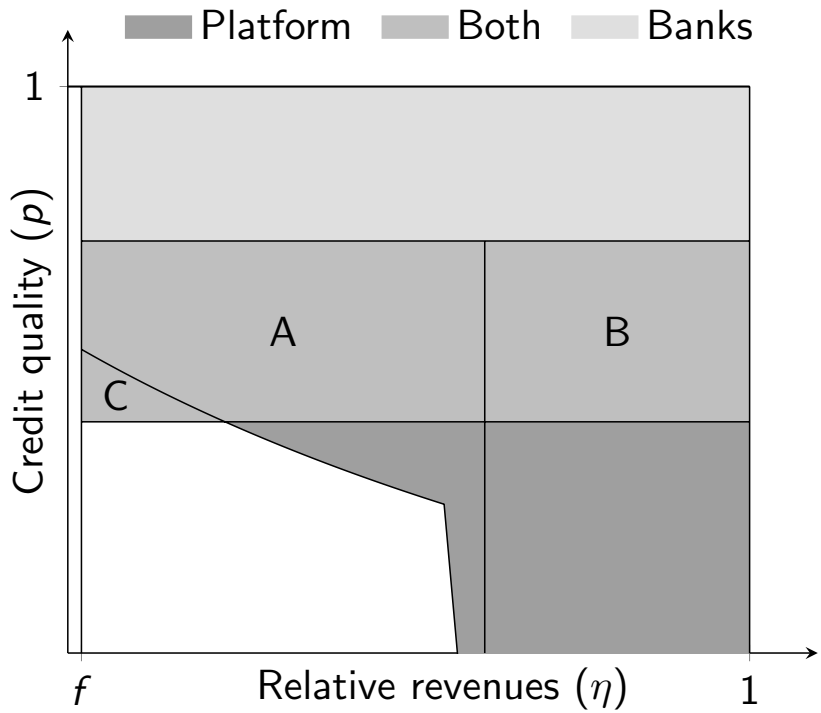

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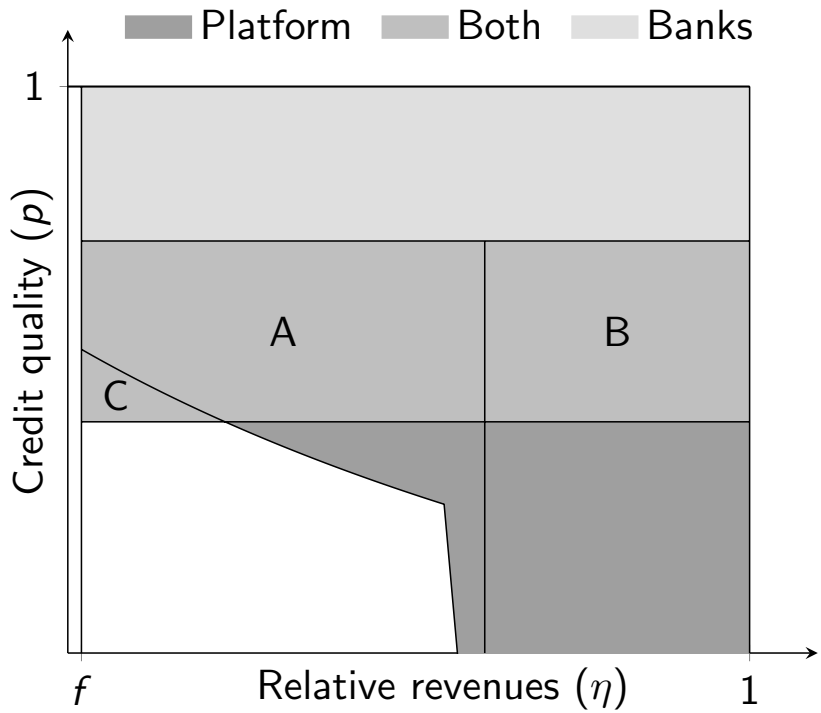

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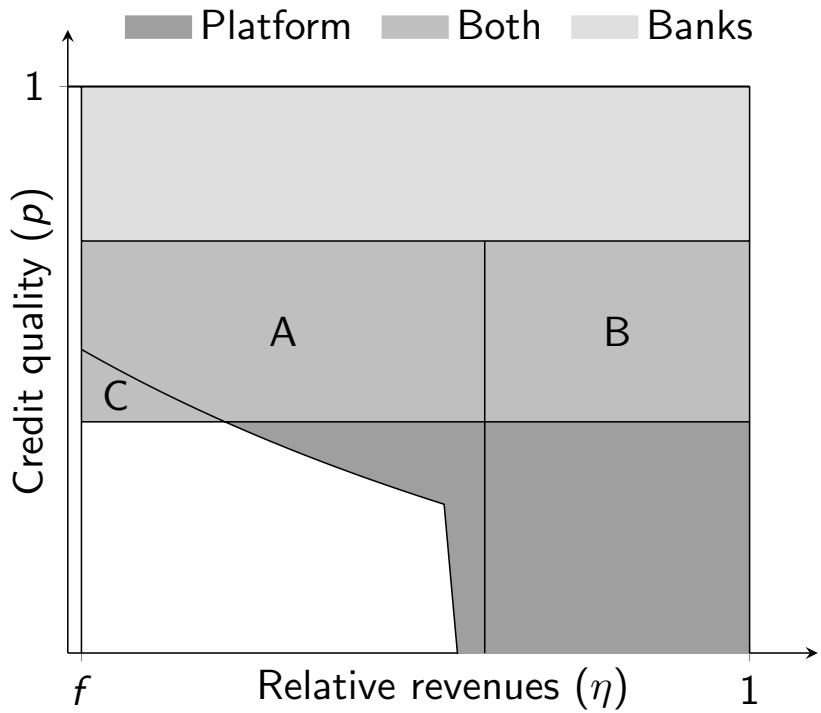

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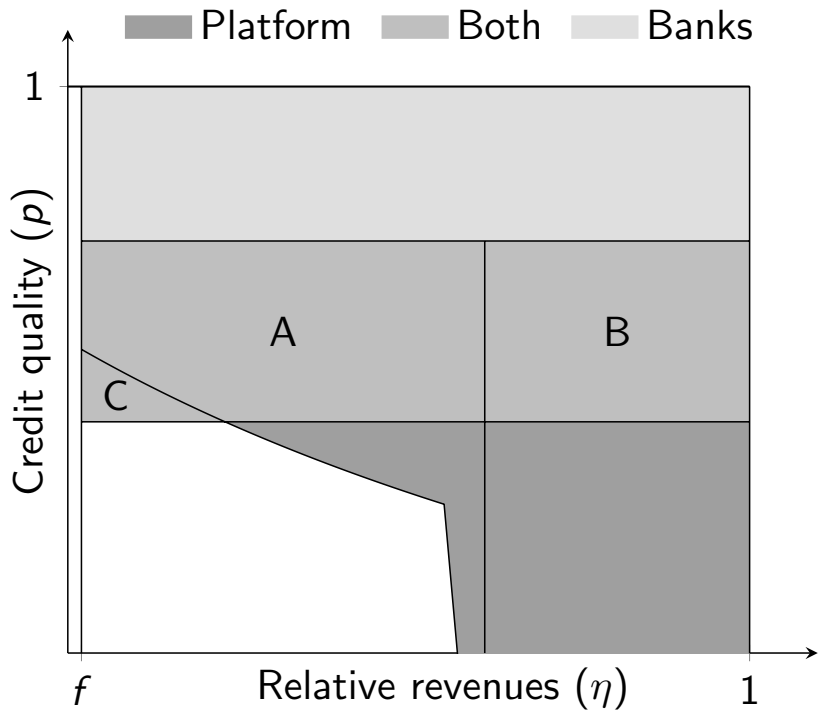

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Information and Enforcement

- The platform can acquire information at cost $c \to 0$
  - High signal: $P(\text{high revenues}) \uparrow$
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- Information used to cream-skim
  - ⋆ Banks lend less because of winner's curse
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- ⋆ The platform controls access to a marketplace
  - Can enforce partial loan repayment
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Thank You!

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s.pegoraro@nd.edu

The Bank's Objective Function

Profits from borrowing at rate R:

$$L_B(R, m_P, G_P; p) := m_P[pG_P(R)(R - R_D) - (1-p)R_D] + (1 - m_P)(pR - R_D)$$

- Platform lends w.p. m_P
  - Borrower is good w.p. p
    - Borrows from banks and repay if $R < R_P$, w.p. $G_P(R)$
  - Borrower is bad w.p. $1 - p$
    - Always borrows from banks and never repays

- Platform does not lend w.p. $1 - m_P$
  - Both types borrow from banks
  - Only the good type repays

Back

The Platform's Objective Function

Profits from borrowing at rate R:

$$L_P(R, m_B, G_B; p) := \begin{cases} l_P^0(R, m_B, G_B; p) & \text{if } R \in ((1-f)c_L, (1-2f+\eta)c_L] \\ l_P^1(R, m_B, G_B; p) & \text{if } R > (1-2f+\eta)c_L. \end{cases}$$

- Bad borrower repays the platform if $R \leq (1-2f+\eta)c_L$
- Bad borrower does not repay the platform if $R > (1-2f+\eta)c_L$

⋆ Discontinuity at $R = (1-2f+\eta)c_L$

Back

The Platform's Profits when $R \leq (1 - 2f + \eta)c_L$

$$I_P^0(R, m_B, G_B; p) := m_B\{pG_B(R)(R - \bar{R}) + [2pc_H + (1-p)c_L]f\} + (1 - m_B)\{R - \bar{R} + 2[pc_H + (1-p)c_L]f\},$$

- Banks lend w.p. m_B
  - Borrower is good w.p. p
    - Borrows from the platform and repay if $R \leq R_B$, w.p. $G_B(R)$
    - Pays transaction fees twice
  - Borrower is bad w.p. $1 - p$
    - Never borrows from the platform
    - Pays transaction fees once
- Banks do not lend w.p. $1 - m_B$
  - Both types borrow from the platform
  - Both types repay
  - Both types pay transaction fees twice

Back

The Platform's Profits when $R > (1 - 2f + \eta)c_L$

$$\begin{aligned} I_P^1(R, m_B, G_B; p) :=& m_B p G_B(R)(R - \bar{R}) \\ &+ (1 - m_B)[pR + (1 - p)(\eta - f)c_L - \bar{R}] \\ &+ [2pc_H + (1 - p)c_L]f, \end{aligned}$$

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  - Bad borrower repays only repayment fees $(\eta - f)c_L$
- In both cases
  - Good type pays transaction fees twice
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Back

Definition of Equilibrium

Lending probabilities $(m_P^*, m_B^*) \in [0,1]^2$ and rate distributions by the platform and the banks F_P^* and F_B^* with supports $\mathcal{R}_P^*$ and $\mathcal{R}_B^*$ such that:

1. The platform and competitive banks set rates optimally

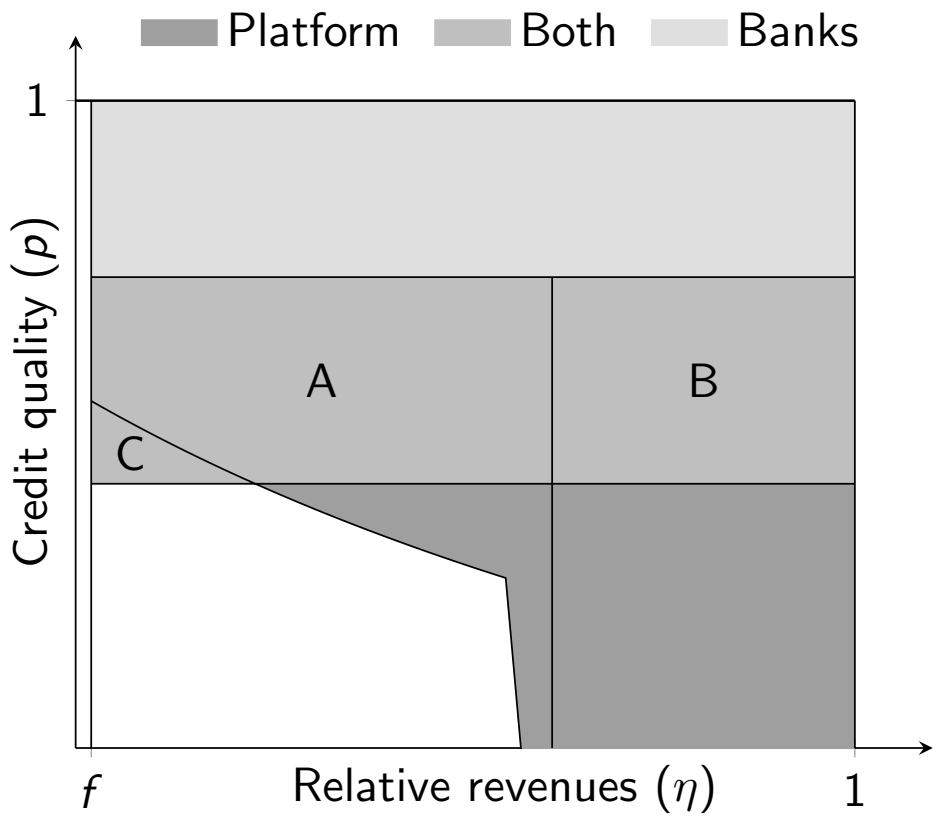
2. Lenders extend credit optimally

3. Banks are competitive in the lending market; that is, no lending mechanism (F_B, m_B) exists such that it improves the bank's and the good merchant's profits.

Back

Case *A*

- No credit rationing
  - The platform always lends
  - Banks deny credit with positive probability
- Lenders randomize rate offers
  - Banks lend above their competitive rate: $[R_D/p, (1-f)c_H]$
  - Platform competes on rates: $[R_D/p, (1-f)c_H] \cup \{(1-2f+\eta)c_L\}$



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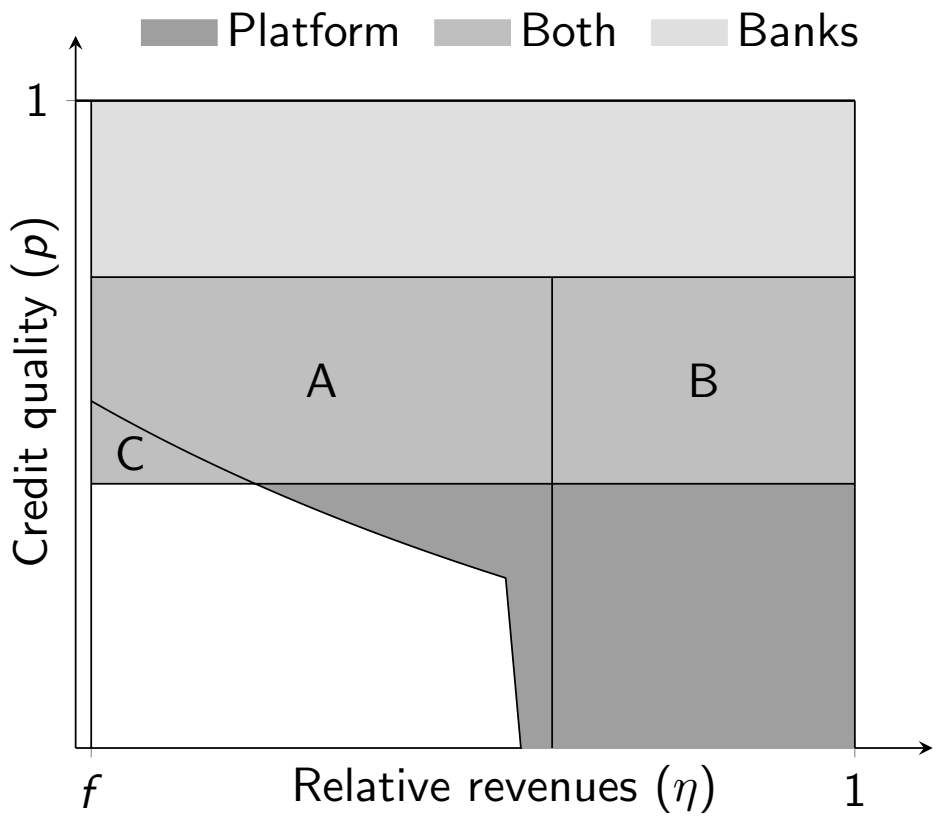

Back

Case *B*

- No credit rationing
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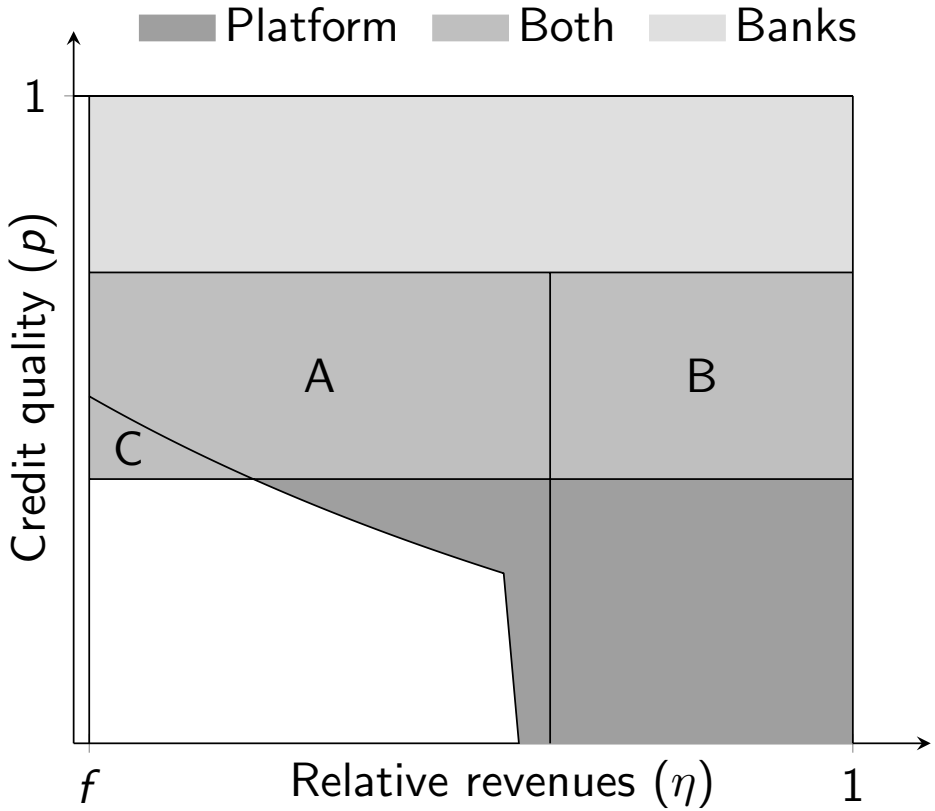
  - Banks deny credit with positive probability

⋆ The platform may offer rates $R_P \leq (1 - 2f + \eta)c_L$
  - Bad merchant may repay the platform in full

- More complex price-dispersion equilibrium
  - ⋆ Discontinuity in the platform's objective function



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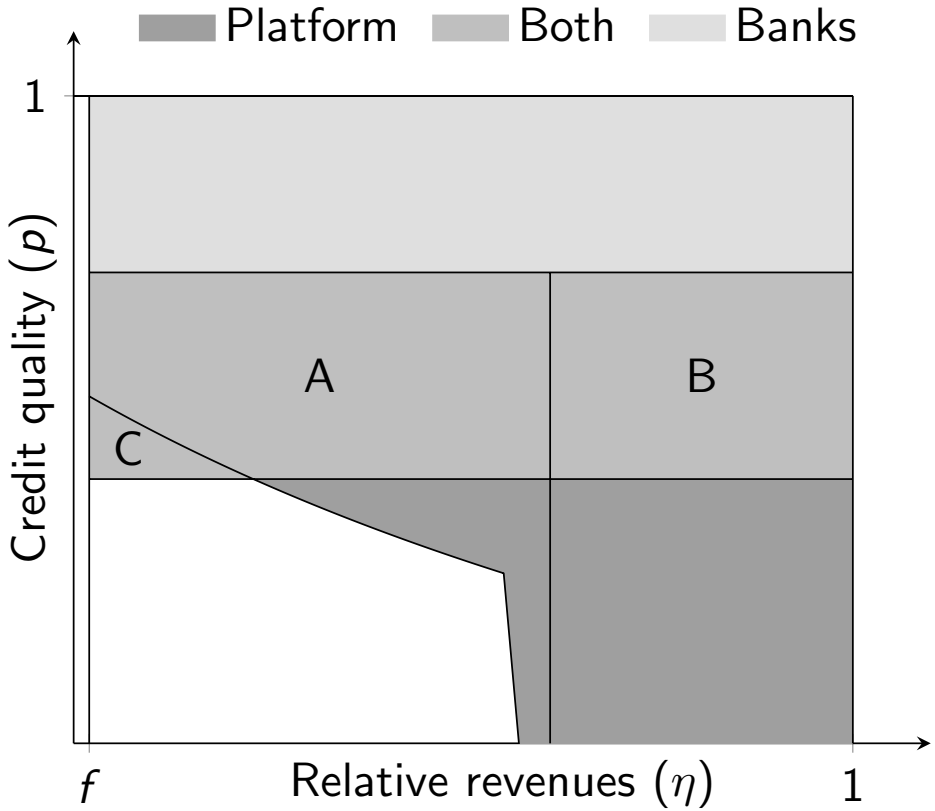

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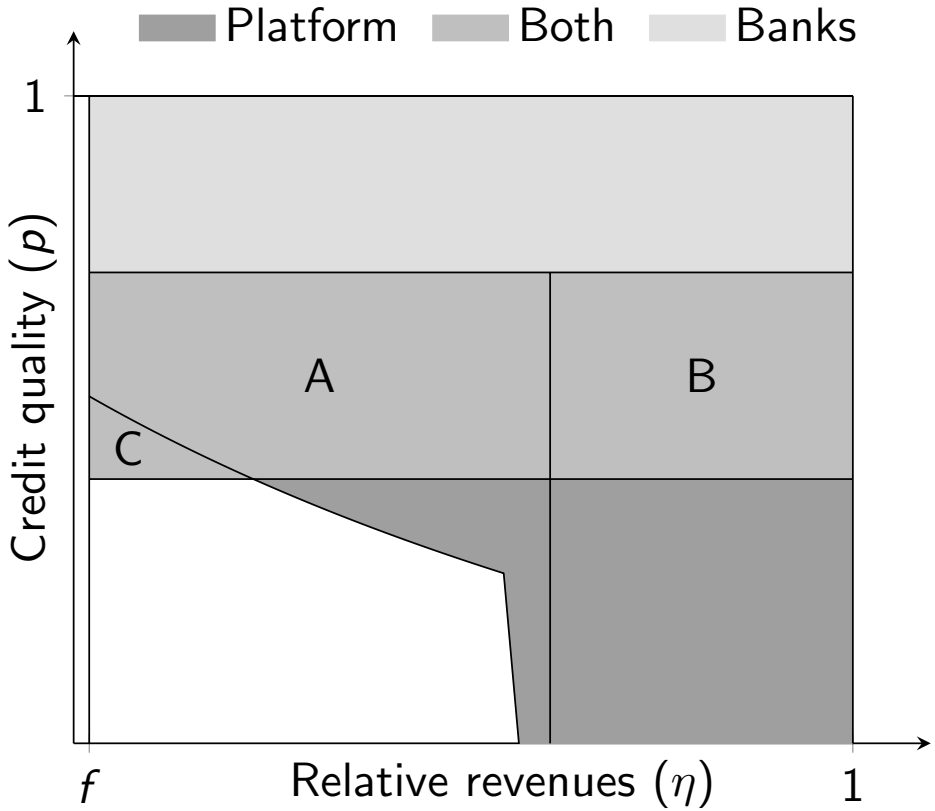

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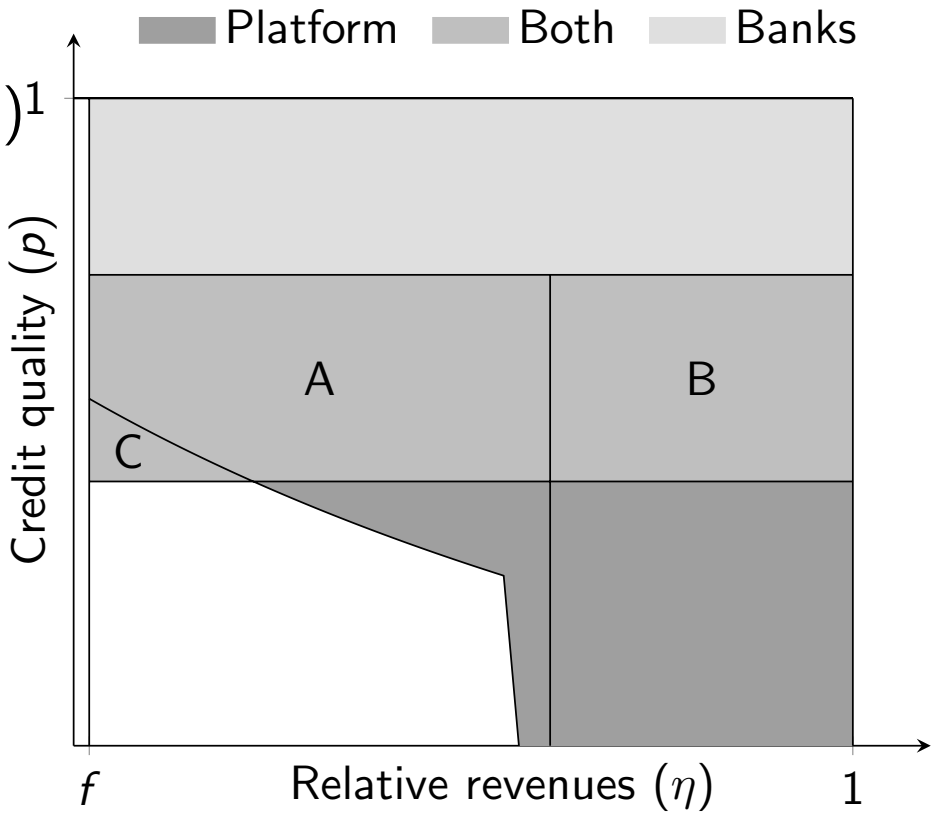
- ⋆ The platform extracts more rents when banks lend more

  Platform's profits $\propto P(\text{banks lend})^1$

- ⋆ Merchants are rationed with positive probability
  - Platform and banks deny credit with positive probabilities

- Lenders randomize rates over $[R_D/p, (1-f)c_H]$



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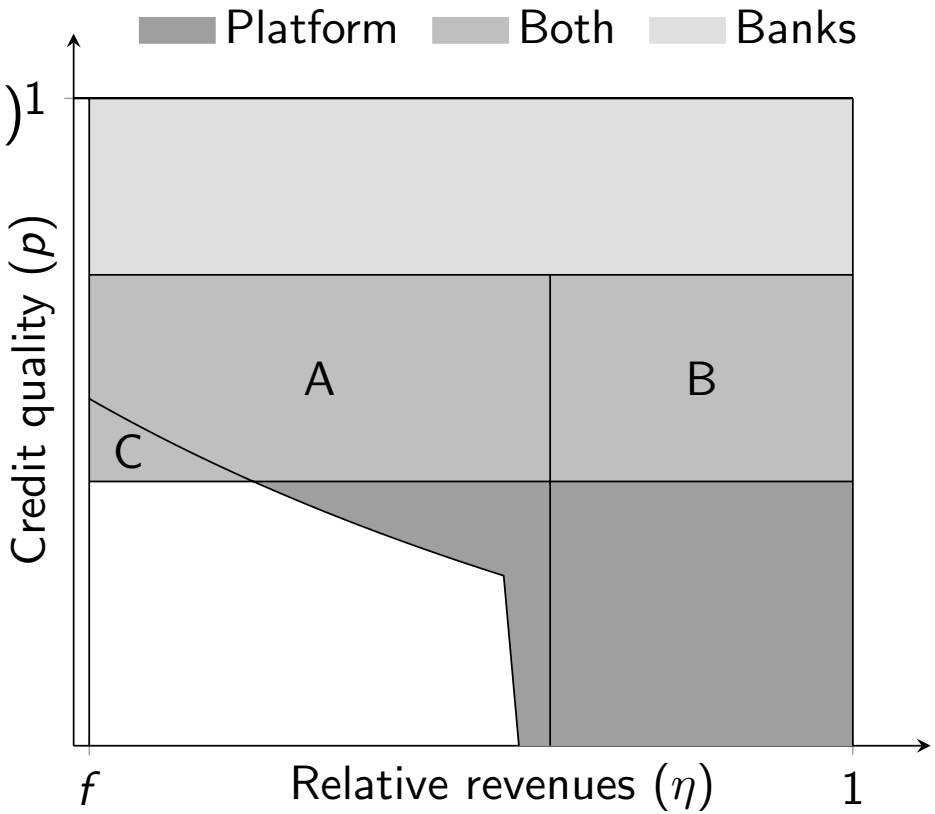

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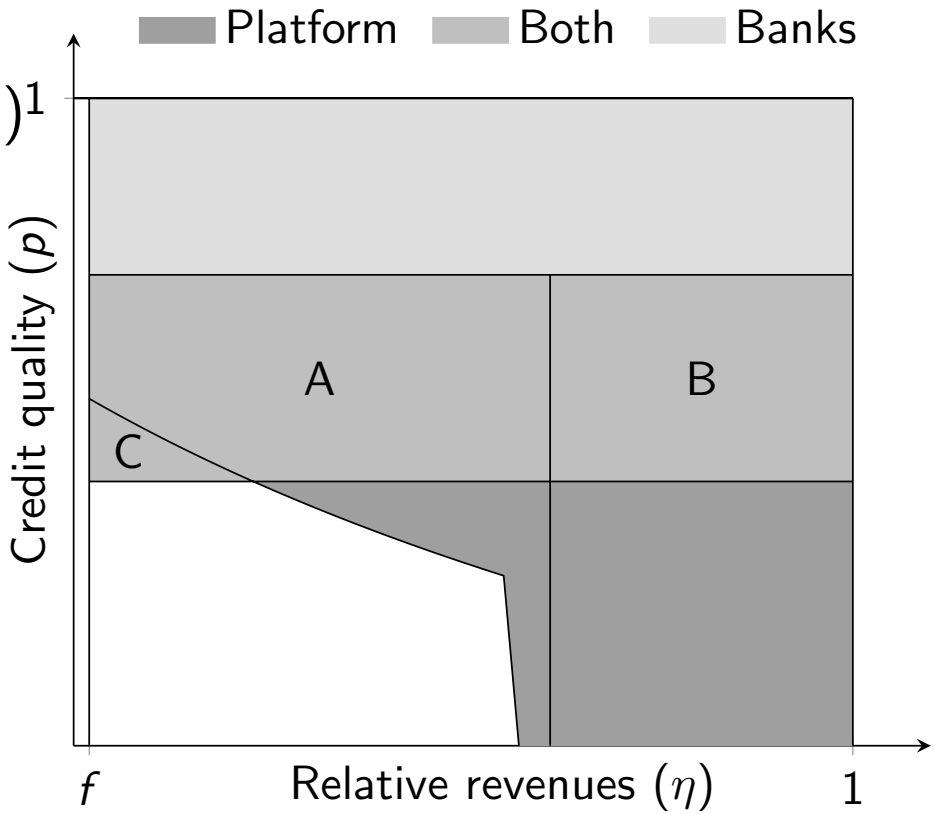

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