

Borrowing from a Bigtech Platform

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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
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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: $f c_\theta$
 - 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

★ $R_J \uparrow$ if $f_J \uparrow$

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

★ Repayment fees f_P as optimal solution for the limited-commitment problem

★ Lemma 4: Repayment fees f_P as optimal solution for the limited-commitment problem

★ Lemma 5: Repayment fees f_P as optimal solution for the limited-commitment problem

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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
 - Always binding

$$\underbrace{f_P}_{\text{cost of remaining on platform}} \leq \underbrace{\eta - f}_{\text{cost of leaving the platform}}$$

- ★ 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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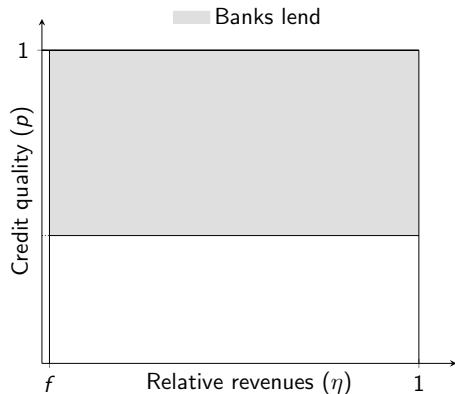
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Benchmark: Borrowing from the Platform Only (1)

- 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): $R_P = (1 - 2f + \eta)c_L$

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$$\text{Monopolistic revenues} \geq \bar{R}$$

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): $R_P = (1 - 2f + \eta)c_L$

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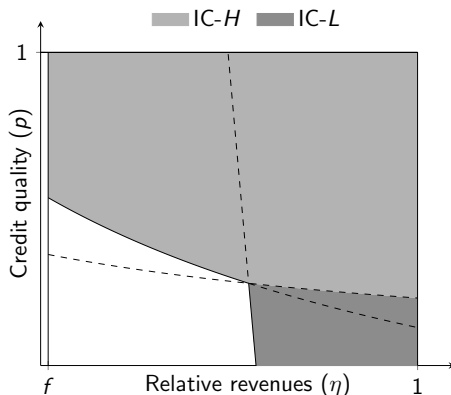
Benchmark: Borrowing from the Platform Only (2)

- $2c_L \geq \bar{R}$
 - IC- L may bind
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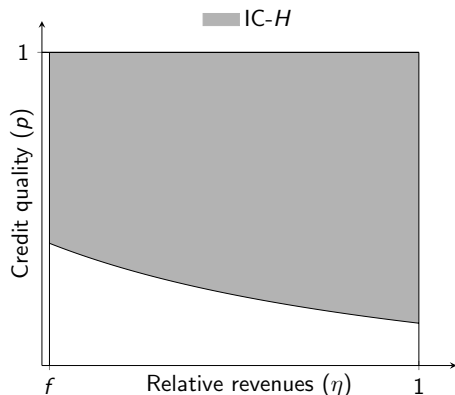
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Platform alleviates financial frictions when $\eta \uparrow$

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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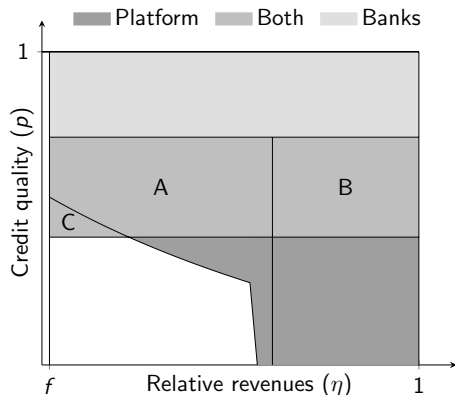
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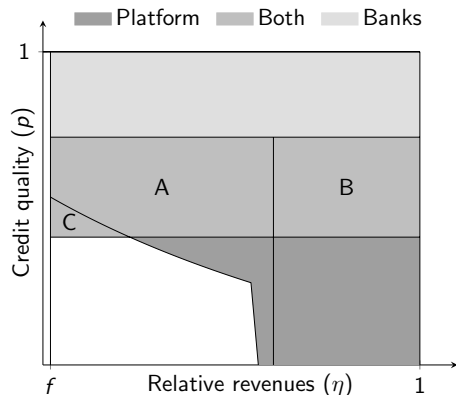
Segmentation by Credit Quality

- ★ Only banks lend to high-quality merchants
 - Banks' competitive rate is too low for the platform to beat
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- ★ Only the platform lends to low-quality merchants
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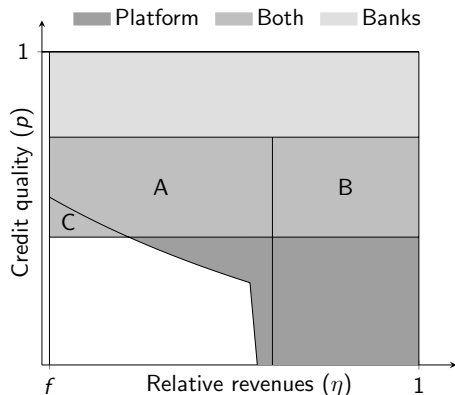
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- ★ The platform benefits from advantageous screening in equilibrium
 - Conditional on observables, the platform lends to a better pool of borrowers than banks
 - ★ The platform extracts rents from banks
- ★ Jointly, the platform and banks offer a 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
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Why Does the Platform Enter the Credit Market?

1. Internalization of fees f

- ★ Relaxes financial constraints

2. Enforcement

- More income can be credibly pledged to the platform
- Lower default risk
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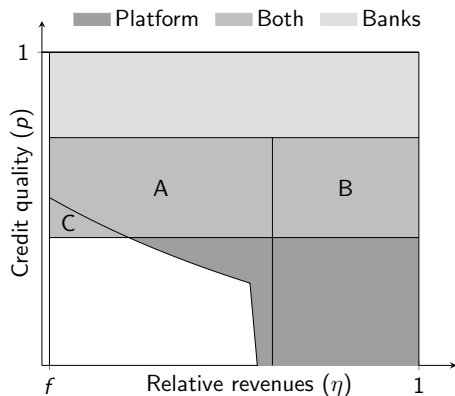
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Borrowing with Competition: Cases

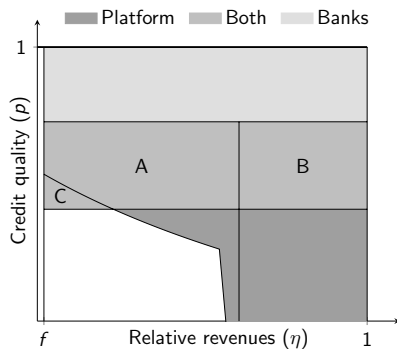
- Cases *A* and *B*
 - Monopolistic revenues $\geq \bar{R}$
- Case *B*
 - Loans satisfying IC-L are profitable: $\bar{R} \leq (1 - 2f + \eta)c_L$
- Case *C*
 - The platform lends only because of advantageous screening



Welfare with Direct Competition

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

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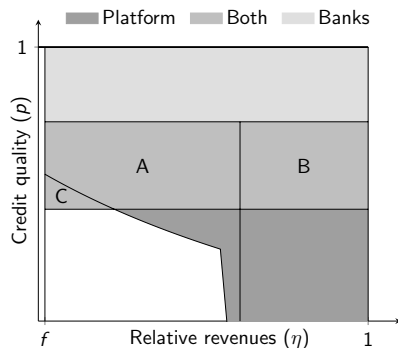


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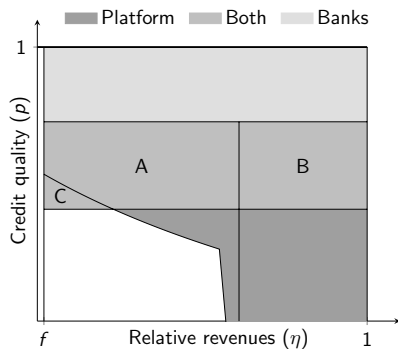


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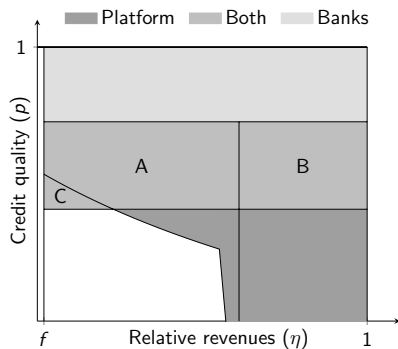


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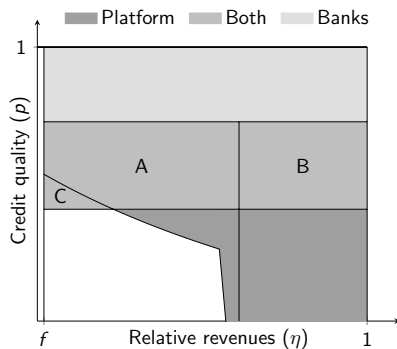


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Information and Enforcement

- The platform can acquire information at cost $c \rightarrow 0$
 - High signal: $P(\text{high revenues}) \uparrow$
 - Low signal: $P(\text{high revenues}) = 0$
- Information used to cream-skim
 - ★ Banks lend less because of winner's curse
 - ★ Smaller advantageous-screening rents
- Information used to extract surplus
 - Higher interest rates after high signal
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Concluding Remarks

- ★ The platform controls access to a marketplace
 - Can enforce partial loan repayment

- ★ Benefits from advantageous screening when competing with banks
 - Contracts with different level of enforcement
 - ★ Negative welfare effects

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Thank You!

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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

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

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

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

- 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

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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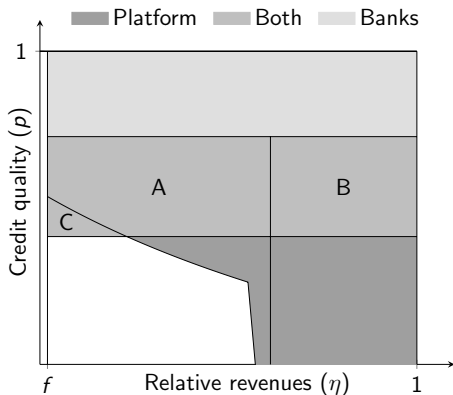
Definition of Equilibrium

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.

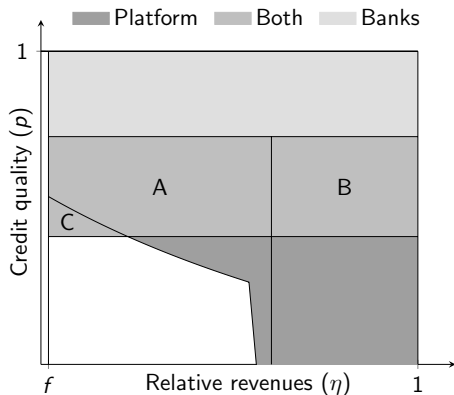
Case A

- 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:
 $[R_D/p, (1-f)c_H] \cup \{(1-2f+\eta)c_L\}$



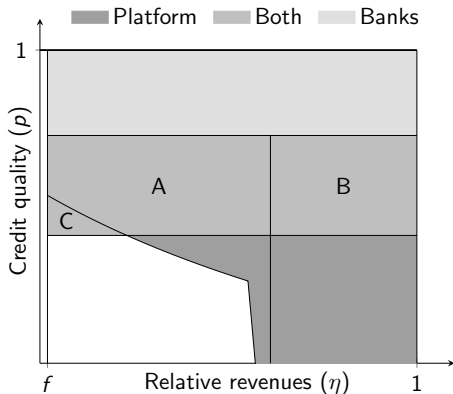
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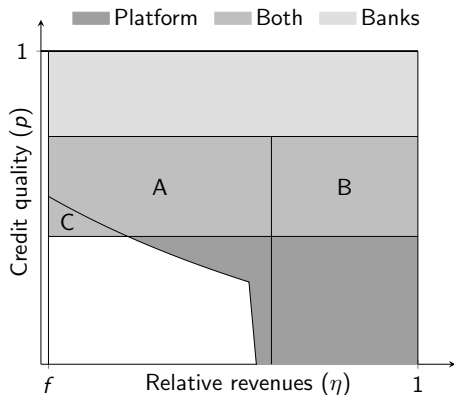
Case B

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- ★ The platform may offer rates $R_P \leq (1 - 2f + \eta)c_L$
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- More complex price-dispersion equilibrium
 - ★ Discontinuity in the platform's objective function



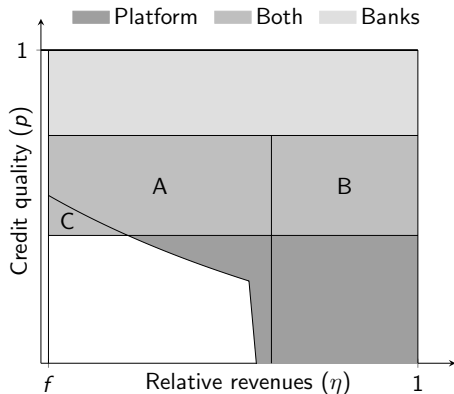
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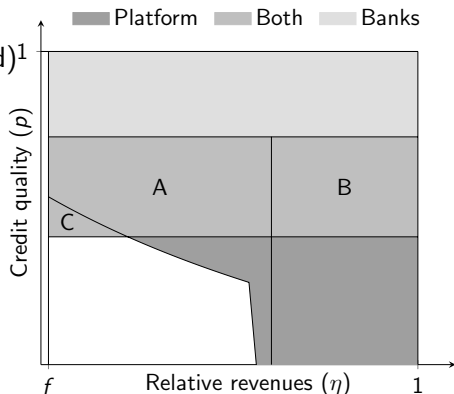


Case C

- ★ The platform extracts more rents when banks lend more

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

- ★ Merchants are rationed with positive probability
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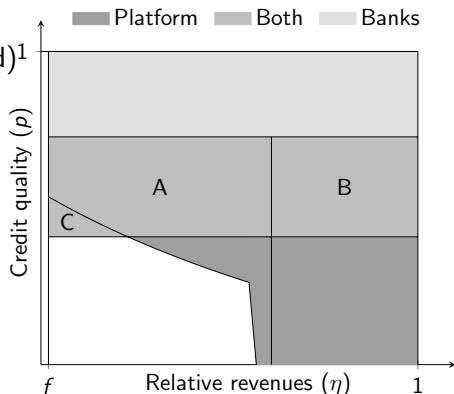


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