The Welfare Effects of Open Banking: Data vs Collateral

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Introduction

- Data and information are pervasive and have transformed markets
- Financial markets are no exception
- For instance, new lenders (eg fintechs) rely on their ability to make predictions based on data
  - According to Giglio et al. (2021), "fintech innovation in lending is found in the use of alternative credit models, online data sources, price risk data analysis, fast lending processes, and lower operating costs."

Motivation and Research Question

- **How do more data and better info on borrowers affect markets and welfare?**

- Improvements in predictions can be due to
  1. Improvements in data analytics, AI, etc.
  2. Data sharing (eg open banking)

- Welfare implications:
  - Borrowers
  - Lenders (traditional banks and fintechs)
  - Overall (total welfare)

The Debate on Open Banking

- **Legal Schemes:** GDPR, CCPA, European Payment Services Directive

- Open Banking is a practice (technology) that provides third-party financial service providers open access to consumers' banking, transaction, and other financial data from banks and non-bank financial institutions through APIs.

- **Promises:**
  - Better screening borrowers' creditworthiness
  - Decreasing information-based market power
  - Increasing credit accessibility by personalizing financial products

- **Concerns:**
  - Market structure and efficiency
  - Market consolidation because of economies of scale and network effects
  - Privacy costs

Preview of Results

- Are improvements in information always better?
  - Borrowers: Always better unless there is a privacy cost
  - Lenders: It depends based on markets structure and markets power!
  - Overall welfare: It depends!

- Implications:
  - Conditions under which data sharing (eg open banking) is good or bad
  - Partial data sharing might be better
  - Alternative arrangements (eg markets for data) instead of open banking
  - Private vs social incentive of improvement in data analytics

Main Ingredients of Model

- Credit market with adverse selection
  - Traditional bank relies on secured loans, limited predictions
  - Fintech relies on data and information to make predictions
- Collateral can be used as a self-selection mechanism but is costly
- Increase in information and better predictions affect market power and structure

Model – Entrepreneurs

- Continuum of entrepreneurs (firms):
  - two types (H and L)
  - share of i is λ_i
  - risk neutral
  - collateral $\bar{C}$ (sufficiently high)

- Unit investment returns Y w.p. θ_i or zero otherwise, where

$$\theta_L Y < 1 < \theta_H Y$$

- A loan contract is a pair (R, C):

$$\theta_i(\bar{C} + Y - R) + (1 - \theta_i)(\bar{C} - C)$$

- State (success or failure) verifiable by court

- Everything but realized type is common knowledge

Model – Lenders

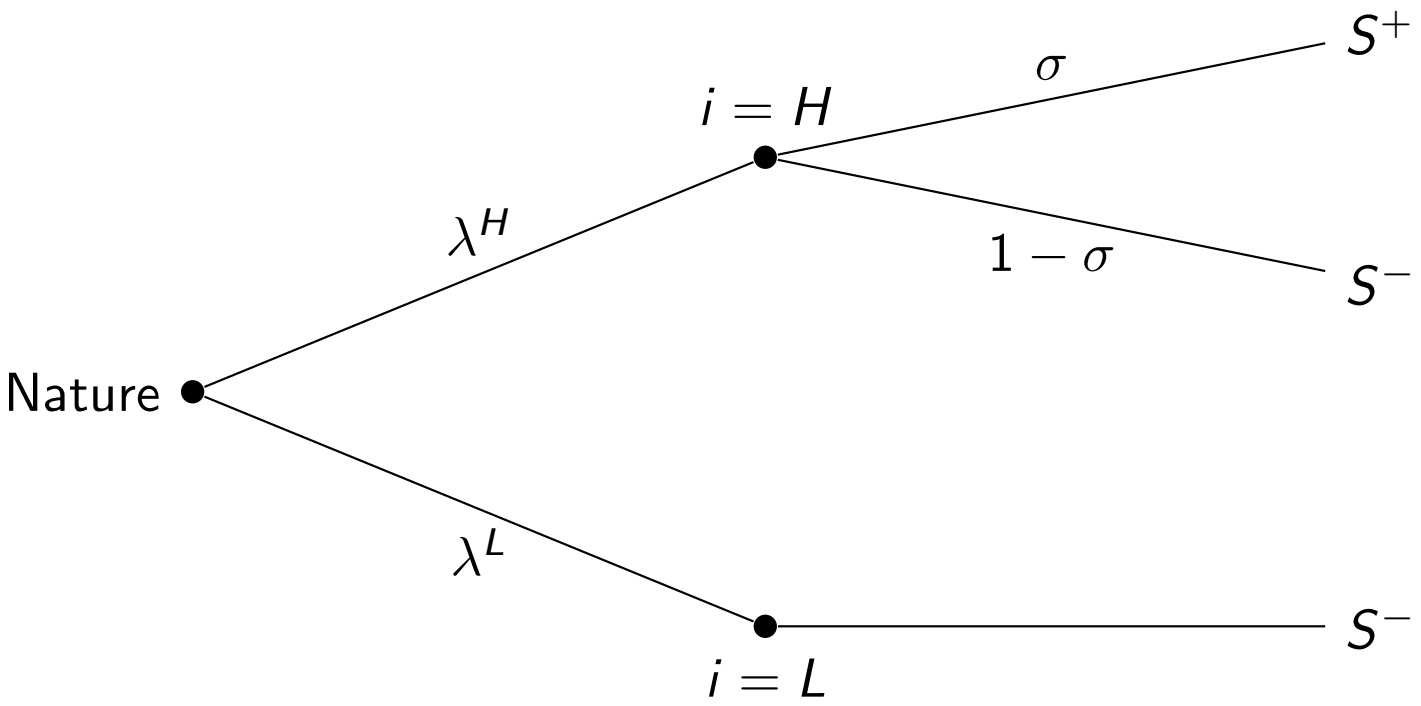
- Two risk neutral lenders $\zeta \in \{B, F\}$
- One unit of collateral pledged by borrower is valued γ^ζ by lender ζ

$$\theta_i R + (1 - \theta_i)\gamma^\zeta C - 1$$

- **Main Assumption**: $0 = \gamma^F < \gamma^B < 1$
- Cerqueiro, Ongena, and Roszbach (2020), Gambacorta et al. (2022), Gopal and Schnabl (2022) back this up empirically
- Negative average NPV: $\bar{\theta} = \lambda_H \theta_H + (1 - \lambda_L)\theta_L \quad \rightarrow \quad \bar{\theta} Y < 1$

Model – Information

- Fintech receives signal $S \in \{S^+, S^-\}$

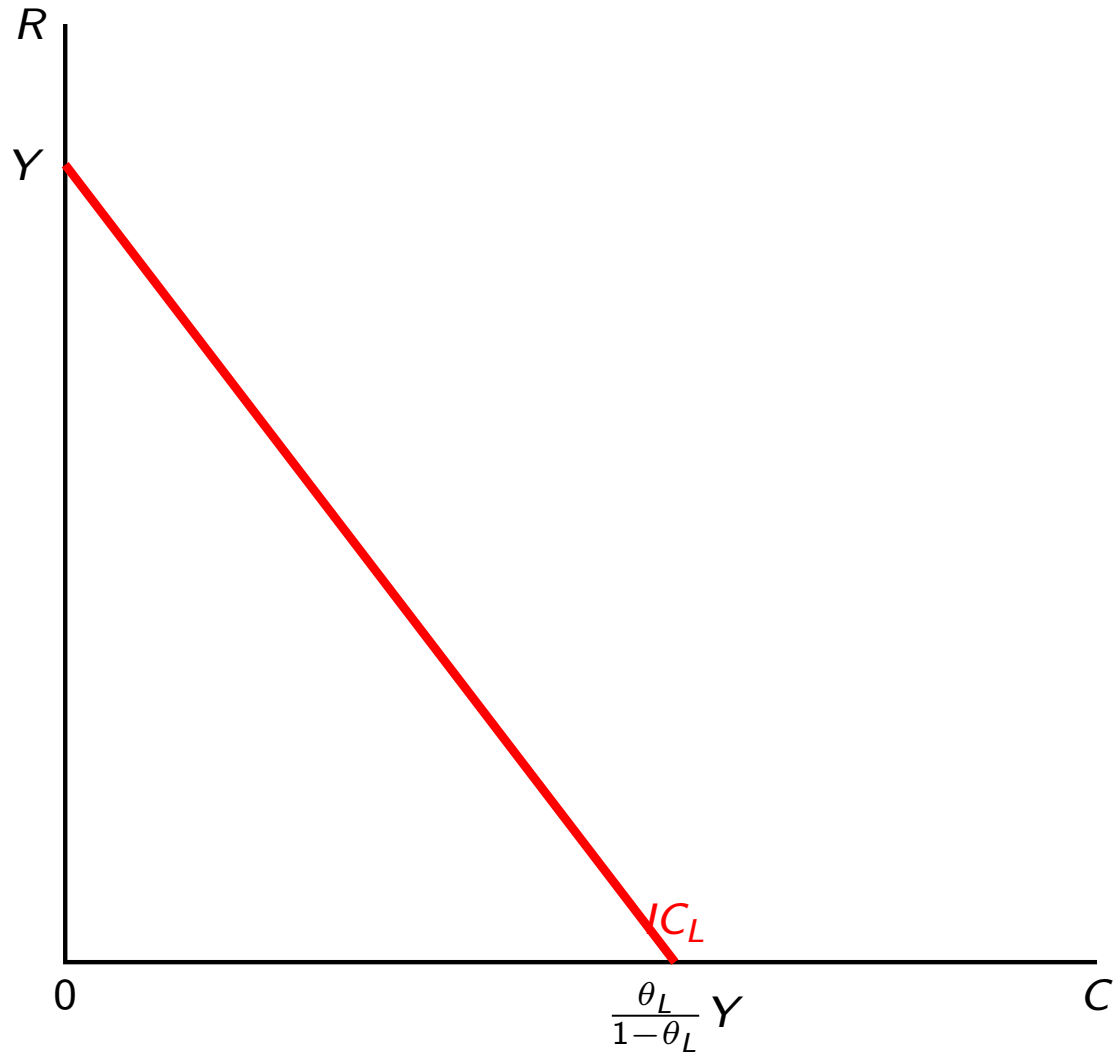


- Bank knows σ but not S
- Higher σ, better info
- Robust in more general signal structures

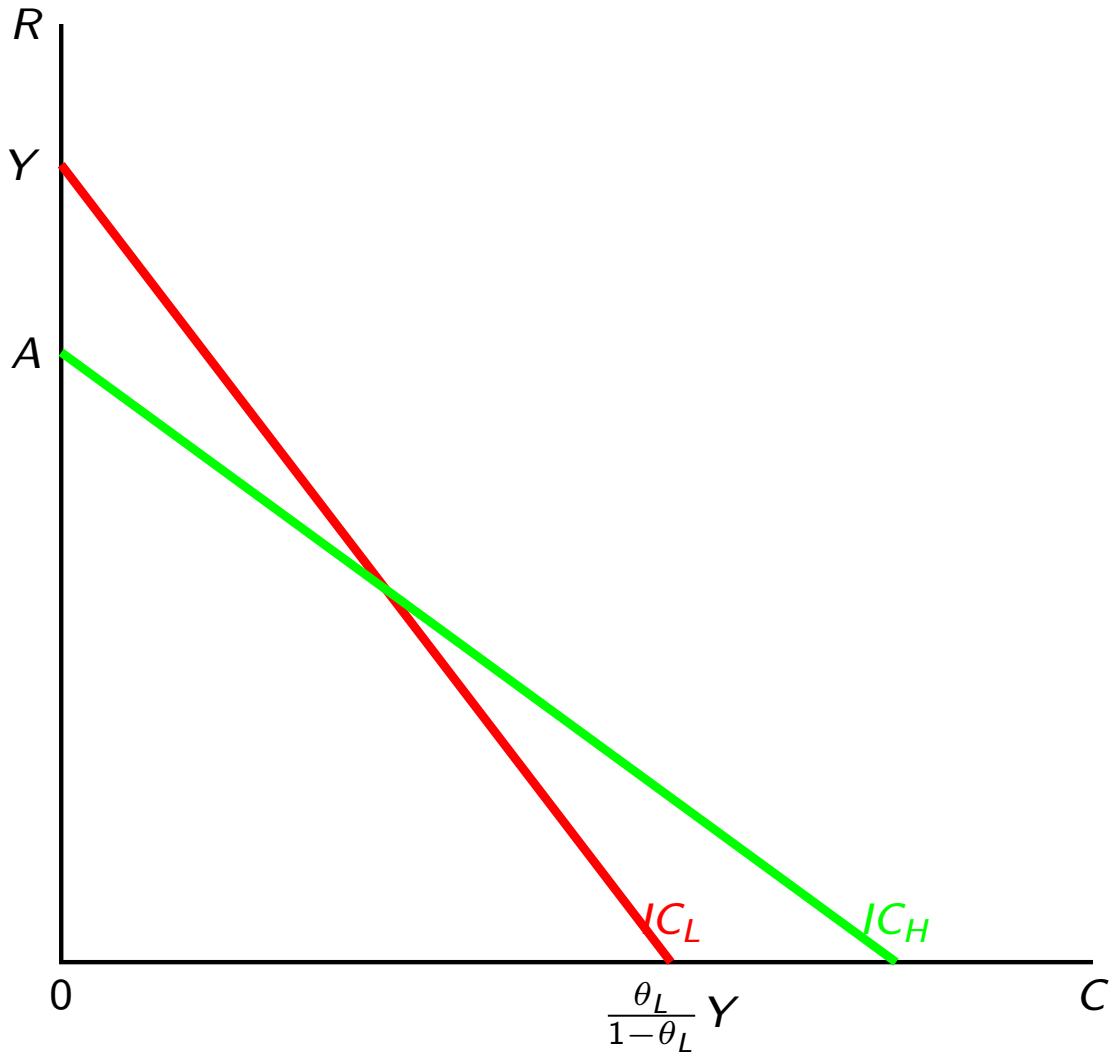
Model – Timing

- Game:
  - **Stage One**: Lenders publicly offer loan contracts that are contingent on the realized signal of the entrepreneurs
  - **Stage Two**: Entrepreneurs privately observe their realized signal at each lender and choose one of the two lenders, or decide not to borrow. If an entrepreneur chooses to borrow, the game proceeds to the next stage
  - **Stage Three**: The entrepreneur receives the funds and invests in the project
  - **Stage Four**: If the entrepreneur succeeds, they repay R; if the project fails, the lender seizes the collateral C
- Perfect Bayesian Equilibrium

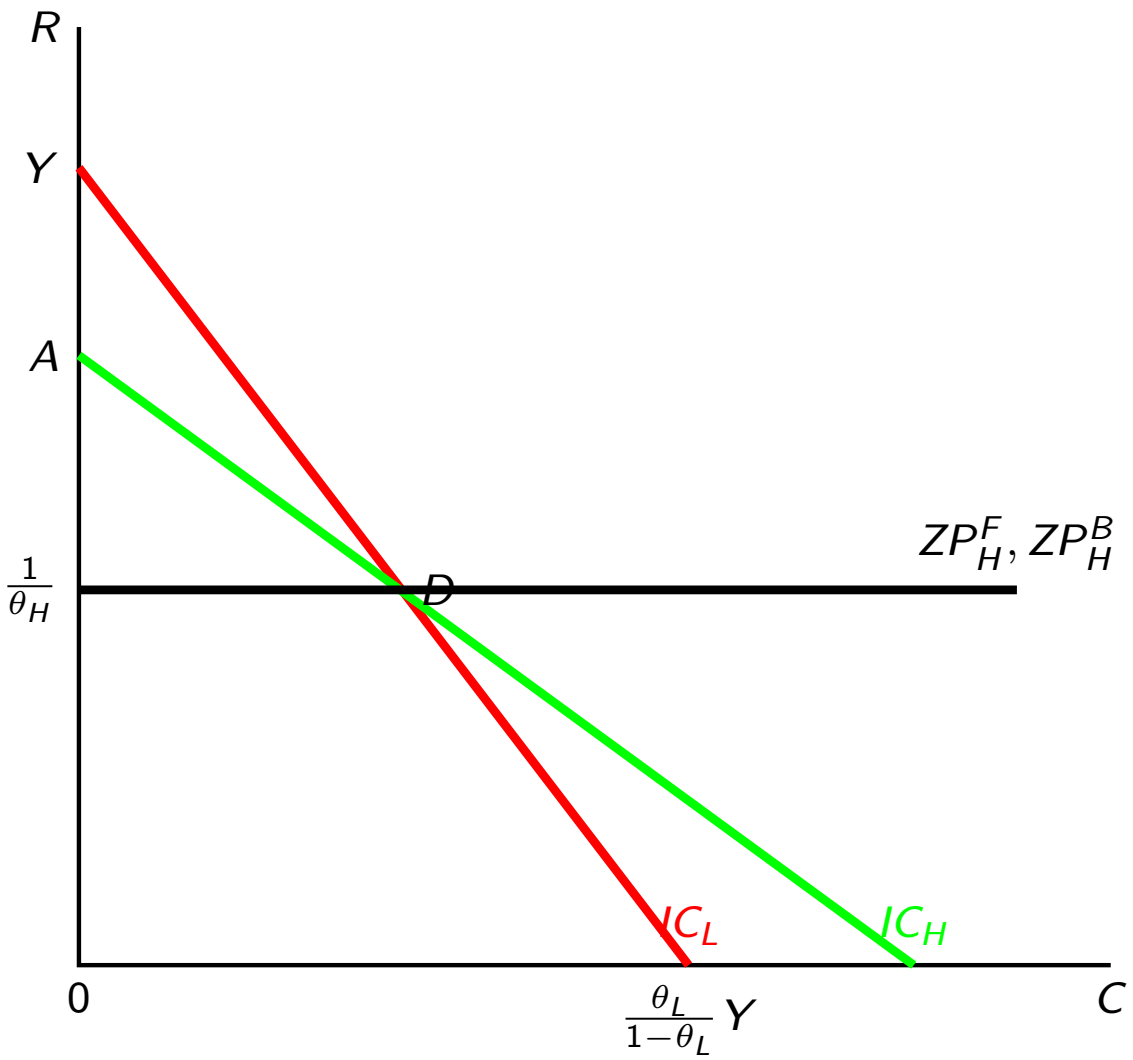
Loan Market Equilibrium



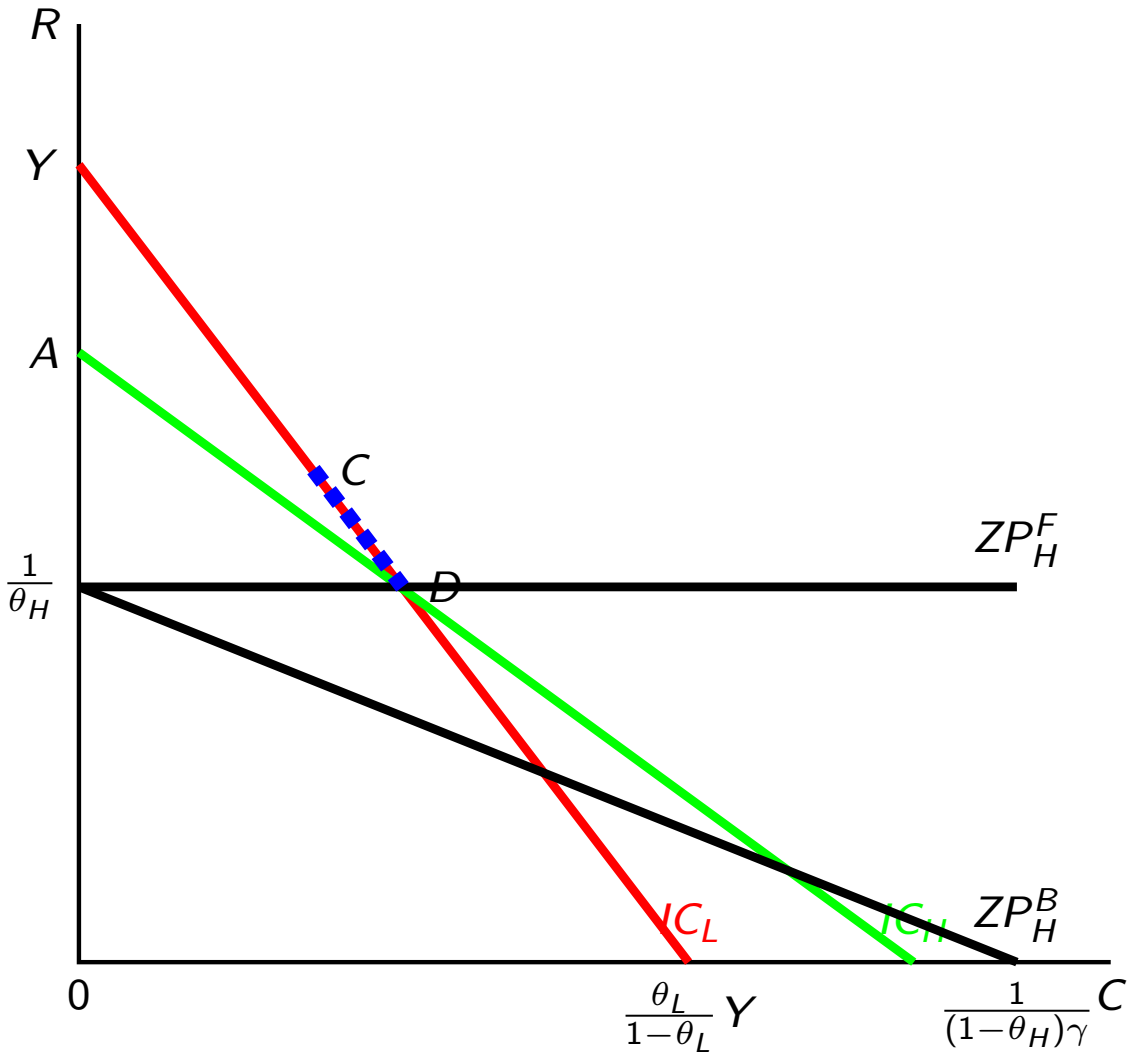
Loan Market Equilibrium



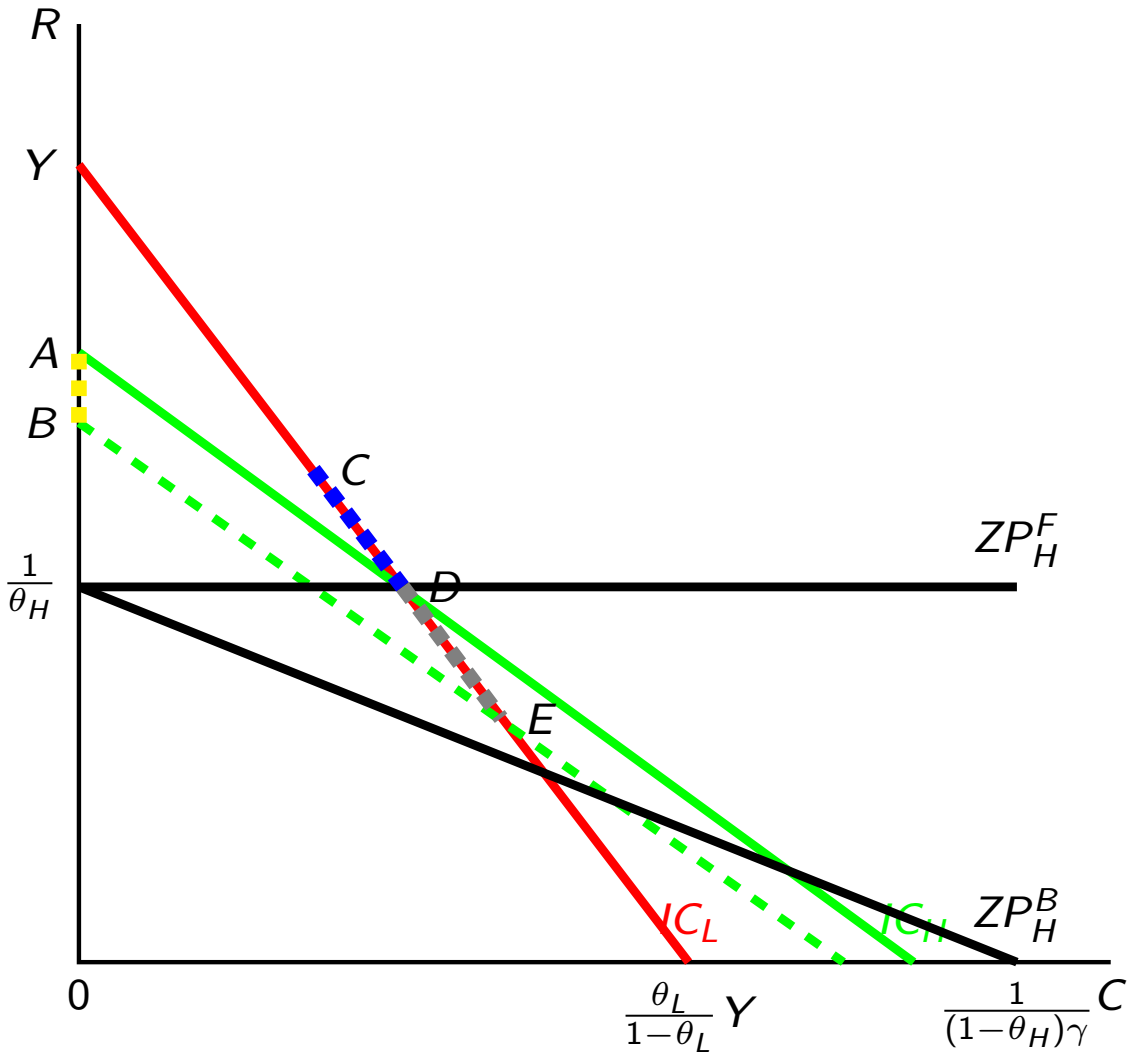
Loan Market Equilibrium



Loan Market Equilibrium



Loan Market Equilibrium



Loan Market Equilibrium

- No pure-strategy equilibrium
- Unique class of pay-off equivalent mixed-strategy equilibria in undominated strategies:
  - Fintech randomizes over unsecured loans for those with good signal and secured (threat) loans for those with bad signal
  - Bank randomizes over secured loans
- Characteristics similar to Varian (1981), but asymmetric competition:
  - Borrowers with a bad signal at fintech are "captive" for bank
  - Bank's willingness to compete for borrowers with good signal at fintech depends on quality of fintech's signal

Welfare Effects

- What if σ increases?
  - Open Banking
  - Better predictions (AI, data analytics, etc)
- Borrowers payoff strictly increasing in σ
  - Higher σ, fiercer competition, more attractive contracts
- Bank's profit strictly decreasing in σ
  - Higher σ, fiercer competition, fintech captures higher market share
- There exists $\hat{\gamma}^F$ such that
  - for $\gamma \leq \hat{\gamma}^F$, fintech's profit strictly increasing in σ
  - for $\gamma > \hat{\gamma}^F$, fintech's profit inverse U-shaped in σ

Welfare Effects

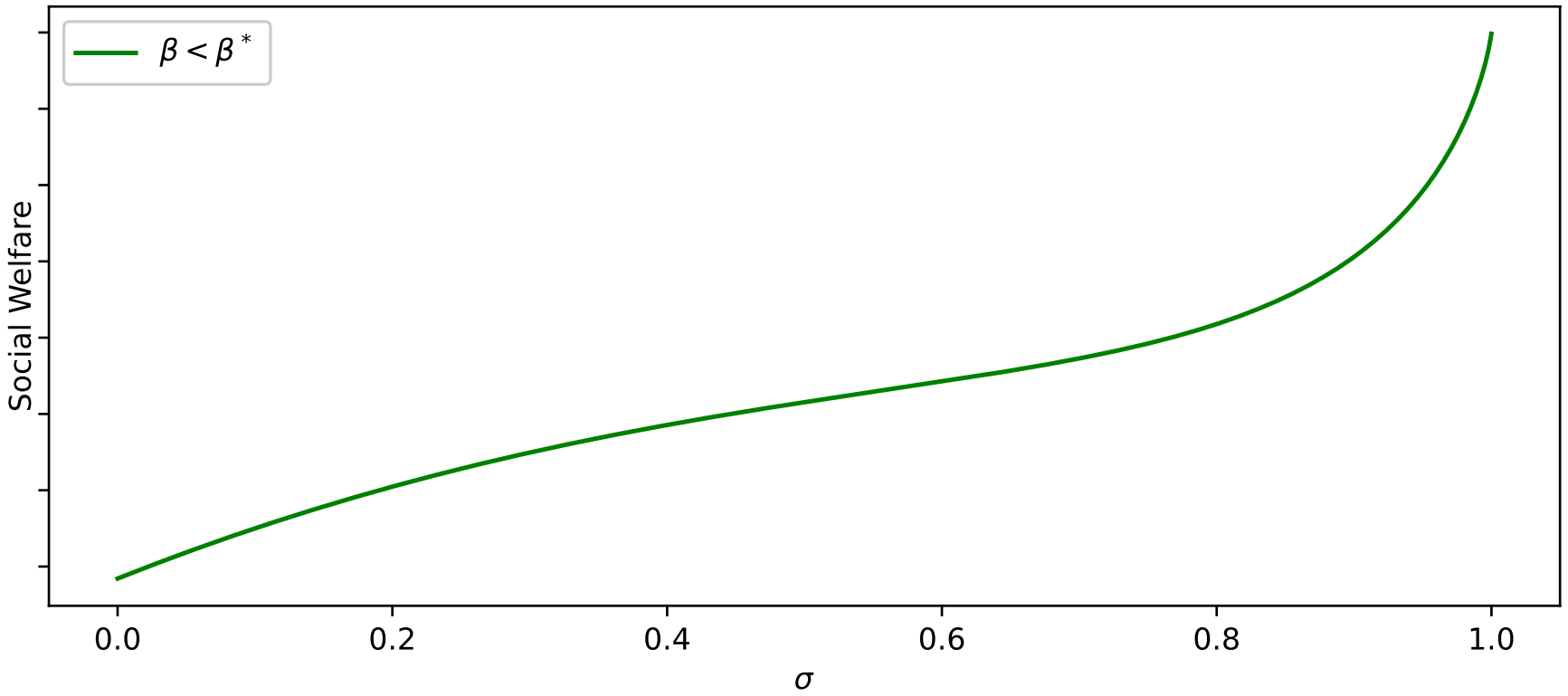
Social Welfare = Profits + Entrepreneurs' payoffs

- **Trade-off** for higher σ:
  - Fintech attracts more borrowers and offer more loans without collateral $\rightarrow$ **higher welfare**
  - Fiercer competition $\rightarrow$ bank offers lower interest rates and higher collateral $\rightarrow$ **lower welfare**

- Overall effect can be **negative!**

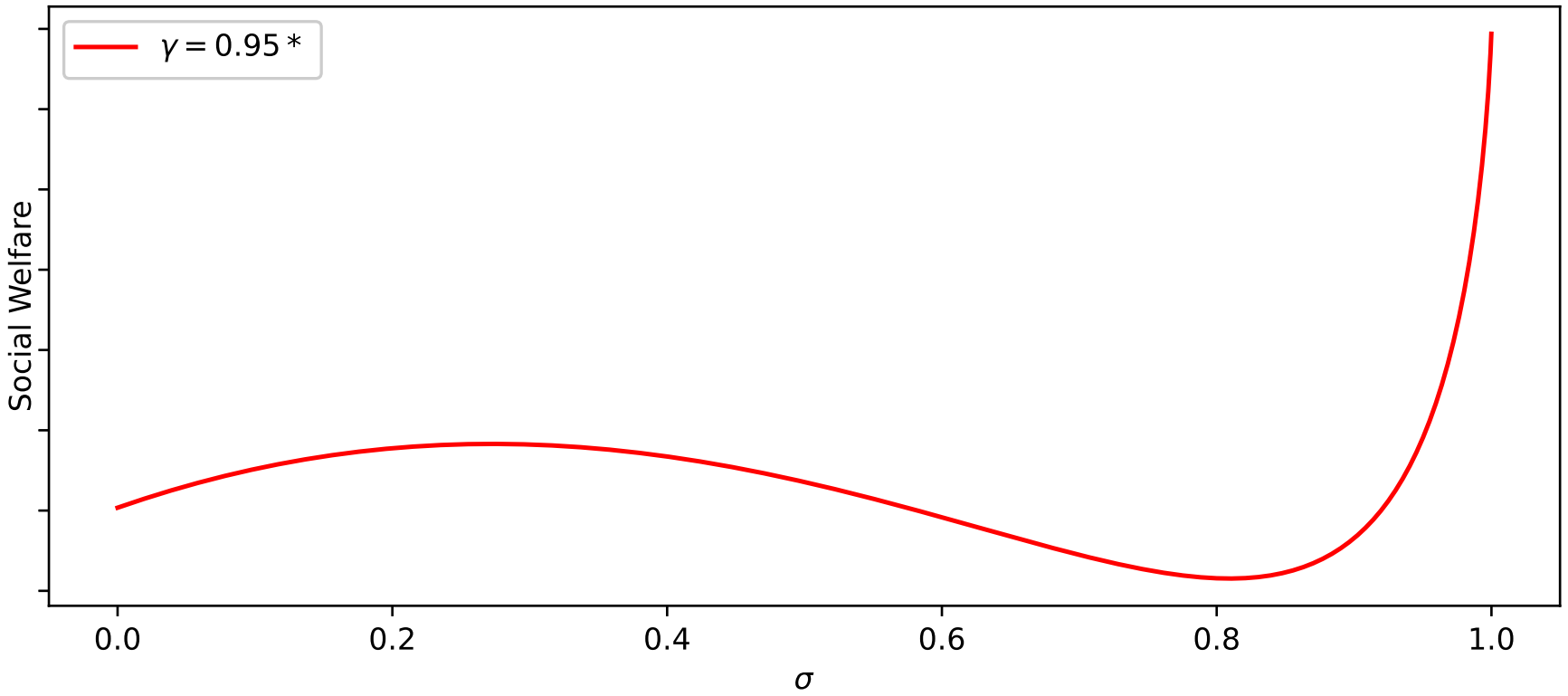
- There exists $\hat{\gamma}^W$ such that
  - for $\gamma \leq \hat{\gamma}^W$, total welfare is strictly increasing in σ
  - for $\gamma > \hat{\gamma}^W$, total welfare is initially strictly increasing but becomes decreasing in σ such that it passes through an internal local maximum and minimum

Welfare Effects



$\theta_g = 0.52, \theta_b = 0.48, Y = 2, \lambda = 0.7, \gamma = 0.85$

Welfare Effects



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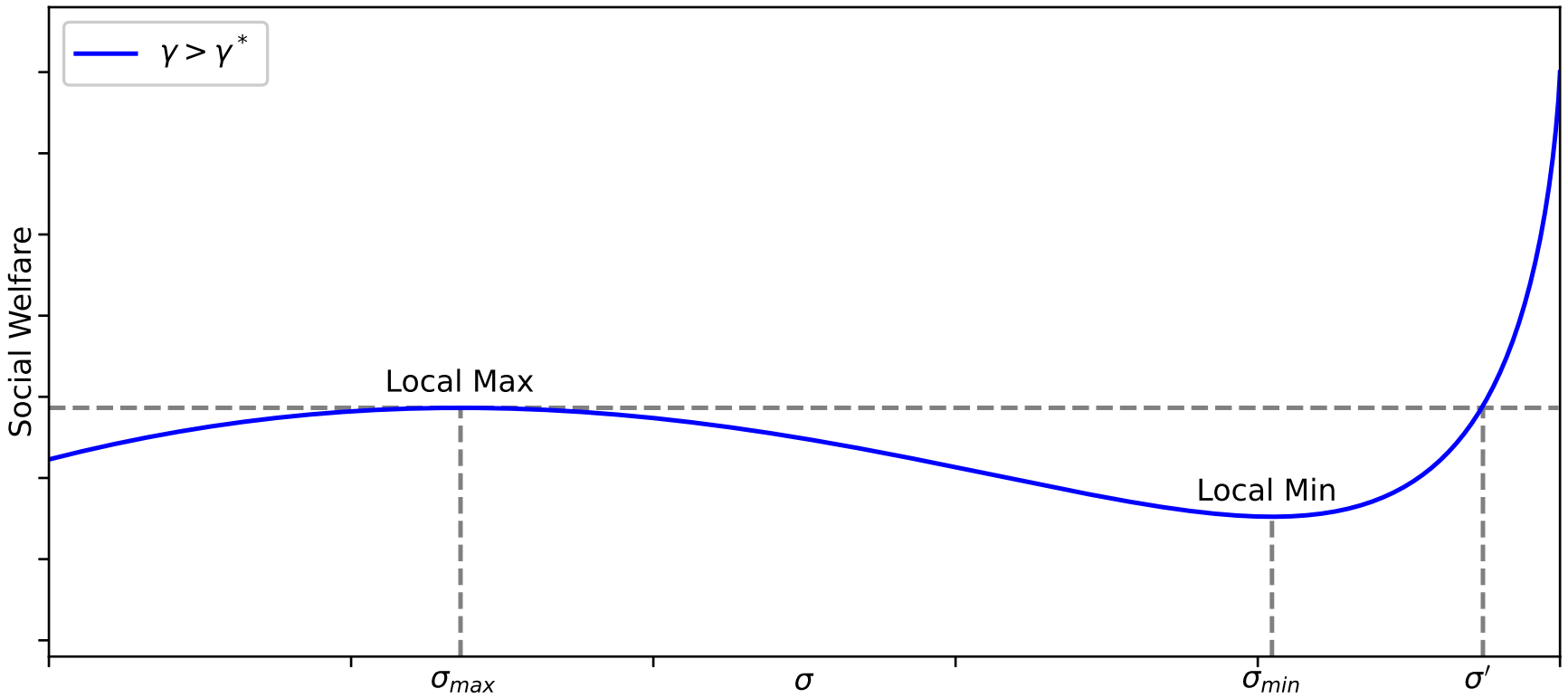
Optimal Data Sharing



Social Welfare

- The social welfare is more likely to become decreasing in σ when:
  - $\theta_g - \theta_b$ is small $\rightarrow$ intense collateralization
  - γ is high $\rightarrow$ intense competition + unsecured loans are not much better than collateralized loans.
- Borrowers' utility is always increasing in the quality of fintech's signal $\rightarrow$ Voluntary data sharing can not prevent the cases of decreasing welfare.

Implications

- Suppose $\sigma \in [\underline{\sigma}, \overline{\sigma}]$
- Exercises:
  1. Open banking vs closed banking, data sharing
  2. Property rights and data markets
  3. Private vs social incentives to improve σ

Extensions

1. Bank has signal
2. More general signal structures for fintech
3. $NPV_L > 0$
4. $\gamma^F > 0$
5. Privacy cost for borrowers
6. Non-utilitarian social planner

Related Literature

- "Fintech business and firm access to bank loans,", Xu Lei, Qian Liu, Bin Li, and Chen Ma, Accounting and Finance,2022.
- "Data versus Collateral", Gambacorta, Leonardo, Yiping Huang, Zhenhua Li, Han Qiu, and Shu Chen, Review of Finance, 2022.
- "Data and Welfare in Credit Markets", Mark Jansen, Fabian Nagel, Constantine Yannelis, Anthony Lee Zhang, NBER, 2022.
- Fintech Entry, Lending Market Competition and Welfare, Xavier Vives, Zhiqiang Ye, SSRN Working Paper, July 2022.
- "Competition and Selection in Credit Markets", Constantine Yannelis, Anthony Lee Zhang, NBER Working Paper, August 2021.

Related Literature

- When FinTech Competes for Payment Flows, Christine A. Parlour, Uday Rajan, Haoxiang Zhu, The Review of Financial Studies, 2022.
- Open Banking*: Credit Market Competition When Borrowers Own The Data, Zhiguo He, Jing Huang, Jidong Zhou, Journal of Financial Economics, 2023.
- Credit-Worthiness Tests and Interbank Competition, Thorsten Broecker, Econometrica, 1990.
- Fintech Expansion, Jing Huang, SSRN Working Paper, December 2022.
- "FinTech vs. Bank: The impact of lending technology on credit market competition," Serfes Konstantinos, Kejia Wu, and Panagiotis Avramidis, 2023.

Conclusion

- Impact of better information on welfare depends on relative strength of banks and fintechs in utilizing collateral and data
- Implications for open banking, data markets and incentives to improve info

Thank you!

Appendix

- **Generalization**
- General Data Structure: Relax the assumption $\sigma_l^{fin} = 0$.

  • Another source of inefficiency: Bad-type borrowers have loan offers.
  • Social welfare can be decreasing in the quality of the fintech's signal even at $\sigma_l^{fin} = \sigma_h^{fin} = 0$.
  • Welfare effects of open banking depends on how it affects σ_L^{fin} and σ_H^{fin}.
  • **Caveat**: This class of equilibria might not exist for some range of parameters.

Appendix

- **Generalization**
- Let's consider the bank also having a signal:
  - $s^{bank}, s^{fin} \in \{h, l\}$:
    $Prob\{s_i^l = h | \theta_i = g\} = \sigma^l$ and $Prob\{s_i^l = h | \theta_i = b\} = \sigma_b^l = 0.$
- Two unique classes of pay-off equivalent mixed strategy equilibria in undominated strategies:
  - $\sigma^{fin} \leq \sigma^{bank}$
  - $\sigma^{fin} > \sigma^{bank}$

Appendix

- $\sigma^{fin} \leq \sigma^{bank}$:

• Both lenders offer randomized unsecured loan contracts to their borrowers with good signal.
• Bank offers one loan contract with collateral (pure strategy) to his borrowers with bad signal.
• Both lenders have positive profits.
• Utility of good-type borrowers is increasing in lenders' signal quality.
• Each lender's profit is decreasing in the other lender's signal quality.
• Each lender's profit might be non-monotonous in his own signal quality, depending on γ and σ^{fin}, and σ^{bank}.

Appendix

- As long as $\sigma^{fin} \leq \sigma^{bank}$:
  - **Social welfare is always increasing in σ^{fin}**

Appendix

- **Generalization**
- $\sigma^{fin} > \sigma^{bank}$:

  • Both lenders offer randomized unsecured loan contracts to their borrowers with good signal.
  • Bank offers randomized loans with collateral to his borrowers with bad signal.
  • Both lenders have positive profits.
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  • Each lender's profit is decreasing in the other lender's signal quality.
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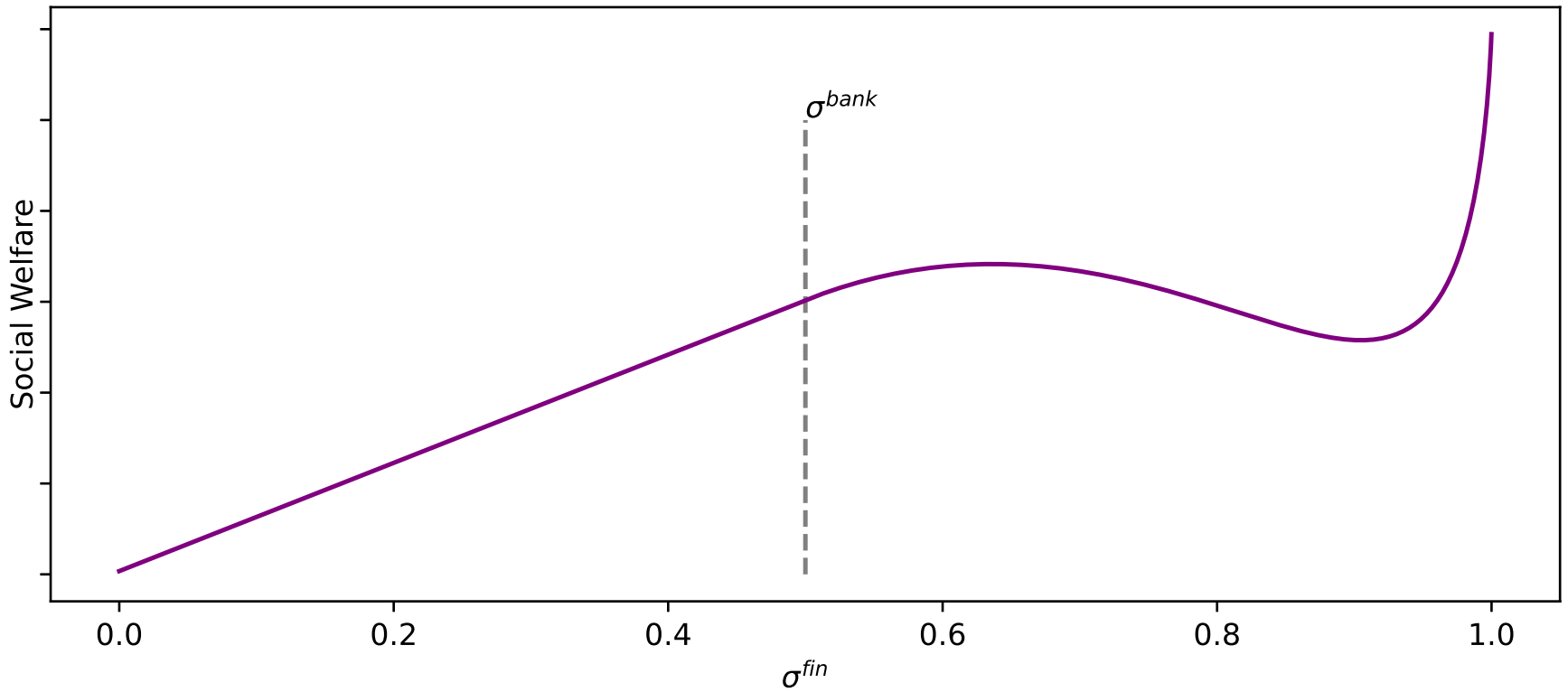
Appendix

- For $\sigma^{fin} > \sigma^{bank}$:
  - **Social welfare can become decreasing in σ^{fin}**
- Same trade-off with σ^{fin} increasing:
  - Fintech attracts more borrowers and offer more loans without collateral $\rightarrow$ **Increases welfare**.
  - Competition Intensifies $\rightarrow$ Bank offers contracts with lower interest rates and higher levels of collateral $\rightarrow$ **Decreases welfare**.
- The same threshold in γ:
  - For $\gamma > \gamma^*$ social welfare becomes decreasing in σ^{fin}.

Appendix



Conclusion and Contribution

- **Novelty**: Investigating the welfare effects of data sharing in a credit market with adverse selection, in the presence of collateral as a self-selection mechanism.
- Higher the efficiency of the bank in utilizing collateral $\rightarrow$ Lower the optimal level of data sharing
- Higher the efficiency of the bank in utilizing data $\rightarrow$ Higher the optimal level of data sharing