FinTech Lending, Banking, and Information Portability

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Abstract

Technological change has led to increased, but segmented, information collection. Tech platforms record the information about trading histories required for making of uncollateralized loans, whereas banks specialize in making the assessment of collateral quality required for collateralized lending. Current regulation hinders tech platforms from offering financial services while strategic behavior between tech platforms and banks impedes cooperation on information sharing and contract enforcement. We study how the government should design - and how lobbying efforts impact - information portability, which ultimately affects financial market segmentation and financial inclusion.

Keywords: Tokens, ledgers, interoperability, smart contracts, platforms, open banking, open architecture, financial inclusion, "PlatFi", political economy in finance, lobbying.

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1 Introduction

Finance requires intermediaries that collect and analyze information to effectively provide funding. Banks have traditionally played this role in the US lending system and so have developed systems for assessing collateral, finding assets, and sharing credit histories. However, a persistent criticism is that banks leave many viable borrowers unfinanced because they lack the types of projects that banks are able to evaluate. In recent years, we have seen a rapid expansion in information collection, particularly by tech platforms that have compiled extensive databases of trading histories and constructed new customer profiles. In principle, this new information could be used to fill the gaps in the lending system and increase financial inclusion. This is supported by research on machine learning default prediction that finds e-commerce platforms can effectively use "digital footprints" to predict default (e.g. Berg et al. (2020)). However, the segmentation of information across different intermediary sectors has posed difficulties. There is little information sharing between tech platforms and banks while current US regulation prevents tech platforms from offering extensive financial services without a banking license. By contrast, in China, tech platforms Alibaba and WeChatPay now play a key role in the financial system. In this paper we explore the consequences of having banks and tech platforms competing to provide financial services.

We start by developing a model to understand which types of customers banks and platforms are likely to serve. We consider an environment where agents have projects that generate revenue partly through future production and partly through the creation of collateral that can be liquidated. Banks are able to learn the value of collateral while tech platforms are able to use their knowledge of trading flows to learn the revenue that a project can generate. This means that there is sufficient information collection to provide efficient lending but the information is segmented across the different intermediaries. We show that segmented information collection leads to segmented bank and platform lending markets. Platforms lend to the agents with high output revenue. This improves financial inclusion for the high output, low collateral agents. However, it also means that banks understand that the average level of production in their pool of borrowers is worse and so they become less willing to lend to medium collateral agents. This means that the introduction of the platform into the financial system changes the financial inclusion problem rather than resolving it.

In principle, efficient lending could be achieved if information could be shared between the bank and platform. In Section 3, we consider whether the bank and the platform would be willing to provide this information in a model where they have market power. We show that banks and platforms have very different incentives to share information. On the one hand, sharing information allows the bank to coordinate with the platform on lending to low collateral agents. On the other hand, it decreases bank profits because they have to compete with the platform in the lending market. So, sharing information is only beneficial for the bank if few projects in the economy are high collateral projects. By contrast, the platform has a strong incentive to share information because a better functioning credit market leads to higher production, and the platform extracts rents from higher production by charging markup fees. That is, the platform sees the credit market as an input into their trading business rather than the only source of their revenue, and hence, they are much more willing to have a more competitive credit market.

In Section 4, we consider a government regulator that sets information sharing in the financial sector. If the regulator acted as a benevolent social planner, then they world set full information planner. However, instead we study a policy maker that is influenced by lobbying from the banking sector and the platform sector. Our model reveals that platforms will lobby for access to a full information financial sector while the banks are will lobby to prevent information sharing unless projects have very little collateral. We show that if the regulator runs a second price auction for influence over information sharing, then the platform wins the auction and forces full information sharing in the financial system. However, the platform is only willing to lobby for information sharing and a competitive lending market because it can get back the profits by charging markups in the goods market. In this sense, the main reason that open banking is likely to emerge from a political process is because it redistributes profit from the banks to some other intermediary not because it redistributes profits to agents in the economy.

Finally, in Section 5, we extend the model to allows agents to choose the characteristics of their project. We show that in a world with only bank financing, agents choose collateral intensive projects while in a world with bank and platform financing the agents choose a mixture of output and collateral intensive projects. This means that the bank has a much stronger incentive to restrict information sharing and force agents to create the types of projects that they have an advantage in financing.

Literature Review: Our paper relates to the growing literature that studies competition between traditional banks and fintech "challengers". Berg et al. (2022) provide surveys of the fintech literature.[1] Our analysis shares with several articles the feature that traditional banks are better in valuing tangible collateral assets, while fintechs, especially platforms, possess superior techniques to seize revenue streams.

One key question is whether the fintech disruption leads to overall credit expansion or simply replace existing bank credit. Many important papers, e.g. Buchak et al. (2018), Erel and Liebersohn (2022), Fuster et al. (2019), Gopal and Schnabl (2022), Tang (2019), Fuster et al. (2022) address this question of financial inclusion. In Boualam and Yoo (2022) fintechs have better information collection ability but higher funding costs. They grant loans to previously "unbanked" borrowers, but competition with fintechs also excludes other potential borrowers. In Parlour et al. (2022) fintechs specialize in payment services, which compete with monopolistic banks that offer both payment service and credit. As fintechs isolate valuable payment information from traditional banks, their credit extension is compromised. In our paper both credit expansion and substitution occurs, but the main focus is on the role of information portability and data sharing arrangements.

Information sharing possibly enforced by "open banking" regulation is at the heart of our analysis. Information sharing between traditional banks, possibly by setting up a credit bureau, is the focus of early work by Pagano and Jappelli (1993) and Bouckaert and Degryse (2006). He et al. (2023) studies the information flow between banks and fintechs induced by "open banking" regulation. Fintechs ability to screen borrowers is enhanced, but fintechs may end up with excessive market power due to their superior data extraction technology. Nam (2023) documents for a German fintech lender that open banking leads to more credit extension for high-risk borrowers but also to more price discrimination. Babina et al. (2024) provides a data set of government-led open banking initiatives across various countries.

Like in our model in Bouvard et al. (2022) platforms can offer more attractive credit conditions since they can make up the forgone profits by increasing platform's

[1] Broecker (1990) and Hauswald and Marquez (2003) focus on competition between inside and outside banks.

access fees. In their model credit market becomes endogenously segmented with banks focussing on less financial constrained borrowers. Our paper stresses how this aspect alters information sharing incentives.

The paper is structured as follows. Section 2 outlines the baseline model with segmented information collection. Section 3 introduces market power and considers whether banks and platforms would be willing to share information. Section 5 allows agents to choose the characteristics of their projects. Section 4 considers the political economy problem. Section 6 concludes.

2 Baseline Model

In this section, we outline our baseline model of segmented information collection and financial contracting by tech platforms and banks. We argue that platforms have a comparative advantage in collecting information product quality and revenue flows whereas banks have a comparative advantage in collecting information about the residual value of the collateral. We show that the impact of segmentation in information collection between intermediaries depends on cooperation between the intermediaries.

2.1 Environment

Setting: Time lasts for two periods: $t \in \{0, 1\}$. There is a collection of goods that are used for production and consumption. The economy is populated by a continuum of agents. There are two competitive intermediary sectors in the economy: a tech platform sector and a banking sector.

Production and preferences: All agents start at $t = 0$. Each agent is endowed with 1 good. At $t = 0$, agents can transform 1 good from any other agent into a project that produces $z \sim U[0, \zeta]$ units of consumption goods at $t = 1$. We interpret the variation in z as reflecting uncertainty about the fraction of the agent's production goods that are valued by other agents. The project can be liquidated for $k \sim U[0, \kappa]$ at time $t = 1$. We interpret the variation in k as reflecting uncertainty about the value of the capital stock after production. So, the total real income generated by the project at $t = 1$ is $z + k$.

Agents get linear utility $u(c) = c$ from consuming c units of their endowment good at $t = 0$ and linear utility $u(c) = c$ from consuming c consumption goods produced by other agents at $t = 1$. For simplicity the preference discount rate is zero. This means that agents need to be able borrow to purchase input goods at $t = 0$ and need to trade their output goods at $t = 1$ in order to be able to consume. Agents lack commitment, cannot seize collateral, and have no information about other agents' projects. This means that they need intermediaries to facilitate borrowing and trading.

Tech Platforms: A platform in the tech sector controls the technology for trading goods and settling transactions. Agents have no other way to trade than through the platform. We assume that the platform can infer z from observing the loan requests and goods orders at $t = 0$ but that the platform derives no value from taking the collateral at $t = 0$. The platform can borrow from agents and make loans to producers. We start by assuming they behave competitively with zero markups.

Banks: Banks also borrow from agents and provide funding. Banks control a technology for learning the collateral values k at $t = 0$ but are not able to learn z.

2.2 First Best Allocations

A central planner with full information about all projects will allocate inputs to all projects with (z, k) such that the return is greater than the opportunity cost of forgone consumption.

Proposition 1. *The first best allocation allocates inputs to projects satisfying*

$$z + k \geq 1.$$

2.3 Traditional Banking

Under a traditional banking system, there is only one type of intermediary, a representative bank, that can observe k but not z. The bank raises deposits at expected return R^d and provides funding at expected return R^b.

We first consider agent demand for deposits and funding. Since agents have linear utility from consumption at $t = 0$, deposit demand for a given (gross) interest rate on deposits R^d is $D(R^d) = 0$ if $R^d < 1$, and $D(R^d) = 1$ if $R^d \geq 1$. Likewise, risk-neutral agents will demand funding as long as they can earn positive average profit. More formally, agent's funding need at a borrowing cost of R^b is $B(R^d) = 0$ if $R^b \geq \mathbb{E}[z+k]$ and $B(R^b) = 1$, if $R^b \leq \mathbb{E}[z+k]$. The expectations is taken over the knowledge of the borrower. We focus on the case where $\mathbb{E}[z+k] \geq 1$ so the borrower will always accept the loan at competitive pricing.

Next, let's consider the problem of the bank. The bank will provide funding to an agent with collateral k so long as:

$$R^b \geq R^d, \qquad s.t. \quad R^d \geq 1, \quad R^b \leq \mathbb{E}[z+k].$$

In a competitive bank market, $R^b = 1$ and the zero profit condition implies $R^b = R^d$. The proposition below summarizes the traditional banking funding conditions.

Proposition 2. *The banks finance projects at $R^b = 1$ with k satisfying:*

$$\mathbb{E}[z] + k \geq 1 \quad \Rightarrow \quad \frac{\zeta}{2} + k \geq 1.$$

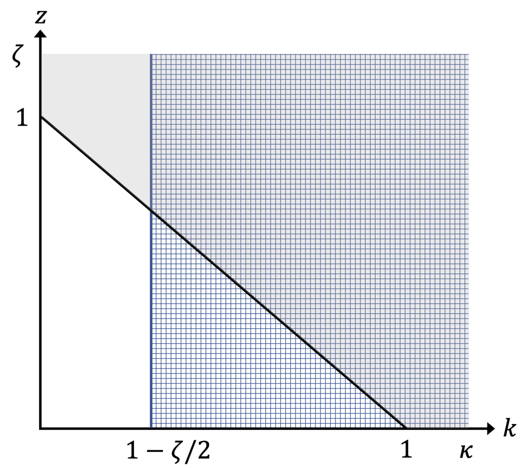
The banking funding condition differs from the first best case $z + k \geq 1$. Agents with $(z,k)-$projects

$$z + k > 1 \quad \& \quad \frac{\zeta}{2} + k < 1 \quad \Leftrightarrow \quad 1 - z < k < 1 - \frac{\zeta}{2}$$

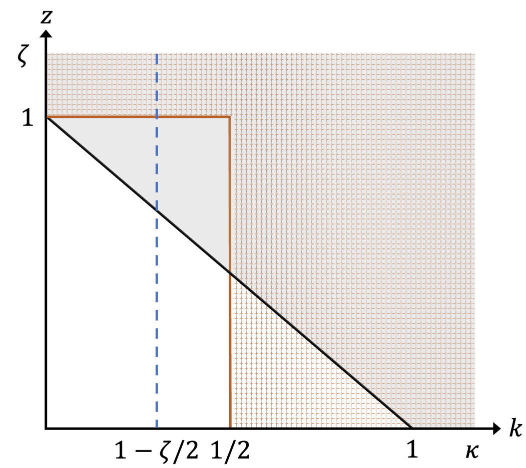
would be funded by the planner but not by banks. Panel a of Figure 1 contrasts the banking outcome with first best outcome. Overall, traditional banking leads to imperfect financial inclusion.

2.4 Segmented FinTech and Banking Markets

Next, suppose a representative tech platform enter the finance sector but does not share information with banking sector. For this subsection, we impose that segmented information collection leads to segmented markets in which the agents must borrow from either the bank or from the platform. Throughout the paper, this will be the outside option if "cooperation" between the bank and platform breaks down in the syndicated loan market. In the next subsection, we discuss a collection of reasons for why segmented information leads to segmented markets. For convenience,



(a) Traditional banking: The solid grey area denotes the projects that are financed by the social planner. The blue dashed area denotes the projects financed by the bank.



(b) Banking and tech platform: The solid grey area denotes the projects that are financed by the social planner. The orange dashed area denotes the projects by the bank and the platform. The blue dashed line indicates the financing threshold under the traditional banking system.

Figure 1: Projects Financed

we look for a segmented market equilibrium where agents borrow from the platform if they are indifferent.

The platform can not seize the remaining collateral and hence only provides funding if $z \geq 1$. Platform's funding alters bank's problem. They know that agents asking for funding must have that $z \leq 1$. Consequently, banks provide funding if:

$$\mathbb{E}[z|z \leq 1] + k \geq 1 \quad \Rightarrow \quad \frac{1}{2} + k \geq 1$$

The following proposition summarizes the outcome in a setting in which non-information sharing banks and platforms compete.

Proposition 3. *Non-information sharing banks and platform finance $(z, k)-$projects with*

$$\{z \geq 1\} \cup \left\{\frac{1}{2} + k \geq 1\right\}.$$

Figure 1 plots the projects that are financed under the different organizations of the financial sector. The solid grey area on both subplots denotes the projects that would be financed by the social planner. The blue dashed area on Panel (a) depicts the projects that would be financed by a traditional bank. The orange dashed area on Panel (b) depicts the projects that would be financed with segmented banking and platform markets. Evidently, the introduction of fintech lenders solves the financial inclusion problem for high z agents but makes the problem worse for agents with medium z and medium k. In other words, there is additional credit extensions but also some credit substitution.

2.5 Joint Bank-Platform Lending, Renegotiation and Covenants

The implication from subsection 2.4 is that agents need to be able to raise funds from both banks and platforms in order for the market to resolve the financial inclusion inefficiency. In this sense, the market needs a syndicated loan market across banks and tech platforms. In this section, we offer a collection of reasons why information segmentation makes bank-platform lending cooperation difficult when banks and platforms are unable to commit: (i) funding needs to be conditional on other lenders' contributions and (ii) there is a threat of renegotiation when there is a possibility of early liquidation.

2.5.1 Contingent Financing

Suppose that markets are no longer completely segmented so the agents can borrow from both the bank and platform. However, there is no common record keeping system for the bank and platform so they cannot write contracts conditional on the financing decision of the other intermediaries. This means that the agents play a simultaneous move game where the bank and platform make funding decisions at the same time. In this case, we get two equilibria: one where the bank platform cooperate and another where they each only finance the parts of the market they can finance individually.

Proposition 4. *There are two equilibria without common ledger:*

(i) In one equilibrium the first best financing, $z + k \geq 1$, emerges.

(ii) In the other equilibrium only projects with $z \geq 1$ and/or $k \geq 1$ are financed.

Proof. If $z \geq 1$ and/or $k \geq 1$, then the one of the platform or bank will finance the project individually irrespective of what the other intermediary does. The difficult is what happens for projects for $z \leq 1$ and $k \leq 1$.

Suppose that the bank believes that the platform will finance $\min\{z, 1\}$ and platform believes that the bank will finance $\min\{k, 1\}$. Then, each the bank finances $1 - \min\{z, 1\}$ and the platform finances $1 - \min\{k, 1\}$. So, the project is started and both lenders are paid.

Now, suppose that the bank believes that the platform will not finance anything and the platform believes that the bank will not finance anything. Then, neither is willing to partly finance the project because they do not believe it will be completed.

□

2.5.2 Renegotiation

Once again, suppose that markets are no longer completely segmented so that agents can borrow from both the bank and the platform. We now assume that the coordination problem has been resolved but there is the potential for liquidation before the project finishes, which introduces a renegotiation problem. In order to do this, we make the following additional adjustments to the environment. We introduce an intermediate period $t = 0.5$. At $t = 0.5$, the project can be liquidated early for non-random l. The value k is only revealed at $t = 0.5$ to the bank and never to the platform. This means that the contract space expands. In addition to an interest rate, a contract now also needs to specify whether the lender has the right to liquidate the project at $t = 0.5$. We assume that banks and platforms cannot commit.

Proposition 5. *We have that:*

(i) Without the right to liquidate, the bank will offer financing up to $\mathbb{E}[k] = \kappa/2$*. Projects with* $z + \kappa/2 \geq 1$ *will be financed.*

(ii) With the right to liquidate, the bank will offer financing up to $\mathbb{E}[\max\{l, k\}]$ *but the platform will not finance any projects. Thus, projects will only be financed if the bank can finance them alone* $1/2 + \mathbb{E}[\max\{l, k\}] \geq 1$ *or the platform can finance them alone* $z \geq 1$*.*

Proof. First, consider the problem of the bank. Without the right to liquidate, the bank will offer financing up to $\mathbb{E}[k]$. With the right to liquidate, the bank will offer joint financing up to $\mathbb{E}[\max\{l,k\}]$ and individual financing if $\mathbb{E}[z]+\mathbb{E}[\max\{l,k\}] \geq 1$.

However, in the subgame at $t = 0.5$, the bank will threaten to liquidate unless the platform pays z. Since the platform gets nothing if liquidation occurs, they will accept the offer. Thus, in any joint contract where the bank has the right to liquidate, the platform gets zero and so will not participate. Thus, the platform will finance up to z if the bank has no liquidation right and nothing if the bank does have a liquidation right. □

The intuition for the results with renegotiation is the following: Without a liquidation right, the bank cannot end the project early if k is realized to be low. Thus, they will only put up $\mathbb{E}[k]$ funding. However, if they have the liquidation right, then they will threaten to liquidate the project at $t = 0.5$ and extort the platform's revenue. Thus, the platform will only participation in joint financing if the bank does not have a liquidation right.

2.6 Common Record Keeping

We have identified the problem with segmented information is that coordination problems and/or negotiation problems lead to segmented markets. Both problems would be solved if the government could costlessly force all agents to share information. In this case, agents could write funding contracts that are conditional on how other agents finance the project and the bank and platform could make a joint liquidation decision.

Of course, the government cannot costlessly extract information from the intermediaries in the economy. Throughout the rest of the paper, we explore the difficulties of incentivizing the bank and platform to share information.

3 Information Sharing and Incentive Compatibility

The previous section highlighted that information sharing between tech platforms and the banking sector is important for resolving financial inclusion problems. We now introduce a government that creates a record keeping system where intermediaries in the economy can share project and contract information. In principle, this allows the banks and platform to share the information required to coordinate on lending. However, we introduce two features that make information sharing difficult. First, information sharing is voluntary so the banks and tech platforms may choose to stay away from the record keeping system. Second, banks and platforms potentially have market power, and so behave strategically to maximize profits. We show that the platform is typically very willing to share lending information because they can also extract surplus through markups in the goods market. By contrast, banks face a trade-off between expanding lending capacity and losing market power.

3.1 Environment Changes

Setting, production, and preferences: Time again lasts for two periods: $t \in \{0, 1\}$. Agents are once again born at $t = 0$ with 1 good and a production technology for using other agent's goods to produce projects that produce (z, k) at $t = 1$. We focuses on cases with $\zeta \geq 1$ and $\kappa \geq 1/2$ so that both banks and platforms can finance loans in a segmented market. We consider more extreme distributions in Section 5 when we endogenous project choice.

Market power: We now assume that the bank and platform potentially have market power. We impose the following competition structure in the funding market. If one intermediary is the only possible lender, then they act as a monopolist and take all the project surplus. If each intermediary can make the loan individually, then they Bertrand compete on price and the borrower takes all the project surplus.

In the goods market, we assume that the platform can charge markups at $t = 1$. This means that the platform has two ways to extract profit: through the loans and through the goods market.

We impose that all profits extract by both banks and platforms are rebated back to households lump sum.

Information and enforcement structure: At the start of $t = 0$, the government sets up and manages a record keeping system. The bank and the platform are invited to share information on z and k. The timing in the subsequent markets is the following:

(i) At the end of $t = 0$ the loan market opens. If information is not shared by both intermediaries, then loan markets become segmented and the outcome is as in Section 2.4.[2] If information is shared, then it can be used for contracting by both intermediaries. However, we maintain the assumption that the bank is better at holding collateral by imposing that the platform can only receive a fraction $\delta \leq 1$ of the collateral value of they end up liquidating it.

(ii) At $t = 1$, the goods market opens and the platform charges markups. Since the platform is the second mover, they take whatever surplus is left after the loan market.

3.2 Bank Information Sharing Decision

The bank problem looks similar to before except that now the bank must also decide whether to share information with the common ledger.

Bank value without information sharing: If the bank doesn't share information, then the platform is unwilling to syndicate and so the markets become segmented. The bank makes loans if they can finance them alone. From subsection 2.4, the platform makes loans for $z \geq 1$ and banks makes loans to the remaining agents if $k \geq 1/2$. So, bank profit without information sharing is:

$$U^b = \mathbb{E}[k - 1/2; k \geq 1/2]$$

Bank value with information sharing: If they share information, both the bank and platform have full information about z and k. For projects with $z + \delta k \geq 1$ the bank and platform are both willing to make the loan, so they compete until $R^b = 1$ and there are no profits on the loans. For projects with $z + k \geq 1 \geq z + \delta k$ the platform cannot compete and so the bank gets profit $z + k - 1$. So, bank profit with information sharing is given by:

$$V^b = \mathbb{E}[\pi; z + k \geq 1 | z + \delta k \leq 1]$$

Proposition 6. *For distributions with $\zeta \geq 1$ and $\kappa \geq 1$, the values for the bank*

[2] To focus on the information sharing decision, we do not specify which possible model delivers market segmentation.

with and without information sharing are given by:

$$U^b = \frac{\kappa - 1}{2} + \frac{1}{8\kappa}$$

$$V^b = \frac{1}{6\zeta\kappa}\begin{cases} \left(1-\delta\left(2-\delta\right)\right)\kappa^3, & \textit{if } \kappa < 1 \\ 1-\delta(2-\delta)+(\kappa-1)\left(3\kappa-\delta(2-\delta)(\kappa^2+\kappa+1)\right), & \textit{if } 1 \leq \kappa \leq 1/\delta \\ (1/\delta-1)^2, & \textit{if } \kappa > 1/\delta \end{cases}$$

Proof. See Appendix A. □

The incentive compatibility constraint for bank information sharing is given by:

$$V^b \geq U^b$$

Conceptually, the bank faces a trade-off between between being able to make more loans and facing more competition in the loan market. From Proposition 6, we have the following special cases. For $\kappa = 1/2$, the bank's value without information sharing is $U^b = 0$ and so the bank always wants to share information. This is because the bank is not able to make any loans without the information provided by the platform. As $\kappa \to \infty$, $U^b \to 0$ and $V^b \to \infty$ so the IC constraint is not satisfied. This is because for large κ the bank is able to make almost all loans without any platform help. In this sense, the project distribution is very important for understanding the bank's incentives to participate in common record keeping.

3.3 Platform Information Sharing Decision

The information sharing problem for the platform is different because they can take surplus through the loan market or through markup fees in the goods market.

Platform value without information sharing: If the platform doesn't share information, then markets are segmented and the platform only earns the surplus on loans with $z \geq 1$. In this case, their profit is:

$$U^p = \mathbb{E}[z - 1 | z \geq 1]$$

Platform value with information sharing: If the platform shares information, then the platform earns no profit in the loan market because the bank competes with them on all loans that they can provide. However, it can charge markups in the goods market at $t = 1$ and extract all the surplus that not taken by the bank. This means that their profit is given by:

$$V^p = \mathbb{E}[z + k - 1 | z + k \geq 1] - \mathbb{E}[z + k - 1 | z + k \geq 1 \geq z + \delta k]$$

Proposition 7. *For distributions with $\zeta \geq 1$ and $\kappa \geq 1$, the values for the platform with and without information sharing are given by:*

$$U^p = \frac{\zeta}{2} - 1 + \frac{1}{2\zeta}$$
$$V^p = \frac{\kappa}{2} + \frac{\zeta}{2} + \frac{1}{6\kappa\zeta} - 1 - V^b$$

Proof. See Appendix A. □

The platform is willing to provide information if $V^p > U^p$ which can be simplified to:

$$\frac{\kappa}{2} + \frac{1}{6\kappa\zeta} - \frac{1}{2\zeta} - V^b \geq 0$$

As $\delta \to 1$, we have that $V^b \to 0$ and so the IC constraint becomes:

$$\frac{\zeta}{2} > \frac{1}{6\kappa}\left(3 - \frac{1}{\kappa}\right)$$

which is always satisfied for $\zeta \geq 1$.

Figure 2 plots the two IC constraints. It shows that the bank and the platform have very different incentives to share information. Banks only make revenue in the loan market and so do not share information if it makes the loan market more competitive. By contrast, the platform see the loan market as an input into making markups on their trading activities. This makes the platform very willing to provide information to make the loan market more competitive but only because they can extract the surplus back in the goods market.

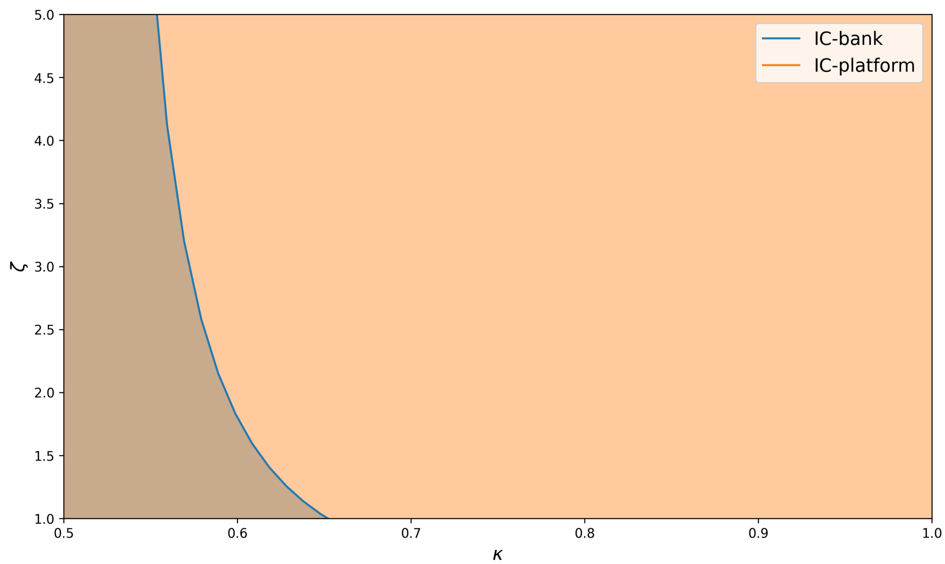


Figure 2: Incentive Compatibility Constraints: The blue shaded area (appearing as brown in the diagram) is the region where the bank is willing to share information while the orange area is the region where the platform is willing to share information. The other parameter is $\delta = 0.8$.

4 Political Economy

The previous section shows that setting up a voluntary information sharing arrangement may not be effective because banks have a strong incentive to keep their information private. We now consider a regulator choosing whether to force information sharing. If the regulator acted as a benevolent social planner, then they would always force information sharing to maximize production. However, regulators in the real world are often captive to private interests. To reflect this, we introduce a political economy friction that the intermediaries can lobby the government to set policy.

Environment changes: We now suppose that there is a government policy maker deciding whether to force intermediaries to share information across the economy. This can be interpreted as the regulator introducing an "open-banking" system where banks do not control the sharing of information with other intermediaries. We impose that the policy maker runs a second price auction where the winning bidder can set information policy.

Bank value from successful lobbying: Using the results from Section 3.2, the bank's surplus from getting to choose their optimal regulation is (for $\kappa \geq 1/\delta$):

$$|U^b - V^b| = \left| \frac{\kappa - 1}{2} + \frac{1}{8\kappa} - \frac{1}{6\zeta\kappa}\left(\frac{1}{\delta} - 1\right)^2 \right|$$

Platform value from successful lobbying Also using the results from Section 3.2, the platform's value from winning the lobbying is given by:

$$V^p - U^p = \frac{\kappa}{2} + \frac{1}{6\kappa\zeta} - \frac{1}{2\zeta} - V^b$$

Proposition 8. *For $\zeta \geq 1$ and $\kappa \geq 1/2$, the outcome of a second price auction is that the government force information sharing and production is efficient.*

Proof. If $V^b > U^b$, then the bank and platform both lobby for information sharing and so that is the outcome. If $U^b > V^b$, then the intermediaries disagree. The bank lobbies for hidden information and platform lobbies for open banking. In this case, the platform wins the second price auction if:

$$\begin{aligned}
&V^p - U^p - (U^b - V^b) \\
&= \frac{\kappa}{2} + \frac{\zeta}{2} + \frac{1}{6\kappa\zeta} - 1 - V^b - \frac{\zeta}{2} - 1 + \frac{1}{2\zeta} - \left(\frac{\kappa - 1}{2} + \frac{1}{8\kappa} - V^b\right) \\
&= \frac{1}{2}\frac{1}{6\kappa\zeta} - \frac{1}{8\kappa} - \frac{1}{2\zeta}.
\end{aligned}$$

At the maximum values of κ and ζ we have that this becomes:

$$\frac{1}{2} + \frac{1}{3} - \frac{1}{4} - \frac{1}{2} > 0$$

and so the platform wins the auction. □

The intuition for the result is that information sharing generates surplus because production is more efficient. The platform fully internalizes this surplus creation so in a "fair" political lobbying process the platform will pay to get an information sharing ledger created. In our model, this looks like an attractive outcome. However, we close this section by noting two extensions that break this result: (i) the platform markups may create distortions and (ii) the political lobbying process may not be fair.

Discussion: platform markup distortions: In our model, the platform is willing to lobby to introduce an "open-banking" system that makes the credit market much more competitive. This ultimately means that agents do not have to give up as much surplus to get loans. However, the platform is only willing to lower lender surplus because it is able to extract all the remaining surplus in the goods market. That is, the platform wants to push regulators to allow it to compete in the loan market so that it can push down bank rents and then extract those rents back as markups on their trading platform. In our model, this does not distort welfare because the platform chooses efficient production and rebates profits to agents. However, in an extension where platform markups distort welfare, platform lobbying to introduce open banking simply replaces one problem by another problem. This highlights that regulators need to be very wary of the motives of tech platforms becoming involved in the financial sector. They may be treating the credit market as an input into their ability to extract rents in the goods market.

Discussion: entry cost: In our political economy problem, we assumed that banks and platforms were both already lending and the regulator ran an auction to determine whether to impose information sharing. However, in reality, banks are incumbents in the lending market. If we had considered an first stage to the political process where banks could lobby to introduce an entry cost, C, that keeps platforms from entering the loan market, then it would choose to so. This implies that the platform would only enter and lobby for information sharing only if $V^p > C$. If δ is low, then the platform may not enter and force the introduction of an open banking system.

5 Endogenous Project Choice

A key lesson from the previous sections is that the distribution of project types is very important for understanding the incentives for banks and platforms to share information. However, so far, we have assumed that projects are exogenously assigned to agents. We now relax this assumption. This allows us to consider the link between financial intermediation and project design. We show that with endogenous project design banks have a much stronger incentive to restrict information sharing because it encourages agents to choose projects that are collateral intensive.

5.1 Agent Project Design Problem

Environment changes: Agents now choose the upper bound for the project distributions (ζ, κ) subject to a cost function constraint $\psi(\zeta, \kappa) \leq 1$. We start by focusing on the affine constraint that $\psi(\zeta, \kappa) = (\zeta + \kappa)/\bar{\psi} \leq 1$ We interpret the constraint as saying that all projects require the same total financing but the agent can choose how much collateral the project creates. After choosing (ζ, κ), the project creator then gets independent draws from $\kappa \sim U[0, \zeta]$ and $k \sim U[0, \kappa]$, as in previous sections.

The timing is the following. At the start of $t = 0$, agents choose a project with properties (ζ, κ). They then show the project to banks who learn the κ that will be realized or platforms who learn the z that will be realized. The banks and platforms offer financing with an offer to the agent that they can keep $(1 - \beta)$ of the surplus. If the agent does not accept financing from the lender, then they get outside option W. Competition and timing then works the same way as in Section 3. If the bank or platform is the monopolist, then they take all the surplus. If the bank and platform compete, then the lenders earn zero profit. At $t = 1$, the agents trade and the platform charges a markup μ on the trades.

Agent Problem: The agent chooses (ζ, κ) to solve:

$$\max_{\zeta,\kappa} \{\mathbb{E}[\mathbf{1}(z, k, \zeta, \kappa)(1 - \beta)(1 - \mu)(z + k - 1)]\} \quad s.t. \quad \psi(\zeta, \kappa) \leq 1$$

where $\mathbf{1}(z, k, \zeta, \kappa)$ is an indicator for whether the project is financed. Throughout this section, the agent has no bargaining power and so, conditional on the project being financed, they always get their outside option W. Thus, their optimization problem becomes:

$$\max_{\zeta,\kappa} \{\phi(\zeta, \kappa)W\} \quad s.t. \quad \psi(\zeta, \kappa) \leq 1$$

where $\phi(\zeta, \kappa)$ is the probability that a project with characteristics (ζ, κ) finds a lender. In other words, the agent simply maximizes the probability of being funded.

We now consider how agent financing decisions change depending on which intermediaries are financing projects.

5.2 Bank Monopoly

If the bank is the only lender, then the post design game is the same as in Section 2.3 and so:

$$\phi(\zeta, \kappa) = \mathbb{P}(\mathbb{E}[z] + \kappa - 1 \geq 0) = 1 - \frac{1}{\bar{\kappa}}\left(1 - \frac{\bar{z}}{2}\right)$$

Proposition 9. *Agents choose $\zeta = 0$ and $\kappa = \bar{\psi}$ and the bank earns profit:*

$$\mathbb{E}[k-1; k > 1] = \frac{1}{\kappa}\left(\frac{\kappa^2}{2} - \kappa + \frac{1}{2}\right)$$

Proof. Substituting in the constraint gives:

$$\phi(\kappa) = \frac{1}{2} - \frac{1}{\kappa}\left(1 - \frac{\bar{\psi}}{2}\right).$$

This is strictly increasing in κ and so the agent chooses $\kappa = \bar{\psi}$. Banks then earn:

$$\mathbb{E}[k-1; k > 1] = \frac{1}{\kappa}\left(\frac{\kappa^2}{2} - \kappa + \frac{1}{2}\right)$$

□

Intuitively, when the bank is the only lender the agents choose projects to maximize the probability that the bank can finance the project. This means that the agents create collateral heavy projects. If the project creation cost function is affine, then they choose the maximum possible collateral.

5.3 Segmented Markets

We now consider the arrangement where platform and banks both participate in the credit market but information is not shared and so the markets are segmented. In this case, the post design game is as described in Section 2.4 and so:

$$\phi(\zeta, \kappa) = \mathbb{P}(\{\mathbb{E}[z|z \leq 1] + k \geq 1\} \cup \{z \geq 1\}) = \begin{cases} 1 - \frac{1}{2\zeta\kappa}, & \zeta > 1, \kappa > 1/2 \\ 1 - \frac{1}{2\kappa}, & \zeta \leq 1, \kappa > 1/2 \\ 1 - \frac{1}{\zeta}, & \zeta > 1, \kappa \leq 1/2 \\ 0, & \zeta \leq 1, \kappa \leq 1/2 \end{cases}$$

Proposition 10. *For* $\bar{\psi} \leq 4$*, the agents choose* $(\zeta, \kappa) = (0, \bar{\psi})$*. The bank takes no surplus on loans with* $\delta k \geq 1$ *and all surplus on loans with* $\delta k \leq 1 \leq k$*. So, their profit is:*

$$\mathbb{E}[k - 1; \delta k \leq 1 \leq k] = \frac{1}{\bar{\psi}} \left(\frac{1}{2\delta^2} - \frac{1}{\delta} + \frac{1}{2} \right)$$

For $\bar{\psi} > 4$*, the agents choose* $(\zeta, \kappa) = (\bar{\psi}/2, \bar{\psi}/2)$*.*

Proof. If the agent chooses $(\zeta, \kappa) > (1, 1/2)$, then they solve:

$$\max_{\kappa, \zeta} \left\{ 1 - \frac{1}{2\zeta\kappa} + \lambda(\bar{\psi} - \zeta - \kappa) \right\}$$

which leads to FOC $\zeta = \kappa = \bar{\psi}/2$ and so the probability becomes:

$$\phi(\zeta, \kappa) = 1 - \frac{2}{\bar{\psi}^2}.$$

Alternatively, the agent can go to one of the extremes. If so, they always prefer to go to the region where $\zeta < 1$ and $\kappa > 1/2$ and set $\kappa = \bar{\psi}$. This gives them:

$$\phi(\zeta, \kappa) = 1 - \frac{1}{2\bar{\psi}}$$

So, the agent prefers the later case if:

$$1 - \frac{1}{2\bar{\psi}} > 1 - \frac{2}{\bar{\psi}^2} \quad \Rightarrow \quad \bar{\psi} < 4.$$

□

For a linear cost function, the introduction of a platform into the lending market does not change the project choice. This is because the agents still prefer to go to one of the extremes and the extreme with $\kappa = \bar{\psi}$ is more attractive because banks are better overall at making loans. However, it does change the distribution of surplus between the bank and the platform. The bank can now only extract surplus from the projects with $\delta k \leq 1 \leq k$.

5.4 Information Sharing

Finally, we now consider the arrangement where the platform and the bank both share information In this case, we have the efficient level of project financing:

$$\phi(\zeta,\kappa) = \mathbb{P}(z+k\geq 1) = \begin{cases} 1-\frac{1}{2\zeta\kappa}, & \zeta>1,\kappa>1/2 \\ 1-\frac{1}{\kappa}+\frac{1}{2}\frac{\zeta}{\kappa}, & \zeta\leq 1,\kappa>1/2 \\ 1-\frac{1}{\zeta}+\frac{1}{2}\frac{\kappa}{\zeta}, & \zeta>1,\kappa\leq 1/2 \\ 0, & \zeta\leq 1,\kappa\leq 1/2 \end{cases}$$

Proposition 11. *For $\bar{\psi}\leq 2$, the agents are indifferent between $(\zeta,\kappa)=(\bar{\psi},0)$ and $(\zeta,\kappa)=(0,\bar{\psi})$. For the former case, both the bank and the platform make zero profit in the loan market. For the later case, the bank only takes the surplus on loans with $\delta k\leq 1\leq k$, as in the previous section. If we let η denote the fraction of projects of type $(\zeta,\kappa)=(0,\bar{\psi})$, then bank profit is:*

$$\eta\mathbb{E}[k-1;\delta k\leq 1\leq k] = \frac{\eta}{\bar{\psi}}\left(\frac{1}{2\delta^2}-\frac{1}{\delta}+\frac{1}{2}\right)$$

For $\bar{\psi}>2$, the agents choose $(\zeta,\kappa)=(\bar{\psi}/2,\bar{\psi}/2)$.

Proof. Using the same logic as in Proposition 10, the comparison is now between:

$$1-\frac{2}{\bar{\psi}^2}\geq 1-\frac{1}{\bar{\psi}}$$

which is satisfied if $\bar{\psi}\geq 2$. □

Once there is information sharing, the banks and the platform are on the same playing field in the loan market. The affine cost function implies that agents still want to go to one of the extremes. However, agents are now indifferent about which extreme they go to. This places an additional limit on the bank's ability to extract profit from the economy.

5.5 Information Sharing Revisited

We can now revisit the model with voluntary information sharing from Section 3.

Corollary 1. *If the cost function is affine, then the bank never wants to share information while the platform always wants to share information.*

We can see that endogenous project creation sharpens the difference between platform and bank attitudes towards information sharing. In Section 3, the bank had to trade-off being able to extract higher profits against being able to finance more projects. However, once project choice is endogenous, this is no longer the case. Agents choose the types of projects that suit the financing system and so information sharing does not increase the volume of projects that the bank can finance.

5.6 Political Lobbying Revisited

We can also revisit the results of our political economy model.

Corollary 2. *If the cost function is affine, then the bank and the platform make the same bids in the second price auction.*

Proof. Without information sharing, the agents choose to set $(\zeta, \kappa) = (0, \bar{\psi})$ and the bank earns profit:

$$\frac{\bar{\psi}}{2} - 1 + \frac{1}{2\bar{\psi}}$$

With information sharing, a fraction η of projects are $(\zeta, \kappa) = (0, \bar{\psi})$ and the remaining fraction $1 - \eta$ are $(\zeta, \kappa) = (\bar{\psi}, 0)$. For the later type, the bank earns no profit. For the former type, the bank only earns profit when $\delta k \leq 1 \leq k$. So, the bank's profit is:

$$\eta \mathbb{E}[k - 1; \delta k \leq 1 \leq k] = \frac{\eta}{\bar{\psi}} \left(\frac{1}{2\delta^2} - \frac{1}{\delta} + \frac{1}{2} \right)$$

The benefit to the bank of successfully lobbying to prevent information sharing is:

$$\Delta^b = \frac{\bar{\psi}}{2} - 1 + \frac{1 - \eta}{2\bar{\psi}} - \frac{\eta}{\bar{\psi}} \left(\frac{1}{2\delta^2} - \frac{1}{\delta} \right)$$

Without information sharing, the platform gets nothing. With information sharing, it gets:

$$\begin{aligned}\Delta^p &= (1-\eta)\mathbb{E}[z-1; z \geq 1] + \eta\mathbb{E}[k-1; \delta k \geq 1] \\ &= \frac{\bar{\psi}}{2} - 1 + \frac{1}{\bar{\psi}}\left(\frac{1-\eta}{2}\right) - \frac{\eta}{\bar{\psi}}\left(\frac{1}{2\delta^2} - \frac{1}{\delta}\right)\end{aligned}$$

So, we have that:

$$\Delta^b - \Delta^p = 0$$

□

The intuition for the result is that the linear cost function leads to an extreme solution to the project financing. In this case, open banking becomes a "zero-sum" game because the financial inclusion problems do not impact production. As a result the platform has less incentive to lobby for regulation.

Discussion: non-linear costs: So far, we have focused on a linear project cost function, which generates closed form but extreme outcomes. An alternative is to consider a the CES cost function:

$$\psi(\zeta, \kappa) = \left(x^{1/\gamma} + y^{1/\gamma}\right)^{\gamma}$$

with $\gamma > 1$. For sufficiently large γ, the agents project choice problem has an interior solution satisfying:

$$\frac{\partial_\kappa \phi(\kappa, \zeta)}{\partial_\zeta \phi(\kappa, \zeta)} = \frac{\partial_\zeta \psi(\zeta, \kappa)}{\partial_\kappa \psi(\zeta, \kappa)}$$

and we can see that the financing frictions distort the average production in the economy. Under full information, we have that $\partial_\kappa \phi(\kappa, \zeta) = \partial_\zeta \phi(\kappa, \zeta)$ and so $\partial_\zeta \psi(\zeta, \kappa) = \partial_\kappa \psi(\zeta, \kappa)$. Under other arrangements, this ratio is distorted. This means that full information once again improves production in the economy and so the platform is willing to pay more in the second price regulation auction.

6 Conclusion

Our model studies a financial sector with traditional banks and tech platform. Banks specialize in learning about collateral, where is the platform has superior technology to grant credit against future revenue since goods trading occurs on this platform. Having the tech platform participate in the loan market alleviates financial inclusion problem so long as both the bank and the platform participate in an information sharing system. The platform will lobby for this information sharing system so that it can reduce bank profits in the loan market and increase its markup revenue in the goods market. This highlights that FinTech regulators need to consider competition across the loan and goods market together.

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A Additional Proofs for Section 3

Proof of Proposition 6. If the bank does not share information, then their value is:

$$
\begin{aligned}
U^b &= \mathbb{E}[k - 1/2; k \geq 1/2] \\
&= \int_{1/2}^{\max\{\kappa,1/2\}} (k - 1/2)\frac{dk}{\kappa} \\
&= \frac{1}{\kappa}\left[\frac{k^2}{2} - \frac{k}{2}\right]_{1/2}^{\max\{\kappa,1/2\}} \\
&= \begin{cases} \frac{\kappa-1}{2} + \frac{1}{8\kappa}, & \text{if } \kappa > 1/2 \\ 0, & \text{if } \kappa \leq 1/2 \end{cases}
\end{aligned}
$$

If the bank does share information, then there are a collection of cases depending on κ. For the case that $\kappa < 1$, we have that:

$$
\begin{aligned}
V^b &= \int_0^{\kappa} \int_{1-k}^{1-\delta k} (z + k - 1)\frac{dz}{\zeta}\frac{dk}{\kappa} \\
&= \frac{1}{\zeta}\int_0^{\kappa} \left[\frac{z^2}{2} + (k-1)z\right]_{1-k}^{1-\delta k} \frac{dk}{\kappa} \\
&= \frac{1}{\zeta}\int_0^{\kappa} \left(\frac{(1-\delta k)^2}{2} + (k-1)(1-\delta k) - \frac{(1-k)^2}{2} + (1-k)^2\right)\frac{dk}{\kappa} \\
&= \frac{1}{\zeta\kappa}\left[-\frac{k}{2} + \frac{k^2}{2} - \delta\left(1 - \frac{\delta}{2}\right)\frac{k^3}{3} - \frac{(1-k)^3}{6}\right]_0^{\kappa} \\
&= \frac{1}{6\zeta\kappa}\left(1 - 2\delta\left(1 - \frac{\delta}{2}\right)\right)\kappa^3
\end{aligned}
$$

For the case that $1 < \kappa < 1/\delta$, we have that profit equals:

$$
\int_0^1 \int_{1-k}^{1-\delta k} (z - k - 1)\frac{dz}{\zeta}\frac{dk}{\kappa} + \int_1^{\kappa} \int_0^{1-\delta k} (z + k - 1)\frac{dz}{\zeta}\frac{dk}{\kappa}
$$

The first term is:

$$\int_0^1 \int_{1-k}^{1-\delta k} (z-k-1)\frac{dz}{\zeta}\frac{dk}{\kappa}$$
$$= \frac{1}{\zeta\kappa}\left[-\frac{k}{2}+\frac{k^2}{2}-\delta\left(1-\frac{\delta}{2}\right)\frac{k^3}{3}-\frac{(1-k)^3}{6}\right]_0^1$$
$$= \frac{1}{6\zeta\kappa}\left(1-\delta(2-\delta)\right)$$

The second term is:

$$\int_1^\kappa \int_0^{1-\delta k} (z+k-1)\frac{dz}{\zeta}\frac{dk}{\kappa}$$
$$= \frac{1}{\zeta}\int_1^\kappa \left[\frac{z^2}{2}+(k-1)z\right]_0^{1-\delta k}\frac{dk}{\kappa}$$
$$= \frac{1}{\zeta}\int_1^\kappa \left(\frac{(1-\delta k)^2}{2}+(k-1)(1-\delta k)\right)\frac{dk}{\kappa}$$
$$= \frac{1}{\zeta}\left[-\frac{(1-\delta k)^3}{6\delta}-\delta\frac{k^3}{3}+(1+\delta)\frac{k^2}{2}-k\right]_1^\kappa$$
$$= \frac{1}{6\zeta\kappa}(\kappa-1)\left(3\kappa-\delta(2-\delta^2)(\kappa^2+\kappa+1)\right)$$

Combining these equations gives the result in the main text.

Finally, for $\kappa > 1/\delta$ we have that profit is given by:

$$\mathbb{E}[\pi; z+k\geq 1; z+\delta k\leq 1]$$
$$= \int_0^1 \int_{1-z}^{(1-z)/\delta} (k-(1-z))\frac{dk}{\kappa}\frac{dz}{\zeta}$$
$$= \frac{1}{\zeta\kappa}\int_0^1 \left[\frac{k^2}{2}-(1-z)k\right]_{1-z}^{(1-z)/\delta} dz$$
$$= \frac{1}{\zeta\kappa}\int_0^1 \left[\frac{(1-z)^2/\delta^2}{2}-(1-z)^2/\delta-\frac{(1-z)^2}{2}+(1-z)^2\right] dz$$
$$= \frac{1}{\zeta\kappa}\left[-\frac{(1-z)^3}{6}\left(\frac{1}{\delta^2}-\frac{2}{\delta}+1\right)\right]_0^1$$
$$= \frac{1}{6\zeta\kappa}\left(\frac{1}{\delta}-1\right)^2$$

□

Proof of Proposition 7. If the platform does not share information, then:

$$\begin{aligned} U^p = \mathbb{E}[z-1; z \geq 1] &= \int_1^{\zeta} (z-1)\frac{dz}{\zeta} \\ &= (1/\zeta)[z^2/2 - z]_1^{\zeta} \\ &= \frac{\zeta}{2} - 1 + \frac{1}{2\zeta} \end{aligned}$$

If the platform does share information, then they get:

$$V^p = \mathbb{E}\{\mathbf{1}(k + z \geq 1; \kappa, \zeta)(z + k - 1)\} - V^b$$

where the first term is given by:

$$\begin{aligned} &\mathbb{E}\{\mathbf{1}(k + z \geq 1; \kappa, \zeta)(z + k - 1)\} \\ &= \int_0^1 \int_{1-k}^{\zeta} (z + k - 1)\frac{1}{\kappa}\frac{1}{\zeta} dz dk + \int_1^{\kappa} \int_0^{\zeta} (z + k - 1)\frac{1}{\kappa}\frac{1}{\zeta} dz dk \\ &= \frac{1}{\kappa}\frac{1}{\zeta}\int_0^1 \left[\frac{z^2}{2} + (k-1)z\right]_{1-k}^{\zeta} dk + \frac{1}{\kappa}\frac{1}{\zeta}\int_1^{\kappa} \left[\frac{z^2}{2} + (k-1)z\right]_0^{\zeta} dk \\ &= \frac{1}{\kappa}\frac{1}{\zeta}\left(\left[\frac{\zeta^2}{2}k + (k^2/2 - k)\zeta - \frac{(1-k)^3}{6}\right]_0^1 + \left[\frac{\zeta^2}{2}k + (k^2/2 - k)\zeta\right]_1^{\kappa}\right) \\ &= \frac{1}{\kappa}\frac{1}{\zeta}\left(\frac{1}{6} + \frac{\zeta^2}{2}\kappa + \frac{\kappa^2}{2}\zeta - \kappa\zeta\right) \\ &= \frac{\kappa}{2} + \frac{\zeta}{2} + \frac{1}{6\kappa\zeta} - 1 \end{aligned}$$

□