Bridging the Gap?

FinTech and Financial Inclusion *

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Abstract

The rise of FinTech lenders offers an opportunity to promote financial access but may disrupt banks' banking efforts. This paper presents a banking model where an incumbent bank specializes in some niche markets. When FinTech enters, it intensifies competition for certain niches, reducing the bank's lending relationship gains. Although FinTech serves some unattended niches, the bank may abandon others, creating an ambiguous impact on financial inclusion. The overall effect depends on the initial level of financial inclusion and on FinTech's efficiency and competitiveness.

Keywords: FinTech, financial inclusion, lending relationships, regulatory arbitrage, market efficiency.

JEL Codes: G21, G23, G28.

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1 Introduction

Increasing access to finance for small and medium enterprises (SMEs) can foster economic growth as these firms are a crucial engine for job creation in developing economies (Ayyagari et al., 2011). However, SMEs face more difficulties gaining access to finance due to severe informational problems (Beck and Demirguc-Kunt, 2006). One way for traditional banks to overcome these problems is by establishing lending relationships, which enable lenders to gather information from more opaque borrowers (Sharpe, 1990; Petersen and Rajan, 1994). The recent and rapid growth of FinTech offers an opportunity to enhance SMEs access to credit through digital technological advancements (Jagtiani and Lemieux, 2018; Abbasi et al., 2021; Hodula, 2023). However, the impact of FinTech's entry on SMEs' financial inclusion is unclear. Despite the promise of increased market efficiency by FinTechs, their presence diminishes the return on soft-information discovery. As a result, soft information-intensive SMEs may be credit rationed, and market's overall financial inclusion may decline (Boot and Thakor, 2000).

This paper studies the impact of a FinTech's entry on financial inclusion through the lens of a banking model. In particular, we show that the impact on financial inclusion is uncertain and depends on 1) how traditional banks initially serve the credit market and 2) FinTech's features, such as its competitiveness, defined as the capacity to draw borrowers away from banks, and its efficiency in serving unattended borrowers.

In the paper's model, a screening cost is paid to serve a niche market due to an adverse selection problem. An incumbent bank has a cost advantage in serving opaque niches, whereas a FinTech entrant is better at banking less opaque niches. The FinTech caters to niches the bank avoids due to its disadvantage in screening costs, thus potentially increasing financial inclusion. Nonetheless, it competes with the bank in more opaque niches. The bank anticipates this competition, and as lending relationship rents fall, it is discouraged from supplying some niches, thus potentially lowering financial inclusion. The overall impact on access to finance is determined by which of these two effects dominates.

The paper adds to the existing literature on the impact of FinTech lending on access to finance. Some papers document that FinTech's contribution to financial inclusion is insignificant (Cornaggia et al., 2018; Fuster et al., 2019) or even negative (Fuster et al., 2022), while others document that FinTech has a positive and sizable effect on financial inclusion (Sheng, 2021; Jagtiani et al., 2021). This paper extends this research by examining in a banking model, the impact of FinTech entry on traditional banks' incentives to promote access to finance and, consequently, its overall effect on financial inclusion. Our results are consistent with the mixed findings of this recent empirical work and lead to several specific policy recommendations.

2 Model

Consider an economy with two dates ($t = 1, 2$) and a credit market that can be divided into a continuum of niche markets according to an opaqueness index $m \in [0, 1]$. Lower values of m correspond to higher opaqueness.

2.1 Entrepreneurs

Each niche market m is populated by a mass $f(m)$ of penniless entrepreneurs that live for two dates, where $f(\cdot)$ is a pdf over the support $[0, 1]$. At any date, each entrepreneur has access to a project that requires a unit investment and matures at the end of the period. The project yields a stochastic payoff x, which is independent and identically distributed according to

$$x = \begin{cases} X, & \text{with probability } \tilde{p}, \\ 0, & \text{with probability } 1 - \tilde{p}, \end{cases}$$

The project's output cannot be stored, so it can not generate collateral for subsequent lending rounds.

Every market m has two unobservable types of entrepreneurs that differ in their ability to run their projects. A project managed by a high-ability entrepreneur has a probability of success p, which is higher than the probability $p - \delta$ of a project run by a low-ability entrepreneur. All entrepreneurs have a reservation utility $\underline{u}$, and the fractions of high- and low-ability types in each niche market are γ and $1 - \gamma$, respectively.

An adverse selection problem may deter the financing of projects belonging to high-ability entrepreneurs. In particular, projects managed by entrepreneurs with high ability have positive one-period NPV, that is,

$$pX - 1 > \underline{u}, \tag{1}$$

where the interest rate of fully insured deposits is normalized to zero, and their supply is perfectly elastic at such a rate. On the contrary, low-ability entrepreneurs' projects have negative one-period NPV, such that if types are unobservable, no niche market will be served. That is,

$$\hat{p}X - 1 < \underline{u}, \tag{2}$$

where $\hat{p} = p - (1 - \gamma) \times \delta$ is the average probability of success.

Only financial intermediaries can finance entrepreneurs' projects. Moreover, they do it by offering one-period loan contracts.

2.2 Financial intermediaries

An incumbent specialized financial intermediary can help to overcome the adverse selection problem. In particular, the *incumbent* can observe the entrepreneur's type by paying a screening cost $m \times \phi_I$ when serving the entrepreneur for the first time. Thus, the incumbent is better at screening niche markets with a low value of m; i.e., more opaqueness. The incumbent can be seen as a traditional bank that is better at soft information processing (Liberti and Petersen, 2018).

Rents from lending relationships help to compensate for the screening cost incurred by the incumbent. In particular, interacting with the borrower in more than one lending round allows the incumbent to extract more rents and cover the initial investment of banking a niche market. In this way, second-round rents can turn into profitable niche markets in which the incumbent lost in the first lending round due to high screening costs. Furthermore, as in Padilla and Pagano (2000), it is assumed that default is forgiven.[1]

Before all lending decisions happen on date 1, a new financial intermediary's entry on date 2 is announced. Contrary to the incumbent, the *entrant* has an advantage in banking niche markets with high index m; i.e., less opaque. The entrant can be seen as a FinTech lender that relies on processing hard information by leveraging big data approaches (Balyuk et al., 2022). In particular, the entrant pays a screening cost $(1 - m) \times \phi_E$ from attending a niche market m. Thus, the parameter ϕ_E measures *the FinTech's efficiency at serving new niches.*

The entrant observes the type of entrepreneurs with previous access to credit (i.e., screened at date 1 by the incumbent), and it can poach the incumbent's clients at a cost $(1-m) \times \kappa$. Thus, the incumbent will face competition at date 2 over the niche markets attended at date 1, reducing date 2 rents extracted from them. The parameter κ can be seen as *the FinTech's degree of competitiveness.* For instance, if the services offered by the bank to SMEs are difficult to substitute, the bank will be in a better position to retain its customers (Nguyen, 2019), in which case κ will be higher. On the contrary, as documented by Buchak et al. (2018), lower regulatory costs for FinTechs relative to banks facilitate the poaching of clients from banks to FinTechs, i.e., a low value of κ.

2.3 Solving the model

The problem is solved by backward induction. First, competition outcomes at date 2 are determined. Next, the incumbent decides which niche markets to serve at date 1.

2.3.a Events at date 2

Let m_I^* be the marginal niche served by the incumbent at date 1, that is, niches with index

[1] Each investment project is run as a separate limited liability company, and the entrepreneur cannot be disqualified after bankruptcy.

$m \leq m_I^*$ received funding in the first lending round, leaving $1 - m_I^*$ niche markets unattended. Among the unattended niches, the entrant decides which of them to serve on date 2. On the other hand, the incumbent and the entrant compete in prices for the bancarized clients in niches $m \leq m_I^*$.

The following proposition characterizes the equilibrium outcome at date 2.

Proposition 1. *The incumbent will serve niches $m \leq m_I^*$ at date 2; whereas the entrant will serve niches $m \geq m_E^*$, where $m_E^* = 1 - \frac{1}{\phi_E} \times (pX - 1 - \underline{u})$. The incumbent and the entrant will offer, respectively, date-2 interest rates*

$$R_{I,2}(m) = \frac{1 + \kappa \times (1 - m)}{p}, \ \textit{for } m \leq m_I^* \quad \textit{and} \quad R_{E,2}(m) = \begin{cases} \frac{1+\kappa\times(1-m)}{p}, & \textit{for } m \leq m_I^*, \\ X - \underline{u}/p, & \textit{for } m \geq m_E^*. \end{cases}$$

Proposition 1 states the new served niche markets after the entry of the new intermediary. As the entrant has an advantage in banking niches with high index m, it will serve unattended niches in which the one-period revenue covers for the funding and screening costs. Moreover, as such niches are far from the incumbent's expertise, the entrant will not face competition, allowing to charge an interest rate that makes indifferent the entrepreneur between taking the contract or not.[2]

The incumbent will retain its customers; i.e., no switching happens on equilibrium. However, competition decreases the interest rate that the incumbent can charge to its clients at date 2. For instance, a very high rate can cause the entrant to poach the incumbent's clients by offering a lower interest rate. Consequently, the incumbent will charge the lowest interest rate the entrant can provide without incurring a loss. Because the entrant cannot poach a client at a zero cost, $\kappa > 0$, the incumbent can price the loan at a price higher than its fair value $\frac{1}{p}$; see Proposition 1. Hence, the incumbent's date-2 profit in a niche m is equal to

$$\pi_{I,2}(m) \equiv p \times R_{I,2}(m) - 1 = \kappa \times (1 - m). \tag{3}$$

[2] The bank's incentives for investing in unattended niche markets are even lower at date 2, as no potential rents from engaging in a second lending round can be extracted.

Note that the rents captured by the incumbent depend on its advantage at serving a niche m. If such an advantage dissipates (i.e., $\kappa = 0$), competition will eliminate rents at date 2.

2.3.b Events at date 1

At date 1, the incumbent decides on the niche markets that it will serve. When doing that, it considers whether the rents extracted from entrepreneurs over the life of the lending relationship compensate for the screening cost $\phi_I \times m$ incurred to overcome the adverse selection problem. Recall that if no screening is done, banking a niche market m is unprofitable due to the presence of low-ability entrepreneurs; see condition (2).

The following proposition states the niche markets served by the incumbent.

Proposition 2. *If $\phi_I > \underline{\phi}$, the incumbent will serve niche markets with index $m \leq m_I^* < 1$, where $m_I^* = \frac{1}{\phi_I + \kappa} \times (pX - 1 - \underline{u} + \kappa)$. Moreover, it will charge a gross interest rate to niche m equal to*

$$R_{I,1}(m) = X - \frac{\underline{u}}{p}, \text{ for } m \leq m^*.$$

Proposition 2 indicates that some niches of the credit market will not have access to finance due to prohibitive screening costs at date 1; i.e., $\phi_I > \underline{\phi}$. In particular, the rents the incumbent can extract from the lending relationship are insufficient to compensate for the screening cost in niches far from the incumbent's expertise. Moreover, as competition intensifies with the entry of the new intermediary, the incumbent will extract fewer rents at date 2, resulting in serving fewer niches; i.e., m_I^* decays. Finally, because there is no competition at date 1, the incumbent charges a gross interest rate that captures entrepreneurs' surplus at date 1.

3 Analysis on access to finance

In this section, we analyze the effect of the FinTech's entry on financial inclusion. On the one hand, the entrant can help financial inclusion by banking unattended niches (*efficiency effect*).

On the other hand, the entrant increases competition, which may discourage the incumbent from serving some niches (*competition effect*). The net effect on financial inclusion will depend on which of these effects predominate.

The effect of the FinTech's entry is illustrated in Figure 1. First, the FinTech promotes the bancarization of high m-index niches; i.e., niches m_E^* to 1 in panel (b). The positive efficiency effect is larger if the FinTech is more efficient at serving these niches (i.e., a low value of ϕ_E); see panel (c). On the contrary, if ϕ_E is higher, the FinTech is less efficient, serving fewer new niches. Second, after the FinTech's entry, the incumbent stops serving some previously attended niches due to more competition from the FinTech. The negative competition effect is represented by the niches m_I^* to m_I^0 that the bank abandons after the FinTech's entry. The magnitude of the competition effect will depend on the degree of competitiveness of the FinTech. In panel (e), the effect is small, as the FinTech is less capable of poaching clients from the bank (i.e., a high value of κ), whereas, in panel (f), the effect is larger, due to more aggressive competition (i.e., a low value of κ). The final effect on financial inclusion will depend on the mass of entrepreneurs in abandoned and newly served niches, which depends of the density function $f(m)$.

Figure 2 illustrates the effect of initial financial inclusion by considering the case where the abandoned and newly served niches are equal. The final impact on financial inclusion will depend on how entrepreneurs are distributed among the niches. In panel (a), we consider a situation where initial financial inclusion is high, as most served entrepreneurs lie within the bank's expertise (niches with a low index m). On the contrary, panel (b) depicts a situation where initial financial inclusion is lower due to fewer entrepreneurs in the bank's expertise area. Despite serving the same number of niches in both cases, the entry of the FinTech fosters financial inclusion in panel (a) compared to panel (b), as the newly served niches contain more entrepreneurs than the abandoned niches by the incumbent. Thus, if initial financial inclusion is low, the entry of the FinTech is more likely to foster financial access. The final effect will also be a function of the abandoned and newly served niches, which depend on the FinTech's features (see Figure 1).

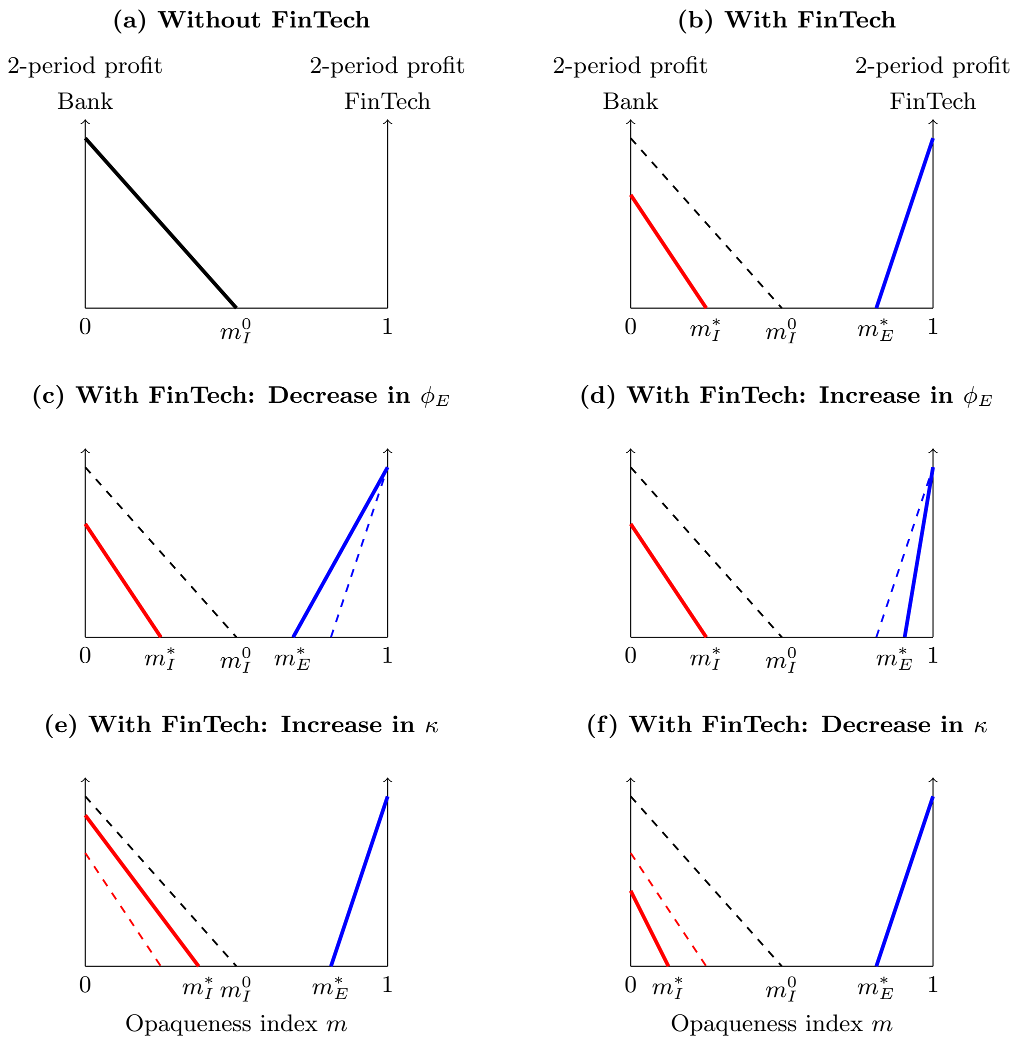

Figure 1: Effect on attended niches of FinTech's efficiency (ϕ_E) and competitiveness (κ)

The figure illustrates the effect of a FinTech's entry on served niches. The lines represent the incumbent's and FinTech's profit from attending a niche market m. Panel (a) depicts a situation in which no entry occurs. In such a case, the incumbent serves niches from 0 to m_I^0 (when profits become zero). The black dashed line represents this case in the rest of the panels. Panel (b) illustrates a situation where a FinTech enters the market. In such a case, the bank serves niches from 0 to m_I^* (when profits become zero), and the FinTech serves niches from m_E^* (when profits become zero) to 1. The *competition* and *efficiency* effects are represented by the niches the bank abandons (from m_I^0 to m_I^*) and the unattended niches the FinTech starts serving (from m_E^* to 1), respectively. The blue and red dashed lines in the rest of the panels coincide with the solid blue and red lines in panel (b). Panel (c) describes a situation of a more efficient FinTech but equally competitive relative to panel (b). In such a case, more newly attended niches are served. Panel (d) describes the same situation as panel (c) but for a less efficient FinTech. In such a case, fewer new niches are served. Panel (e) shows a situation in which the FinTech is less competitive but equally efficient relative to panel (b). In such a situation, fewer niches are abandoned by the bank. Panel (f) shows the same situation as panel (e) but now the FinTech is more competitive. In such a situation, more niches are abandoned.

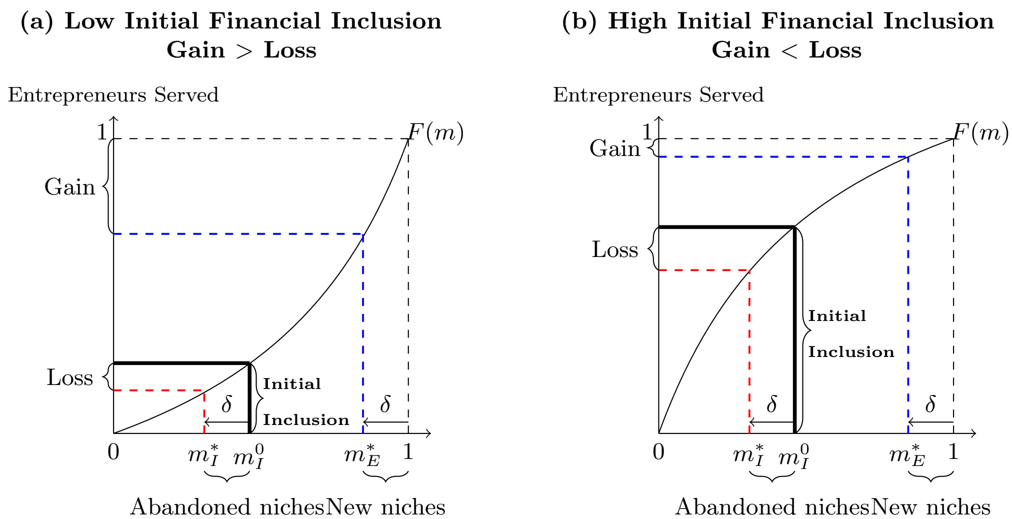

Figure 2: Effect on financial inclusion of the initial financial inclusion level

The figure shows how financial inclusion changes when we assume that the niches the bank abandons are equal to the niches the FinTech serves. $F(\cdot)$ is the cumulative distribution function of f and measures the fraction of entrepreneurs served. The black solid line represents the financial inclusion without FinTech's entry. The dashed red line depicts the niches (from 0 to m_I^*) and entrepreneurs ($F(m_I^*)$) the bank serves after the FinTech's entry. The blue line shows the niches (from m_E^* to 1) and entrepreneurs ($1 - F(m_E^*)$) the FinTech serves after it enters the market. Panel (a) depicts a situation with lower initial financial inclusion than panel (b). In particular, despite serving the same niches (from 0 to m_I^0), the bank initially serves fewer entrepreneurs in panel (a) than (b) because a smaller mass of entrepreneurs is located in niches within the bank's expertise. Panel (a) then shows that after FinTech's entry, financial inclusion increases because the newly served niches, contain more entrepreneurs, than those abandoned by the bank. Conversely, in Panel (b), financial inclusion falls as the bank abandons a larger mass of entrepreneurs compared to those newly served by the FinTech.

Let Δ be the change in access to finance after the FinTech's entry, which is defined as

$$\Delta = \gamma \times \Bigg(\underbrace{\int_{m_E^*}^{1} f(m)\mathrm{d}(m)}_{\text{Efficiency effect}} - \underbrace{\Bigg(\int_0^{m_I^0} f(m)\mathrm{d}(m) - \int_0^{m_I^*} f(m)\mathrm{d}(m) \Bigg)}_{\text{Competition effect}} \Bigg), \tag{4}$$

where the first term represents the mass of new high-ability entrepreneurs attended by the entrant. The second term represents the mass of high-ability entrepreneurs the incumbent stopped serving after the FinTech's entry, which is the difference between the mass of high-ability entrepreneurs served by the incumbent in the absence and the presence of the FinTech, respectively.

Figure 3 shows how financial inclusion varies following the entry of the FinTech across all the

(a) High initial financial inclusion **(b) Low initial financial inclusion**

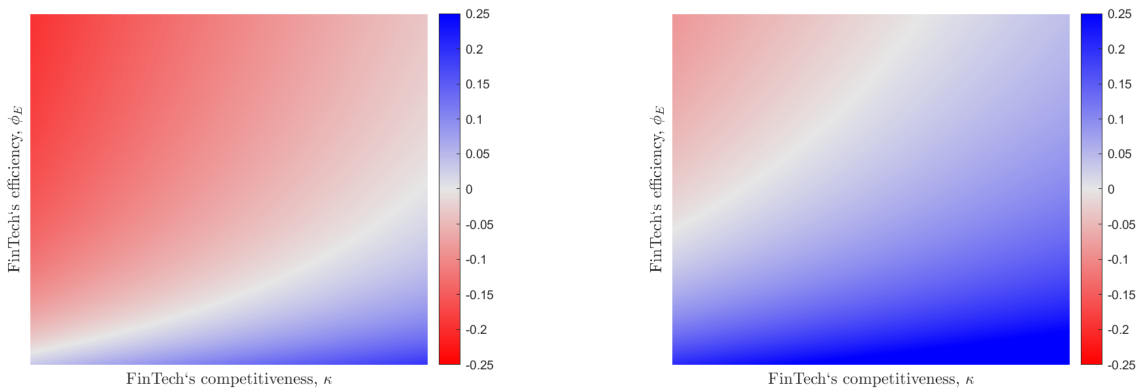

Figure 3: Effect on Financial Inclusion of FinTech's Entry

For the sole illustration of the solution, the following parametrization was chosen: $X = 1.2$, $p = 1$, $\underline{u} = 0$, $\phi_I = 1$, $f \sim \text{Beta}(a, b)$. Panel (a) considers a case where the incumbent bank initially serves a large portion of the credit market. In particular, the parameters of the beta function are equal to $a = 1$ and $b = 1.35$. Thus, most borrowers will be in niche markets where the incumbent bank has larger expertise (low values of m). Panel (b) considers a case where the incumbent bank initially serves a few niche markets. By choosing $a = 1$ and $b = 0.95$, fewer borrowers will be located in niche markets where the monopoly bank has a comparative advantage (low values of m). For each case, the figure depicts how access to finance changes after the entry of a FinTech (Δ in equation 4) for different values of the FinTech's efficiency ϕ_E and degree of competitiveness κ. A red point indicates less financial inclusion ($\Delta < 0$), and a blue point indicates more financial inclusion ($\Delta > 0$).

previous dimensions. Panel (a) illustrates a credit market with a high initial financial inclusion (most borrowers located in low-m niches), whereas panel (b) depicts a scenario with a low initial financial inclusion (thicker tails for high-m niches). When financial inclusion is initially high, the FinTech's entry can disrupt the bank's incentive to engage in lending relationships, making access to finance less inclusive. As shown in panel (a) of Figure 3, this is especially severe when κ is low, and ϕ_E is high, as competition leads the bank to withdraw from specific niches, and the FinTech's ability to broad access to finance does not compensate for the loss. In contrast, if traditional banks serve only a small portion of the credit market, the gains in financial inclusion can be significant; see panel (b) of Figure 3. This is because the entrepreneurs served by the entrant significantly outweigh those that the bank stops serving.

4 Conclusions and policy discussion

Our findings have the following policy implications. First, given the crucial role of soft-information discovery for the financial inclusion of SMEs (Petersen and Rajan, 1994; Uchida et al., 2012) and its positive effect on firm performance Allen et al. (2019), measures that reduce the return of information discovery must be avoided. Information-sharing policies should focus on hard information and avoid the mandatory disclosure of soft information. Regulators should also be cautious when regulating the disclosure of hard information as its effects on the provision of SMEs are mixed (Sutherland, 2018).

Second, we propose introducing mechanisms to measure, monitor, and, if needed, foster soft-information discovery. Our analysis shows that if the socially optimum soft-information discovery is not achieved, soft-information-intensive SMEs will be financially excluded. A regulator wishing to enhance financial inclusion must proactively monitor this crucial indicator for credit provision (Berger et al., 2001) and intervene if levels fall below the social optimum.

Third, given the regulation advantage that FinTechs gained in the aftermath of the Great Financial Crisis (Dou et al., 2018; Buchak et al., 2018), we recommend a regulatory action that levels the field between banks and FinTechs in line with the recommendations by Vives (2019). Here, we stress that the design of this new regulation should prevent banks' anticipation of competition from stopping their lending to previously banked niches.

Fourth, given that FinTechs do not necessarily increase the overall financial inclusion in credit markets (Buchak et al., 2018; Fuster et al., 2019) and may even be detrimental to this objective (Fuster et al., 2022), entry regulation should consider FinTechs' efficiency and competitiveness and the initial level of financial inclusion. This recommendation aligns with the ongoing debate on the need for regulatory action on financial technology-intensive lenders and its impact on social welfare (Vives, 2019; Vives and Ye, 2022).

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A Proofs

Proof of Proposition 1

Consider the entrant's decision to serve an unattended niche. For a niche $m > m_I^*$, the entrant will serve it if it can make profits after paying the screening cost, that is,

$$\max_{R_{2,E}(m)} p \times R_{2,E}(m) - 1 - \phi_E \times (1 - m) \geq 0, \quad \text{subject to } p \times (X - R_{2,E}(m)) \geq \underline{u}.$$

The entrant does not face competition for niches $m > m_I^*$. Note that if the incumbent does not initially serve a niche, it will not serve it at date 2 as no rents from a second lending round will be available. Thus, the entrant can charge an interest rate that allows it to keep the project's surplus; i.e., $R_{2,E}(m) = X - \frac{\underline{u}}{p}$. As a consequence, the entrant serves a niche m if

$$p \times X - 1 - \underline{u} - \phi_E \times (1 - m) \geq 0,$$

which delivers threshold $m_E^* = 1 - \frac{1}{\phi_E} \times (pX - 1 - \underline{u})$. Hence, new niches $m \geq m_E^*$ are being served by the entrant at date 2 and charged an interest rate $R_{2,E}^*(m) = X - \frac{\underline{u}}{p}$.

On the other hand, the incumbent competes with the entrant for its clients in niches $m \leq m_I^*$. In this scenario, the incumbent does not need to pay the screening cost, but it faces the possibility that the entrant poaches its client by offering better interest rates. Thus, for every niche $m \leq m_I^*$, both lenders compete in prices, decreasing interest rates until equilibrium interest rates make the entrant break even due to its cost disadvantage. That is, $R_{2,I}^*(m) = R_{2,E}^*(m)$, such that

$$p \times R_{2,E}^*(m) - 1 - \kappa \times (1 - m) = 0 \quad \Rightarrow R_{2,E}^*(m) = \frac{1 + \kappa \times (1 - m)}{p} \text{ for } m \leq m_I^*.$$

Note that if the poaching cost is sufficiently low, that is,

$$\kappa < p \times X - \underline{u} - 1,$$

the borrower's participation constraint will be satisfied at the equilibrium interest rates. Thus, part of the project's surplus is kept by bancarized borrowers at date 2, even in niches with less competition at date 2 (low values of m).

Proof of Proposition 2

Note that the date-2 profit of banking a niche m at date 1 is

$$p \times R_{2,I}^* - 1 = \kappa \times (1 - m) > 0.$$

Hence, when considering to serve a niche m at date 1, the incumbent considers rents over the entire life of the lending relationship.

In particular, the lender will serve a niche m if

$$\max_{R_{1,I}(m)} (p \times R_{1,I}(m) - 1) + \kappa \times (1 - m) - \phi_I \times m \geq 0, \quad \text{subject to } p \times (X - R_{1,I}(m)) \geq \underline{u},$$

that is, if the profit over the two periods of the lending relationship compensates for the screening cost $\phi_I \times m$. Because the incumbent enjoys monopoly power at date 1, it sets $R_{1,I}(m)$ so the borrower is left with her outside option. Hence, the marginal niche m_I^* served by the incumbent is determined by

$$p \times X - 1 - \underline{u} + \kappa \times (1 - m_I^*) - \phi_I \times m_I^* = 0 \quad \Rightarrow m_I^* = \frac{p \times X - 1 - \underline{u} + \kappa}{\phi_I + \kappa},$$

such that niches $m \leq m_I^*$ are served from date 1 and charged $R_{1,I}^*(m) = X - \frac{\underline{u}}{p}$ at date 1. Moreover, if the screening cost is sufficiently large, not all niches are served at date 1; that is,

$$\underline{\phi} \equiv p \times X - 1 - \underline{u} < \phi_I.$$

Furthermore, if the screening cost of the entrant is sufficiently large, there will still be unserved niches after its entry, that is,

$$m_I^* < m_E^* \Longleftrightarrow \frac{(\phi_I + \kappa)(p \times X - 1 - \underline{u})}{\phi_I - (p \times X - 1 - \underline{u})} < \phi_E.$$