THE REAL HARM OF TOO MUCH OR TOO LITTLE CREDIT COMPETITION (AND THE ROLE FOR VENTURE CAPITAL)*

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Abstract

This paper models a credit market in which lenders offer entrepreneurs either arm's-length or relationship loans and shows that competition in the credit market affects both the loans banks offer and the projects entrepreneurs undertake. Relationship lending is expensive, but it allows lenders to finance projects that would be unprofitable if funded at arm's-length because they require monitoring. These projects are always efficient, but often entrepreneurs don't undertake them or lenders do not fund them. In fact, we show that for only in-between credit competitiveness is investment efficient and innovation possible.

The inefficiency is partially solved when VCs enter the market: they finance innovative projects that banks do not fund. As competitiveness in the credit market increases VCs provide a larger share of capital but never fully crowd out banks and may still be scarce in the perfect competition limit. Even though no type heterogeneity on either side of the market is assumed, VCs fund high NPV projects and banks fund low NPV projects in equilibrium.

1 Introduction

How does competition in the credit market affect the real economy? The empirical literature is divided. For example, Petersen and Rajan (1995) shows that increased credit competition in the 1980s inhibited profitable lending to US SMEs. In contrast,

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Bertrand et al. (2007) finds that increased bank competition in France facilitated the flow of capital to productive borrowers. Existing theories can explain either of these effects in isolation. For example, to explain their findings Petersen and Rajan suggest that competitive credit markets prevent banks from making costly upfront investments in long-term relationships since borrowers can switch lenders once they become profitable. Contrariwise, Boot and Thakor (2000) shows that increased credit competition leads banks to invest more in lending relationships to add value to projects and extract oligopoly rents. But no single theory reconciles the seemingly contradictory empirical evidence. This paper fills the gap. We suggest that the data are not contradictory, but reflect the willingness of lenders and borrowers to make specific investments. Our main result is that corporate productivity is hump-shaped in credit market competitiveness.

Lenders actively monitor loans to add value to their investments. But to increase the value of an investment with monitoring ex post, a lender must make costly relationship-specific investments in information or technology ex ante.When a loan funds a project that is highly differentiated from the mainstream—one likely to be innovative, risky, and also profitable—monitoring is especially important. Without the means to monitor such a project, a lender will not profit from the investment and will deny funding. Anticipating these funding constraints, a borrower can standardize his project—he can invest in good collateral, for example, or choose a more transparent endeavor all together—sacrificing NPV but loosening borrowing constraints. Our model investigates the effect of credit market conditions on both lenders' incentives to offer relationship or arm's-length loans and borrowers' incentives to differentiate or standardize their projects.

The main result of the model is that entrepreneurs perform differentiated projects for only in-between credit market competitiveness. When credit is very competitive, entrepreneurs standardize even if creditors are willing to offer relationship loans; when credit is very uncompetitive, lenders prefer not to undertake the entrepreneur-specific investment necessary to finance differentiation. Given differentiation is efficient, agents fail to achieve first-best for extreme credit competitiveness.

Can theses inefficiencies be mitigated? Is there a form of funding that obviates these problems? In competitive credit environments like the US, many innovative entrepreneurs rely on alternatives to bank and market finance. We extend the model to suggest a mechanism by which, when the lending market is competitive, some (but not all) financiers choose to specialize in alternative credit, which we argue resembles venture capital. We show that VCs restore efficiency in firms they invest in, but those reliant on traditional banking continue to standardize. Real activity thus depends on the nature of finance that corporate borrowers obtain, rather than on exogenous firm characteristics. As credit competition increases, VCs account for a larger proportion of lending, but they never overwhelm traditional credit, potentially remaining scarce in the perfect-competition limit.

1.1 Model Overview and Mechanism

The framework is a dynamic search-and-matching model in which entrepreneurs with ideas but no money are matched with creditors with money but no ideas. At every date agents search in a two-sided matching model. Each either finds a match or keeps searching. When a creditor is matched with an entrepreneur, he can either invest in a relationship-specific monitoring technology—in which case he offers what we call a relationship loan—or not invest—in which case he offers what we call an arm's-length loan. Next, the entrepreneur decides whether to differentiate or standardize his project. His project choice is irreversible. We assume that differentiated projects have high NPV but are not good investments for creditors who have not invested in the relationship-specific monitoring technology. Standardized projects, on the other hand, have low NPV but can obtain arm's-length finance. Finally, the creditor and the entrepreneur bargain to determine loan terms. We assume that if the entrepreneur differentiates his project and bargaining breaks down between him and his creditor, he will not obtain funding from another creditor at a later date. This may be because, for example, his project is time-sensitive or it is too late for a new creditor to acquire the appropriate monitoring technology.

Our aim is to study the effect of credit competition on the type of projects entrepreneurs choose and the type of loans banks offer. Credit competition is the ratio of creditors to entrepreneurs in the market. Increasing competition increases the time creditors expect to wait before finding a match and decreases the time entrepreneurs expect to wait before finding a match. Thus, the higher is competition, the lower is the continuation value of unmatched creditors and the higher is the continuation value of unmatched entrepreneurs with standardized projects. The continuation value of entrepreneurs with differentiated projects is nil independently of market competition: they can never find funding at a later date. Two main trade-offs confront the agents. Entrepreneurs trade off increasing the total surplus via differentiation against increasing their continuation values via standardization. Creditors trade off bearing the private cost of relationship-lending to increase total surplus against saving the cost but restricting themselves to arm's-length credit and thus eliminating the possibility of funding high-surplus differentiation.

The main result is that efficient differentiation arises in equilibrium for only intermediate credit market competitiveness. For very high credit competition entrepreneurs assume very strong bargaining positions when they standardize and are not willing to forgo them to increase the surplus within their bilateral match. For low credit competitiveness creditors do not invest in relationship finance preventing entrepreneurs from investing in differentiation; because creditors assume strong bargaining positions when competition is low, they capture much of the surplus of standardized projects and are thus unwilling to bear the private cost of investing in relationship-specific monitoring.

To study alternatives to bank and market finance, we appeal to the critical resource literature in the theory of the firm (cf. references in subsection 1.2 below) and present a novel way to model venture capital funding: VCs fund projects in exchange for inside equity stakes. In our extended model, a VC is a lender that obtains access to a critical resource—viz. an entrepreneur's idea—when he injects capital into a project. After the entrepreneurs and his VC implement the project, the entrepreneur and VC bargain over the cash flows. Thus, in our framework, while a traditional lender has a technology for enforcing contracts—parties bargain over the terms of loans—a VC has a technology for running projects—parties bargain over realized cash flows.

In the model we allow creditors to choose the type of lending they specialize in before they search for entrepreneurs. They can either become venture capitalists or traditional lenders, which we call banks. Next, creditors are matched with entrepreneurs. Banks and entrepreneurs play the same stage game outlined above. VCs and entrepreneurs have aligned incentives ex ante and choose the efficient project. They then bargain over the surplus ex post.

Since VCs never fund standardized projects, when creditors move money away from traditional lending, standardized entrepreneurs face a less competitive credit market. The feedback mechanism by which increasing credit competition implies that more loanable funds flow to venture capital and thus bank competition decreases explains the coexistence of traditional and alternative credit even though the model assumes no exogenous agent heterogeneity. In a competitive credit market in which arm's-length lending and standardized projects prevail, venture capital becomes profitable. For high enough credit competition, VCs enter the market. In equilibrium, each creditor is indifferent between devoting his money to venture capital or traditional lending. This indifference condition pins down the proportion of VCs in the market. When credit competition is high, all stationary equilibria involve a mix of creditor types. Intuitively, if VCs took over the market, a bank would be a monopolist lender to standardized entrepreneurs and it would be profitable for creditors to revert to banking to capture the monopoly rents. While VCs never overtake the lending market, the proportion of credit they account for increases as lending becomes more competitive. The reason is that, because credit competition affects only VCs' expected waiting times and not the terms at which they trade, VC profits are less sensitive to competitiveness than are bank profits. Thus, the proportion of creditors specialized in venture capital must increase to increase banks' ex post bargaining power and keep creditors' ex ante profits from banking and venture capital equal.

1.2 *Literature and Motivation*

Rajan's 2012 AFA presidential address emphasizes the interdependence of the two sides of a firm's balance sheet. It outlines the enterprise's inception in the language of an entrepreneur's differentiation and a collaborator's coordination with him. Differentiation and coordination create NPV but destroy expected redeployment value. In this context of relationship-specific investment, we analyze the link between the nature of assets and liabilities in the general equilibrium context of a larger credit market. Our collaborator is a creditor whose coordination is an entrepreneur-specific investment in relationship finance that takes place before the entrepreneur's final commitment to his project. In Rajan's model, asset ownership determines agents' outside options à la Grossman and Hart (1986) when they bargain over the surplus after the project is complete, whereas, in our model, market conditions in a Diamond–Mortensen–Pissardis setup pin threat points down when agents negotiate the terms of debt. Our venture capitalist is a simplified version of Rajan's collaborator, since in that case the Williamsonian transformation obviates market considerations in bargaining; we do not consider asset ownership, but simply endow VCs with arbitrary bargaining power. Twenty years previously (Rajan (1991)/Rajan (1992)), Rajan modelled ex post bargaining between entrepreneurs and their creditors. There, the credit market is perfectly competitive ex ante and a bank's ex post bargaining power comes from its ability to withdraw funds at an interim date coupled with the informational advantage it has as a relationship lender. What we call a VC roughly resembles a reduced form of a specialist bank in that model.

Like us, Boot and Thakor (2000) define a relationship loan as "a loan that permits the bank to use its expertise to improve the borrower's project payoff" but requires costly specific investment to originate in contrast to an arm's-length loan, "a pure funding transaction, a 'commodity product' with none of the sector specific investments connected with relationship lending." They study an extensive game of incomplete information in which credit competition is identified with the probability that, once matched with a lender, a borrower receives a competing loan offer. They generate coexistence of relationship and transaction loans with the key assumption that value added from relationship lending decreases in entrepreneur type, so only above a threshold quality do borrowers seek arm's-length finance. Their main result is that credit competition increases the proportion of relationship lending that banks do. The driver is that the market power gained from relationship-specific investment is most valuable in competitive environments. Despite our model's superficially disparate setup, without heterogeneous projects or explicit information frictions, the same force is at work in our main result, preventing creditors from coordinating with entrepreneurs when competition among them is low. Since our entrepreneurs' project choice is endogenous, however, our model exposes the other side of the connection between credit competition and relationship banking: when lending is competitive, banks anticipate that entrepreneurs will standardize their projects to exploit their market position, eliminating the value of relationship finance.

In a simple three-date model with good and bad borrowers whose creditors learn their quality at the interim date and who have incentive to risk shift when interest rates are high, Petersen and Rajan (1995) likewise ask whether credit competition undermines relationship lending. They find that it does on the extensive margin—complementing Boot and Thakor (2000)'s contrary result about the intensive margin—and back up their finding with interstate data from US SMEs. In their model, competition subverts long-term relationships by forcing creditors to break even period-by-period and thereby driving up short-term interest rates, inducing risk-shifting and in turn credit rationing. Our model provides a different mechanism by which high credit competition induces borrowers to take inefficient actions; rather than the distortionary effect of leverage, we focus on the advantages of maintaining a strong bargaining position even at the expense of reducing the surplus.

We owe a methodological debt to Nanda and Rhodes-Kropf (2012) who also embed an extensive game between a creditor and debtor in a search-and-matching model to analyze the effect of finance on real output. They study experimentation using a three-date stage game in which the creditor can pay a cost to withhold funds at the interim date. A high cost commits him to the future of the project and weakens his bargaining position when he negotiates contracts for the second period. They show that experimental entrepreneurs can secure funding only from uncommitted lenders because the real option value of abandonment lowers their price of lending. (The implication is that failure-tolerant lenders stifle aggregate innovation because they lend only to vanilla firms at the initial date.) In our model, creditors decide whether to dedicate their funds to venture capital investing or traditional banking; their lenders can choose the level of their abandonment costs before searching for entrepreneurs, which they interpret as a VC's committing to an investment style. In equilibrium, all lenders may be high-cost, making funding experimentation prohibitively expensive and leaving a fraction of good projects unfunded. Our model focuses on changing outside options via specific investments between a matched entrepreneur and creditor in connection with credit market competition, while theirs studies the ex ante determination of bargaining positions. However, as creditors commit to weaken their bargaining positions and avoid credit rationing, analogously, in our model, creditors specialize in venture capital to change the timing of bargaining in order to prevent hold-up.

Inderst and Muller (2004) also model venture capital investing in a search model.

Once matched, the entrepreneur and VC bargain to determine equity stakes and then simultaneously exert effort with nonnegative complementarity. Asymmetric bargaining positions result in one party's having a small ownership share and thus little incentive to work ex post. Balanced bargaining positions lead to more efficient output. They find that intermediate competitiveness in the VC market helps the ex ante bargaining problem induce good ex post investment incentives; we find that intermediate competitiveness in the traditional credit market provides good ex ante investment and project choice incentives in anticipation of ex post bargaining.

Szentes and Jovanovic's 2013 paper also considers a two-sided effort-provision problem between entrepreneurs and VCs after contracts are signed, but, modelling dynamic interaction explicitly, they add the additional feature that the project termination time is endogenous. VCs post contracts in a competitive spot market and simple equity is optimal. The key assumptions that VCs are scarce and project hazard rates are hump-shaped imply that VCs wish to abandon nonperforming projects to move on to more profitable ventures. This selection effect helps the model to explain high VC yields and IPO values and to match the data quantitatively. In our model, venture-backed projects also have high returns, but our explanation is that inside equity finance mitigates the hold-up problem because VCs commit capital early and add value with specific investments ex post. We also offer an explanation of VC scarcity. As more loanable funds are dedicated to venture investing, standardized entrepreneurs become more dependent on traditional credit, easing competition among banks and inducing creditors to redirect funds to arm's-length activities. While venture capitalists perform an increasing proportion of lending as the credit market becomes more competitive, they never overtake it, even in the perfect-competition limit, due to this feedback effect.

Ueda (2004) examines an entrepreneur's trade-off between borrowing from a bank that evaluates his project poorly and from a VC who has an informational advantage but may appropriate his idea. Intense informational frictions, resulting, for example, from low collateral values or high payoff variance, prevent entrepreneurs from obtaining bank finance. Different types of entrepreneurs find finance from different types of lenders, explaining numerous stylized facts about the venture capital industry including the coexistence of banks and VCs, but not endogenizing their presence in the market. Our model, on the other hand, assumes no exogenous heterogeneity of either entrepreneurs or creditors, but, so long as credit market competition is sufficiently high, a fraction of creditors pursue venture investing and the entrepreneurs they fund endogenously choose to differentiate their projects.

Like Ueda, we consider VCs' ability to expropriate entrepreneurs' projects as their defining feature, but go a step further and assume that cash flows are noncontractible and that VCs and entrepreneurs bargain over ex post surplus. Our notion of inside equity as ex post bargaining power is inspired by critical resource theories of the firm pioneered by Penrose (1959) and Wernerfelt (1984) and employed recently in the incomplete-contracting literature spurred by Hart and Moore (1990) in the context of asset ownership and by Rajan and Zingales (1998) and Rajan and Zingales (2001) in the analysis of access to more general resources. We assume that VC funding entails an entrepreneur's sharing access to his idea and, since VCs are industry experts, both parties can use the idea to produce ex post, but competition would destroy its value so they stay in the relationship and bargain over cash flows.

Section 2 solves the model in which creditors offer only debt-like finance to entrepreneurs and states the main result. Section 3 extends the model, allowing creditors to specialize in venture capital/inside equity finance. Section 4 concludes.

2 Traditional Credit

2.1 *Model*

2.1.1 *Agents and Projects*

A creditor c provides start-up capital I to a penniless entrepreneur e to fund a project δ that can be *differentiated*, $\delta = \mathrm{d}$, or *standardized*, $\delta = \mathrm{s}$. A differentiated project has a higher present value V_d but requires coordinated, relationship lending from the creditor, whereas a standardized project has a lower present value V_s but uncoordinated, arms-length lending suffices for its success.

When granting a loan, the creditor chooses the type of credit η to provide. He either pays k to make an entrepreneur-specific investment—to perform *relationship lending*, $\eta = \mathrm{r}$—or does not—to provide *arms-length finance*, $\eta = \mathrm{a}$.

Differentiation is efficient, $\Delta V := V_\mathrm{d} - V_\mathrm{s} > k$, and both projects have positive NPV, $V_\mathrm{s} - I > 0$.

Bargaining determines loan terms (cf. subsection 2.1.3 below). The creditor has bargaining power β and his share of the differentiated project's surplus exceeds his private cost, but the value added from differentiation does not:

$$\beta \Delta V < k < \beta(V_\mathrm{d} - I). \tag{1}$$

If an entrepreneur differentiates given a relationship loan, but fails to agree on the terms of repayment with his creditor, then the project fails—only e's initial match has the ability to coordinate with him. Contrariwise, a standardized entrepreneur may still obtain outside finance.

Creditors and entrepreneurs find each other by searching in a decentralized market.

2.1.2 *Search and Matching*

At time $t \in \{..., -1, 0, 1, ...\}$ a set E_t of searching entrepreneurs matches with a set C_t of creditors with intensity $m(|E_t|, |C_t|)$. Define $\theta_t := |C_t|/|E_t|$, the credit market competition. Assume the probability that a creditor finds an entrepreneur at time t,

$$q(\theta_t) := \frac{m(|E_t|, |C_t|)}{|C_t|}, \tag{2}$$

and the probability an entrepreneur finds a creditor at time t,

$$Q(\theta_t) := \frac{m(|E_t|, |C_t|)}{|E_t|}, \tag{3}$$

depend only on θ_t (for which, for example, m being homogenous of degree one suffices).

Assume m is such that q and Q are differentiable with $q' < 0$, $Q' > 0$, $q(0) = 1$, $Q(0) = 0$, and with $q(\theta) \to 0$ and $Q(\theta) \to 1$ as $\theta \to \infty$. As credit competition increases the likelihood that a creditor finds an entrepreneur decreases and that an entrepreneur finds a creditor increases.

To make the model stationary, assume that new entrepreneurs and creditors appear in the market at the rate at which they are matched, i.e. $|E_t| = |E_s|$ and $|C_t| = |C_s|$ for all times t and s.

2.1.3 *Stage Game Extensive Form*

When an entrepreneur $e \in E_t$ matches with a creditor $c \in C_t$, they play the extensive form game defined by the timing below:

1. c chooses whether to pay k to make an entrepreneur-specific investment or not, $\eta \in \{\mathrm{r}, \mathrm{a}\}$.
2. e chooses between a differentiated project and a standardized project, $\delta \in \{\mathrm{d}, \mathrm{s}\}$.
3. e and c agree on the terms of debt for investment I according to the generalized Nash bargaining solution where the creditor has bargaining power β.
    - If bargaining breaks down, e obtains nil if $\delta = \mathrm{d}$ and searches again if $\delta = \mathrm{s}$ as c always does (cf. subsection 2.1.1).
4. The project's cash flow realizes and e repays or defaults.

See figure 1 for a visual representation.

If unmatched, agents search again. The common discount rate is the return on the money market account r.

Stage Game Tree

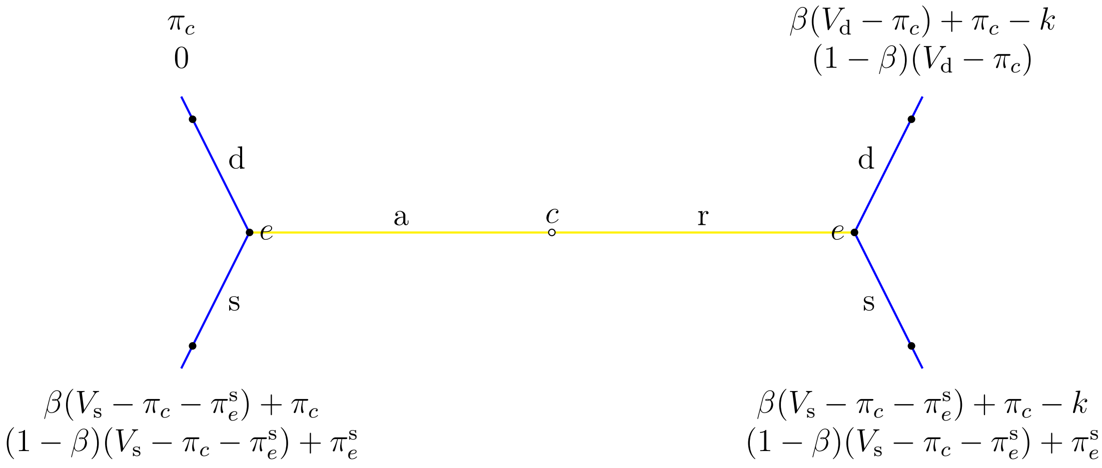

Figure 1: Representation of the stage game between e and c; see subsection 2.2.1 for the payoff notation.

2.2 Bank Credit Results

2.2.1 Stage-game and Disagreement Utilities

When e and c are matched, their decisions as to whether to engage in relationship lending and to undertake a differentiated project depend on the surplus they anticipate winning in bargaining. Their outside options determine gains from negotiation and thus in turn the nature of credit and investment. In particular, differentiating his project lowers e's outside option π_e^δ but increases the total shared surplus—no subsequent lender can coordinate to rescue the project. c's outside option π_c does not depend on his or e's actions, but relationship specific investments may still enhance his bargaining position since he is effectively a monopolist when e differentiates. Since competition decreases e's expected waiting time and increases c's, it will increase π_e^s and decrease π_c in equilibrium.

If offered arm's-length credit, e plays $\delta = \mathrm{s}$ since d requires coordinated financing ($\eta = \mathrm{r}$). If $\eta = \mathrm{r}$, e's best-response is d whenever

$$(1-\beta)(V_\mathrm{d} - \pi_c) \geq (1-\beta)(V_\mathrm{s} - \pi_e^\mathrm{s} - \pi_c) + \pi_e^\mathrm{s} \tag{4}$$

or

$$\pi_e^\mathrm{s} \leq \frac{1-\beta}{\beta}\Delta V \tag{5}$$

and is s otherwise. In words: if e's outside option given standardization is sufficiently high, he will never differentiate because the surplus fails to compensate for the losses in bargaining power.

If c believes that e will never play d, he will never play r. If c believes that e will play d if he plays r, he will indeed play r whenever

$$\beta(V_{\mathrm{d}} - \pi_c) + \pi_c - k \geq \beta(V_{\mathrm{s}} - \pi_e^{\mathrm{s}} - \pi_c) + \pi_c \tag{6}$$

or

$$k \leq \beta(\Delta V + \pi_e^{\mathrm{s}}). \tag{7}$$

In words: if e's outside option given standardization is sufficiently low, the creditor will not be willing to pay the cost of entrepreneur-specific investment and coordinate—he can extract as much rent from arm's length finance. c otherwise plays a.

In order to effect efficient project choice, the entrepreneur's outside option can be neither too high nor too low: in the equilibrium of the stage game, $\delta = \mathrm{d}$ if and only if

$$\frac{k}{\beta} - \Delta V \leq \pi_e^{\mathrm{s}} \leq \frac{1-\beta}{\beta}\Delta V \tag{8}$$

(from inequalities (5) and (7) above); $\delta = \mathrm{s}$ otherwise.

2.2.2 Value Functions

To demonstrate that if credit competition is either too intense or too weak real investment is choked off ($\delta \neq \mathrm{d}$), compute the disagreement utilities given players believe (r, d) is the stationary action profile of the stage game.

Suppose that r is large enough that c does not search again given s—$r > 1 - \beta$ suffices as shown in appendix B.1, which also states necessary and sufficient conditions given the equilibrium below. If e plays s

$$\pi_e^{\mathrm{s}} = \frac{Q\big((1-\beta)(V_{\mathrm{s}} - \pi_e^{\mathrm{s}} - \pi_c) + \pi_e^{\mathrm{s}}\big) + (1-Q)\pi_e^{\mathrm{s}}}{1+r} \tag{9}$$

or

$$\pi_e^{\mathrm{s}} = \frac{(1-\beta)Q}{r + (1-\beta)Q}\big(V_{\mathrm{s}} - \pi_c\big). \tag{10}$$

e's outside option is decreasing in c's, which solves

$$\pi_c = \frac{q\Big(\beta(V_{\mathrm{d}} - \pi_c) + \pi_c - k\Big) + (1-q)\pi_c + rI}{1+r} \tag{11}$$

or

$$\pi_c = \frac{q\big(\beta V_{\mathrm{d}} - k\big) + rI}{r + \beta q} \tag{12}$$

independently of e's outside option since $\pi_e^{\mathrm{d}} \equiv 0$.

In any efficient equilibrium,

$$\pi_e^{\mathrm{s}} = \frac{(1-\beta)Q}{\big(r+\beta q\big)\big(r+(1-\beta)Q\big)}\Big(q\big(k-\beta\Delta V\big)+r(V_{\mathrm{s}}-I)\Big), \tag{13}$$

having substituted equation (12) into equation (13). The lemma below gives a sufficient condition for the above to be monotonic in θ.

Lemma 2.2.1. *If players believe that* (r,d) *is the stationary action profile, e's outside option* $\pi_{\mathrm{e}}^{\mathrm{s}}$ *is strictly increasing in credit market competition* θ*.*

Proof. See appendix A.1 □

2.2.3 The Two Sides of Credit Market Competition

Efficient project choice requires a balance of bargaining power (as expressed by inequalities (8)). If creditors have too much, relationship lending may not be worthwhile since they extract a lot of rent from arm's-length credit and avoid entrepreneur-specific costs of coordination. If entrepreneurs have too much, they do not commit to differentiated projects that make them dependent on their current creditors. Proposition 2.2.1 below says that since an entrepreneur's effective bargaining position is monotone in competition (lemma 2.2.1 above), the necessary balance results only for intermediate levels of competition. When banks have too much market power, they find it more profitable to offer only transaction loans. When credit is too competitive, entrepreneurs must standardize their projects to pit lenders against each other and capture much of the surplus.

Proposition 2.2.1. *Entrepreneurs differentiate only if competition is sufficient, i.e. there is* $\theta_{\mathrm{d}} > 0$ *such that* $\delta = \mathrm{d}$ *only if* $\theta \geq \theta_{\mathrm{d}}$*.*

If

$$\Delta V \leq \frac{\beta}{1+r-\beta}\big(V_{\mathrm{s}}-I\big), \tag{14}$$

then for only intermediate levels of competition do entrepreneurs undertake differentiated projects—there is $\theta^{\mathrm{d}} > \theta_{\mathrm{d}}$ *such that* $\delta = \mathrm{d}$ *if and only if* $\theta \in [\theta_{\mathrm{d}}, \theta^{\mathrm{d}}]$*.*

Proof. See appendix A.2 □

2.2.4 Full Characterization of Stationary Equilibria

If e's outside option given standarization is stationary then the stage game equilibrium is either (r,d) for intermediate π_e^{s} or (a,s) for extreme π_e^{s} (inequalities (8)). In the stage game the set of π_e^{s} for which the equilibrium is (r,d) is the complement of the set for which it is (a,s); however, since π_e^{s} is a fixed point in the matching model, the sets of levels of competitiveness for which differentiated and standardized stationary equilibria exist overlap and their union does not cover the real half-line. This section finds conditions for (a, s) to be a stationary equilibrium.

Given the belief that (a, s) is the stationary action profile, e's outside option is

$$\pi_e^{\mathrm{s}} = \frac{(1-\beta)Q}{r+(1-\beta)Q}(V_{\mathrm{s}} - \pi_c). \tag{15}$$

and c's is

$$\pi_c = \frac{\beta q\,(V_{\mathrm{s}} - \pi_e^{\mathrm{s}}) + rI}{r+\beta q}. \tag{16}$$

Combining these equations gives

$$\pi_e^{\mathrm{s}} = \frac{(1-\beta)Q}{r+\beta q+(1-\beta)Q}(V_{\mathrm{s}} - I) \tag{17}$$

and

$$\pi_c = I + \frac{\beta q}{r+\beta q+(1-\beta)Q}\big(V_{\mathrm{s}} - I\big). \tag{18}$$

Lemma 2.2.2. *If players believe that* (a, s) *is the stationary action profile, e's outside option* π_e^{s} *is strictly increasing in credit market competition* θ*.*

Proof. See appendix A.3 □

Proposition 2.2.2. *There is* $\theta_{\mathrm{s}} > 0$ *such that if* $\theta \leq \theta_{\mathrm{s}}$ *then* $\delta = \mathrm{s}$ *is a stationary equilibrium.*

If

$$\Delta V \leq \frac{\beta}{1+r-\beta}\big(V_{\mathrm{s}} - I\big), \tag{19}$$

then there is $\theta^{\mathrm{s}} > \theta_{\mathrm{s}}$ *such that* $\delta = \mathrm{s}$ *in a stationary equilibrium if and only if* $\theta < \theta_{\mathrm{s}}$ *or* $\theta > \theta^{\mathrm{s}}$*.*

Proof. See appendix A.4. □

3 Venture Capital

3.1 Extended Model

3.1.1 Banks, VCs, and Equity

At each date a newly born creditor decides whether to provide (relationship or arm's-length) debt finance—to act as a "bank"—or to take an active ownership role—to become a "venture capitalist". Let B_t denote the set of time-t banks and VC_t denote the set of time-t VCs; b and v indicate their respective representative members. The proportion of VCs at t is

$$\varphi_t := \frac{|\mathrm{VC}_t|}{|C_t|} = \frac{|\mathrm{VC}_t|}{|B_t \cup \mathrm{VC}_t|}. \tag{20}$$

A VC v funds the penniless e's project in exchange for an (inside) equity stake. No contracts are enforceable among the project owners; e and v Nash bargain ex post over the surplus. Since e has implemented his project and v has committed his capital, their outside options are both nil. v's bargaining power is γ. A VC may extract much of a project's revenue ex post, but his investment I is sunk. To focus on the emergence of venture capital lending to innovative entrepreneurs in competitive credit markets, assume

$$\gamma V_{\mathrm{s}} - I < 0 < \gamma(V_{\mathrm{d}} - k) - I \leq \beta(V_{\mathrm{s}} - I), \tag{21}$$

which says, firstly, that VCs find it profitable to finance differentiated but not standardized projects and, secondly, that in a one-shot interaction (outside options nil), a bank is better off than a VC, so only when entrepreneurs have substantial market power is it profitable for a creditor to specialize and offer venture capital.

The distinction between debt and equity is the distinction between ex ante and ex post bargaining. A bank has the technology to enforce contracts while a VC has the technology to operate a project.

3.1.2 Matching

The matching intensity between entrepreneurs and creditors remains m. At t e finds a VC with probability $Q(\theta_t)\varphi_t$ and a bank with probability $Q(\theta_t)(1 - \varphi_t)$. Any creditor $c \in B_t \cup \mathrm{VC}_t$ finds an entrepreneur with probability $q(\theta_t)$.

3.1.3 Stage Game with VCs

Before matching a creditor chooses his type, $c \in \{b, v\}$. If v matches with e, then e either rejects v, in which case both agents continue to search, or e grants v an equity stake in this project and e and v bargain over the total surplus $V_{\mathrm{d}} - k$.

If b matches with e then e either rejects b, in which case both agents continue to search, or e and b play the stage game detailed in subsection 2.1.3 above.

3.2 Venture Capital Results

3.2.1 Equilibrium Restrictions

We focus on stationary equilibria (so $\theta_t \equiv \theta$ and $\varphi_t \equiv \varphi$) in which entrepreneurs are sufficiently impatient that when they match with any creditor they prefer to transact than to search again. Namely, e's value function before searching π_e is less than his surplus from matching with either a bank or a VC:

$$\pi_e \leq \min\left\{(1 - \gamma)(V_{\mathrm{d}} - k), (1 - \beta)(V_{\mathrm{s}} - \pi_e^{\mathrm{s}} - \pi_b) + \pi_e^{\mathrm{s}}\right\}. \tag{22}$$

If banks and VCs coexist in equilibrium, an entrepreneur must prefer to standardize and transact with a bank than to search for a VC, for which the condition

$$\frac{(1-\gamma)(V_{\mathrm{d}}-k)}{1+r} \leq (1-\beta)(V_{\mathrm{s}}-I), \tag{23}$$

which holds if r is not too small, suffices. Appendix B.2 states necessary and sufficient conditions in terms of primitives in light of the equilibrium below and derives the last inequality.

3.2.2 Value Functions: Standardization and VCs

Given that for high lending competition traditional credit cannot achieve entrepreneurial differentiation, focus firstly on equilibria in which entrepreneurs standardize to determine whether VC finance mitigates the inefficiency.

If e differentiates, his outside option vanishes as above. If he standardizes, however, he faces the new risk that he is matched with a VC and forced to search again (by assumption (21)); his value function solves

$$\pi_e^{\mathrm{s}} = \frac{Q\Big(\varphi\pi_e^{\mathrm{s}} + (1-\varphi)\big((1-\beta)(V_{\mathrm{s}}-\pi_e^{\mathrm{s}}-\pi_b)+\pi_e^{s}\big)\Big) + (1-Q)\pi_e^{\mathrm{s}}}{1+r} \tag{24}$$

or

$$\pi_e^{\mathrm{s}} = \frac{(1-\beta)(1-\varphi)Q}{r+(1-\beta)(1-\varphi)Q}\big(V_{\mathrm{s}}-\pi_b\big). \tag{25}$$

If $c=b$, a lender's value function is as in the (a, s) equilibrium (equation (16))

$$\pi_b = \frac{\beta q\,(V_{\mathrm{s}}-\pi_e^{\mathrm{s}})+rI}{r+\beta q} \tag{26}$$

If $c=v$, only ex post bargaining and not ex ante competition determines his value function, which solves

$$\pi_v = \frac{q\gamma(V_{\mathrm{d}}-k)+(1-q)\pi_v+rI}{1+r}. \tag{27}$$

Note that π_v is immediately determined in terms of primitives, whereas π_e^{s} and π_b depend only on each other constituting a two-by-two linear system; lemma 3.2.1 now summarizes the solution.

LEMMA 3.2.1. *In any standardized equilibrium with endogenous creditor types, the agents' value functions are:* $\pi_e^{\mathrm{d}}=0$,

$$\pi_e^{\mathrm{s}} = \frac{(1-\beta)(1-\varphi)Q}{r+\beta q+(1-\beta)(1-\varphi)Q}\big(V_{\mathrm{s}}-I\big), \tag{28}$$

$$\pi_b = I + \frac{\beta q}{r + \beta q + (1-\beta)(1-\varphi)Q}\big(V_\mathrm{s} - I\big), \tag{29}$$

and

$$\pi_v = \frac{q\gamma(V_\mathrm{d} - k) + rI}{r + q}. \tag{30}$$

3.2.3 Competitive Credit and the Role of Venture Capital

A creditor chooses $c = b$ if $\pi_b > \pi_v$ and $c = v$ otherwise. Observe that π_v depends only on credit competition θ (via q) while π_b depends also on the proportion φ of VCs in the market. The reason is that high φ implies a standardized entrepreneur is likely to match with a VC next period, in which case he remains unfunded and searches again, so b's bargaining position against him is strong. This feedback mechanism leads to the coexistence of banks and VCs whenever equation

$$\pi_v(\theta) = \pi_b(\theta, \varphi) \tag{31}$$

has a solution $\varphi = \phi(\theta) \in (0,1)$. The next proposition (proposition 3.2.1) solves for ϕ.

Proposition 3.2.1. *For θ sufficiently large, there is stationary equilibrium in which a proportion of creditors* $\phi(\theta) = \max\big\{0\,,\,\tilde{\phi}(\theta)\big\}$, *where*

$$\tilde{\phi}(\theta) := \frac{\big(r + \beta q + (1-\beta)Q\big)\big(\gamma(V_\mathrm{d} - k) - I\big) - \beta(r+q)\big(V_\mathrm{s} - I\big)}{(1-\beta)Q\big(\gamma(V_\mathrm{d} - k) - I\big)}, \tag{32}$$

becomes venture capitalists; entrepreneurs undertake differentiated projects if and only if matched with them.

In equilibrium, the creditor that an entrepreneur finds determines the nature of his project: if e finds a VC, $\delta = \mathrm{d}$, but if e finds a bank, $\delta = \mathrm{s}$. The proportion φ represents not only the proportion of VCs in the market but also the proportion of differentiated projects undertaken. Proposition 3.2.2 now states that, in a stationary standardized equilibrium, credit competition helps to generate differentiation (ϕ is increasing), but that even in the limit a fraction of projects is standardized—VCs never overtake the market.

Proposition 3.2.2. *The proportion of venture capitalists $\phi(\theta)$ increases in credit competition θ. When competition becomes perfect, the proportion of venture capitalists is*

$$\varphi_\infty \equiv \lim_{\theta\to\infty} \phi(\theta) = 1 - \frac{r\Big(\beta(V_\mathrm{s} - I) - \big(\gamma(V_\mathrm{d} - k) - I\big)\Big)}{(1-\beta)\big(\gamma(V_\mathrm{d} - k) - I\big)} \tag{33}$$

whenever it is positive and zero otherwise (so long as the equilibrium exists in the limit).

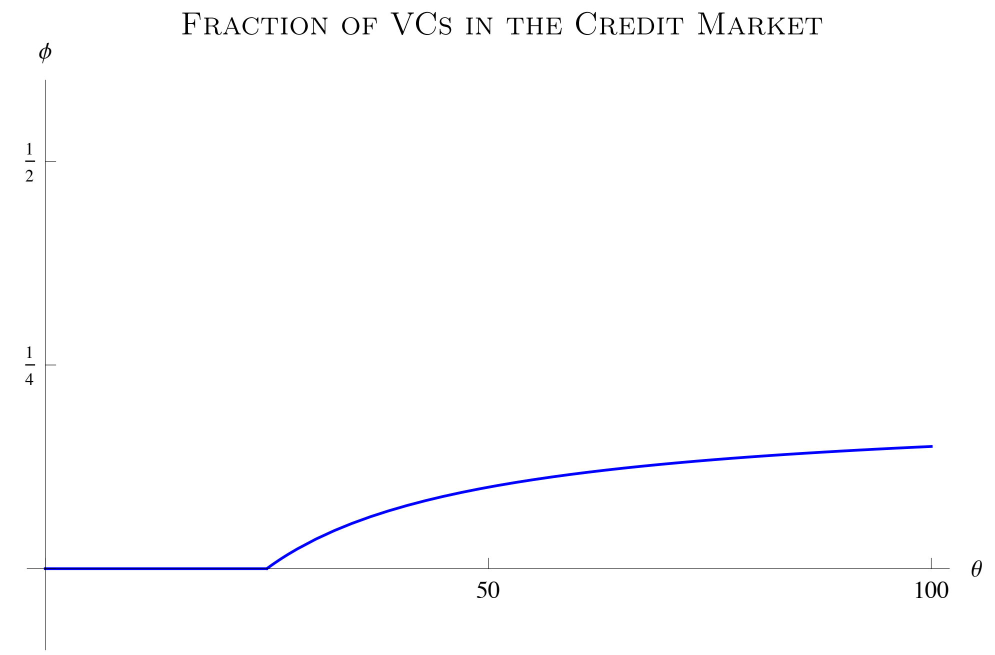

Figure 2: Plot of ϕ for parameterization $V_\mathrm{d} = 60$, $V_\mathrm{s} = 45$, $k = 5$, $I = 15$, $\beta = 0.75$, $\gamma = 0.5$, $r = 0.25$.

Proof. See appendix A.5 for the proof and appendix.

□

3.2.4 VCs and Relationship Banking?

If e matches with a bank b and chooses $\delta = \mathrm{d}$ in a stationary equilibrium, b's value function is independent of φ since e's outside option is nil regardless of his probability of being matched with a VC if bargaining breaks down. Banks and VCs coexist when $\pi_b(\theta) = \pi_v(\theta)$ (which are given by the formulae (12) and (30)). Since neither depends on φ, generically relationship banking and VCs never coexist.

Proposition 3.2.3. *Unless*

$$\frac{q\big(\beta V_\mathrm{d} - k\big) + rI}{r + \beta q} = \frac{q\gamma\big(V_\mathrm{d} - k\big) + rI}{r + q}, \tag{34}$$

there is no stationary equilibrium in which banks play $\eta = \mathrm{r}$ and coexist with VCs.

If

$$\frac{\beta V_\mathrm{d} - k}{r + \beta q(\theta^\mathrm{d})} > \frac{\gamma(V_\mathrm{d} - k)}{r + q(\theta^\mathrm{d})}, \tag{35}$$

then VCs emerge in a stationary equilibrium only if banks play $\eta = \mathrm{s}$ and competition is sufficiently high.

The proof is immediate from comparing π_b given differentiation and π_v (formulae

(12) and (30))and the observations that, first,

$$\frac{rI}{r+\beta q} > \frac{rI}{r+q} \tag{36}$$

and, second, $(r+\beta q)/(r+q)$ decreases in q (and therefore increases in θ). Sending $\theta \to \infty$, provides the cleaner (but much stronger) sufficient condition for relationship banking always to overrun venture capital:

$$\beta V_{\mathrm{d}} - k > \gamma(V_{\mathrm{d}} - k). \tag{37}$$

The inequality simply captures the requirement that $c = v$ must not be too lucrative relative to $c = b$ and reads equivalently as

$$(\beta - \gamma)V_{\mathrm{d}} > (1-\gamma)k, \tag{38}$$

which holds so long as banks' ex ante bargaining power is large relative to VCs ex post bargaining power (not taking into account outside options).

4 Conclusions

Credit competitiveness determines not only whether lenders offer relationship or arm's-length loans but also the projects that entrepreneurs undertake. Both too little and too much credit competition prevent efficient project choice. In competitive credit markets, expert equity lenders (called VCs) enter and mitigate the problem, but since they make the credit market effectively less competitive for standardized entrepreneurs, they may remain scarce in even in the perfect-competition limit. The model suggests that VC-backed firms differentiate because they have access to specialized finance.

A Omitted Proofs

A.1 Proof of Lemma 2.2.1

Direct computation from equation (13) gives

$$\frac{\partial \pi_e^{\mathrm{s}}(\theta)}{\partial \theta} = \frac{r(1-\beta)\Big(Q'(r+\beta q)\Big[r(V_{\mathrm{s}}-I)+(k-\beta\Delta V)q\Big] - q'Q\Big[\beta(V_{\mathrm{d}}-I)-k\Big]\Big[r+(1-\beta)Q\Big]\Big)}{(r+\beta q)^2(r+Q-\beta Q)^2}.$$

By the assumptions on the matching function (cf. subsection 2.1.2) $q' < 0$ and $Q' > 0$ and by assumption (1) $k - \beta\Delta V > 0$, so the first term in the numerator is positive. By assumption (1), $\beta(V_{\mathrm{d}} - I) - k > 0$, and since $-q' > 0$ the second term in the numerator is positive. The denominator is a square, so the expression is positive.

A.2 Proof of Proposition 2.2.1

Formula (13) gives immediately that π_e^{s} is a continuous function of θ with $\pi_e^{\mathrm{s}}(0) = 0$. Thus if θ is sufficiently small

$$\beta(\Delta V + \pi_e^{\mathrm{s}}) < k \tag{39}$$

by assumption (1) so, from the condition (7), c pays a and thus e plays s. The first part of the proposition is proved.

For the second part, the limit of formula (13) is

$$\lim_{\theta\to\infty} \pi_e^{\mathrm{s}} = \frac{(1-\beta)(V_{\mathrm{s}}-I)}{1+r-\beta} \tag{40}$$

so the intermediate value theorem and the monotonicity of π_e^{s} (lemma 2.2.1) give the existence of the unique interval $[\theta_{\mathrm{d}}, \theta^{\mathrm{d}}] \subset (0,\infty)$ in light of the conditions (8):

$$\pi_e^{\mathrm{s}}(0) < \frac{k}{\beta} - \Delta V < \frac{1-\beta}{\beta}\Delta V < \lim_{\theta\to\infty} \pi_e^{\mathrm{s}}(\theta), \tag{41}$$

where the last inequality is satisfied whenever 14 holds.

A.3 Proof of Lemma 2.2.2

Equation (17) can be rewritten as

$$\pi_e^{\mathrm{s}} = \frac{1-\beta}{r/Q + \beta q/Q + 1 - \beta}(V_{\mathrm{s}} - I). \tag{42}$$

Since $q' < 0$ and $Q' > 0$ and both are positive, $(q/Q)' < 0$. Thus as θ increases the denominator decreases and π_e^{s} increases.

A.4 Proof of Proposition 2.2.2

From the formula (17), π_e^{s} is a continuous function of θ and $\pi_e^{\mathrm{s}}(0) = 0$. Thus assumption (1) implies that if θ is small the inequality (7) is violated and c plays a and e plays s. The first part of the proposition is proved.

The limit of formula (17) coincides with the limit in the efficient stationary equilibrium,

$$\lim_{\theta\to\infty} \pi_e^{\mathrm{s}} = \frac{(1-\beta)(V_{\mathrm{s}} - I)}{1+r-\beta}. \tag{43}$$

so the intermediate value theorem and the monotonicity of π_e^{s} (lemma 2.2.2) give the existence of the unique interval $[\theta_{\mathrm{s}}, \theta^{\mathrm{s}}] \subset (0, \infty)$ in light of the conditions (8):

$$\pi_e^{\mathrm{s}}(0) < \frac{k}{\beta} - \Delta V < \frac{1-\beta}{\beta}\Delta V < \lim_{\theta\to\infty} \pi_e^{\mathrm{s}}(\theta), \tag{44}$$

where the last inequality is by the hypothesis of the second part of the proposition.

A.5 Proof of Proposition 3.2.2

Use the shorthand $\xi_v := \gamma(V_{\mathrm{d}} - k) - I$ and $\xi_b := \beta(V_s - I)$, so, from equation (32),

$$\tilde{\phi}(\theta) := \frac{\big(r + \beta q + (1-\beta)Q\big)\xi_v - (r+q)\xi_b}{(1-\beta)Q\xi_v}. \tag{45}$$

Its derivative is

$$\tilde{\phi}'(\theta) = \frac{Q'\Big(r(\xi_b - \xi_v) + q(\xi_b - \beta\xi_v)\Big) - q'Q\big(\xi_b - \beta\xi_v\big)}{(1-\beta)Q^2\xi_v}, \tag{46}$$

which is positive since $\xi_v < \xi_b < \xi_b/\beta$ by assumption (21) and $q' < 0$.

B Equilibrium Restrictions on Primitives

B.1 Parameter Restrictions for Creditors Not to Reject Standardized Entrepreneurs

c deals with e given s when

$$\beta(V_{\mathrm{s}} - \pi_c - \pi_e^{\mathrm{s}}) + \pi_c \geq \pi_c \tag{47}$$

or

$$\pi_e^{\mathrm{s}} + \pi_c \leq V_{\mathrm{s}}. \tag{48}$$

To state the condition in terms of primitives in the stationary differentiated equilibrium, sum equations (12) and (13) to obtain its equivalence to

$$\pi_e^{\mathrm{s}} + \pi_c = \frac{(1-\beta)Q}{r+(1-\beta)Q} V_{\mathrm{s}} + \frac{r}{\big(r+\beta q\big)\big(r+(1-\beta)Q\big)} \big(q\big(\beta V_{\mathrm{d}} - k\big) + rI\big) \leq V_{\mathrm{s}} \quad (49)$$

or, equivalently,

$$\frac{q}{r+\beta q} \big(\beta(V_{\mathrm{d}} - I) - k\big) \leq V_{\mathrm{s}} - I. \quad (50)$$

Assumption (1) implies that $\beta(V_{\mathrm{d}} - I) - k < V_{\mathrm{s}} - I$, so $(1-\beta)q \leq r$ suffices.

B.2 Parameter Restrictions for Entrepreneurs to Deal with Banks

Before searching, e's value solves

$$\pi_e = \frac{Q\Big(\varphi \max\{\pi_e, (1-\gamma)(V_{\mathrm{d}} - k)\} + (1-\varphi)\max\{\pi_e, (1-\beta)(V_{\mathrm{s}} - \pi_e^{\mathrm{s}} - \pi_b) + \pi_e^{\mathrm{s}}\}\Big)}{1+r} + \\ + \frac{(1-Q)\pi_e}{1+r} \quad (51)$$

which simplifies (with help from assumption (22)) to read

$$\pi_e = \frac{Q}{r+Q}\Big(\varphi(1-\gamma)(V_{\mathrm{d}} - k) + (1-\varphi)\big((1-\beta)(V_{\mathrm{s}} - \pi_e^{\mathrm{s}} - \pi_b) + \pi_e^{\mathrm{s}}\big)\Big). \quad (52)$$

Since in equilibrium creditors are indifferent between being VCs and banks and the surplus VCs create is higher, an entrepreneur is better off with a VC or $(1-\gamma)(V_{\mathrm{d}} - k) > (1-\beta)(V_{\mathrm{s}} - \pi_e^{\mathrm{s}} - \pi_b) + \pi_e^{\mathrm{s}}$. Then equation (22) simplifies to

$$\pi_e \leq (1-\beta)(V_{\mathrm{s}} - \pi_e^{\mathrm{s}} - \pi_b) + \pi_e^{\mathrm{s}}, \quad (53)$$

or

$$\frac{\phi Q}{r+\phi Q}(1-\gamma)(V_{\mathrm{d}} - k) \leq \frac{\big(r+(1-\phi)Q\big)}{r+\beta q+(1-\beta)(1-\phi)Q}(1-\beta)(V_{\mathrm{s}} - I). \quad (54)$$

If $\phi = 0$, the inequality is always satisfied. Otherwise, $\phi = \tilde{\phi}$; replace ϕ on the right of the inequality above with the formula in equation (32) to get

$$\frac{\phi Q}{r+\phi Q}(1-\gamma)(V_{\mathrm{d}} - k) \leq V_{\mathrm{s}} - \gamma(V_{\mathrm{d}} - k). \quad (55)$$

The left-hand side is increasing in ϕQ which is bounded above by one, so

$$\frac{(1-\gamma)(V_{\mathrm{d}} - k)}{1+r} \leq V_{\mathrm{s}} - \gamma(V_{\mathrm{d}} - k) \quad (56)$$

is sufficient. Condition (23) results from the final inequality and assumption (21).

C Venture Capital Equilibrium Characterization

The stationary (a,s) equilibrium exists with proportion ϕ as given in proposition 3.2.1 whenever either e always plays s or b always plays a, namely the negation of the inequalities 8 or

$$\pi_e^{\mathrm{s}} \in \left[\frac{k}{\beta} - \Delta V\,,\, \frac{1-\beta}{\beta}\Delta V\right]^c. \tag{57}$$

Since

$$\lim_{\theta\to\infty} \pi_e^{\mathrm{s}} = \frac{\beta(V_{\mathrm{s}} - I) - \big(\gamma(V_{\mathrm{d}} - k) - I\big)}{\beta}, \tag{58}$$

so the (a,s) equilibrium described in proposition 3.2.2 obtains so long as

$$\beta(V_{\mathrm{d}} - I) - \big(\gamma(V_{\mathrm{d}} - k) - I\big) \notin \big[k, \Delta V\big]. \tag{59}$$

Table 1 summarizes the conditions for each stationary equilibrium of the model to exist. For each level of competitiveness, every stationary equilibrium constitutes either (i) all relationship banks funding differentiated projects, (ii) all arm's length banks funding standardized projects, or (iii) a combination of arm's length banks funding standardized projects and venture capitalists funding differentiated projects. Generically, regions exist for which no stationary equilibria exist and for which multiple exist.

Table 1: Taxonomy of stationary equilibria.

Equilibrium description	Existence
$(\eta,\delta) = (\mathrm{r},\mathrm{d})$, $c = b$ for all c	$\theta \in [\theta_{\mathrm{d}}, \theta^{\mathrm{d}}]$, $\pi_b > \pi_v$
$(\eta,\delta) = (\mathrm{a},\mathrm{s})$, $c = b$ for all c	$\theta \notin [\theta_{\mathrm{s}}, \theta^{\mathrm{s}}]$, $\pi_b > \pi_v$
$(\eta,\delta) = (\mathrm{a},\mathrm{s})$, both $c = b$ and $c = v$	$\theta > \theta^{\mathrm{d}}$, $\pi_e^{\mathrm{s}} \notin [k/\beta - \Delta V, (1-\beta)\Delta V/\beta]$
$c = v$ for all c	Never ($\pi_b > \pi_v$ if $\varphi = 1$)
$(\eta,\delta) = (\mathrm{r},\mathrm{d})$, both $c = b$ and $c = v$	Generically never (proposition 3.2.3)

References

Bertrand, M., A. Schoar, and D. Thesmar (2007). Banking deregulation and industry structure: Evidence from the french banking reforms of 1985. *The Journal of Finance 62*(2), 597–628.

Boot, A. W. A. and A. V. Thakor (2000, 04). Can relationship banking survive competition? *Journal of Finance 55*(2), 679–713.

Grossman, S. J. and O. D. Hart (1986, August). The costs and benefits of ownership: A theory of vertical and lateral integration. *Journal of Political Economy 94*(4), 691–719.

Hart, O. and J. Moore (1990, December). Property rights and the nature of the firm. *Journal of Political Economy 98*(6), 1119–58.

Hombert, J. and A. Matray (2013). The real effects of hurting lending relationships: Evidence from banking deregulation and innovation. Working paper.

Inderst, R. and H. M. Muller (2004, May). The effect of capital market characteristics on the value of start-up firms. *Journal of Financial Economics 72*(2), 319–356.

Nanda, R. and M. Rhodes-Kropf (2012). Innovation and the financial guillotine. Working paper, Harvard Business School.

Penrose, E. (1959). *The Theory and Growth of the Firm.* New York: Oxford University Press.

Petersen, M. A. and R. G. Rajan (1995, May). The effect of credit market competition on lending relationships. *The Quarterly Journal of Economics 110*(2), 407–43.

Rajan, R. (1991). *Essays on Banking.* Ph. D. thesis, Massachusetts Institute of Technology.

Rajan, R. (2012, January). The corporation in finance. NBER Working Papers 17760, National Bureau of Economic Research, Inc.

Rajan, R. G. (1992, September). Insiders and outsiders: The choice between informed and arm's-length debt. *Journal of Finance 47*(4), 1367–400.

Rajan, R. G. and L. Zingales (1998, May). Power in a theory of the firm. *The Quarterly Journal of Economics 113*(2), 387–432.

Rajan, R. G. and L. Zingales (2001, May). The influence of the financial revolution on the nature of firms. *American Economic Review 91*(2), 206–211.

Szentes, B. and B. Jovanovic (2013). On the market for venture capital. *Journal of Political Economy*, Forthcoming.

Ueda, M. (2004, 04). Banks versus venture capital: Project evaluation, screening, and expropriation. *Journal of Finance 59*(2), 601–621.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal 5*(2), 171–180.