Informal Finance: A Theory of Moneylenders

JOB MARKET PAPER

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November 17, 2005

Abstract

This paper argues that weak legal institutions explain the coexistence of formal and informal financial sectors in developing credit markets. Informal finance emerges as a response to the formal sector's inability to perfectly enforce its claims in an environment with poor creditor protection. Given this setting, the theory incorporates the possibility of a credit-rationed informal sector to show that entrepreneurial and informal sector assets can be either complements or substitutes. The theory rationalizes the observation that entrepreneurs employ multiple lenders and suggests that an unequal wealth distribution promotes investment in poor societies.

JEL classification: O12; O16; O17; D31.
Keywords: Credit markets; Income distribution; Institutions.

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1 Introduction

A common characteristic of credit markets with weak legal institutions is the coexistence of formal and informal financial sectors. Informal transactions, such as loans made by moneylenders, traders, landlords, and family, account for between one third and three quarters of total credit in Asia (Germidis et al., 1991). Informal lenders provide more credit and attract a larger volume of savings than the formal sector in sub-Saharan Africa (Nissanke and Aryeetey, 1998). In India, as much as 70 percent of all entrepreneurs obtain finance from both sectors at the same time (Das-Gupta et al., 1989, also see Conning, 2001 and Giné, 2005 for similar evidence from Chile and Thailand). Moreover, informal lenders who offer credit frequently acquire formal funds to service entrepreneurs' financing needs, with formal credit totaling two thirds of the informal sector's liabilities in many Asian countries (Ghate et al., 1992; Hoff and Stiglitz, 1993; Irfan et al., 1999).

Such financing arrangements raise a number of issues. First, why do entrepreneurs resort to multiple lenders simultaneously in developing credit markets? Second, is there a causal link between institutional development and informal lending? If so, precisely what is the connection? A third question concerns the relation between investment and the distribution of income. Should assets be allocated equally across credit markets participants, as proposed in recent growth models (Banerjee and Newman, 1993; Galor and Zeira, 1993), or is wealth concentration more efficient as in the tradition of Kuznets (1955)?

Following recent work on the effect of institutions on economic performance (La Porta et al., 1997, 1998), I view legal protection of creditors as essential to ensure availability of credit.[1] In what follows, reduced creditor vulnerability is thus synonymous with institutional development. To address my questions in a systematic fashion, I construct a model in which credit rationing is a result of creditor vulnerability in the formal sector. Specifically, entrepreneurial moral hazard at the investment stage prevents formal lenders from extending sufficient funds. In contrast, the informal sector is able to monitor borrowers and induce investment by offering credit to a group of known clients within a small community where strong social ties and social sanctions prevent borrowers from deliberately misusing their loan.[2]

[1] By legal protection I mean more than simply written law, but also functioning law-enforcement bodies and supportive political institutions.

[2] For evidence of the highly personal character of informal lending see, for example, Udry (1993), Steel et al. (1997), and La Ferrara (2003) for the case of Africa and Ghate et al. (1992), Aleem (1993), and Bell (1993) for the case of Asia. See also Besley et al. (1993) and Banerjee et al. (1994) for theoretical work on rotating savings and credit associations stressing the importance of social sanctions. Anderson et al. (2004) and Karlan (2005, forthcoming) provide related empirical evidence. Note that my aim is not to explain informal lenders ability to prevent opportunistic behavior, but to understand its implications as in Besley and Coate (1995).

The rich variety of lender-borrower constellations that characterize developing credit markets has been explored theoretically in two mutually exclusive ways; by modeling informal lenders as competitors with their formal counterparts (Bell et al., 1997; Jain, 1999; Varghese, 2005) or as a channel of formal funds (Floro and Ray, 1997; Bose, 1998; Hoff and Stiglitz, 1998). While both strands of the literature share the notion that informal lenders hold a monitoring (or screening) advantage over formal lenders, existing theory suffers from two main drawbacks. First, it is not clear whether informal lenders compete with formal lenders or primarily engage in channeling funds. Second, it neglects the dual role of informal lenders—simultaneously giving and taking credit—thus failing to address the role of supply constraints in informal lending.

In this paper I provide a unified theoretical framework by considering monitoring problems between formal and informal lenders, as well as between formal lenders and entrepreneurs. I also allow for lending and competition between the informal and the formal sector to arise endogenously, thereby establishing the precise conditions under which each regime appears. The model is thus consistent with both underlying motivations in the existing literature. The driving factor of the model is the interplay between the different constraints that formal and informal lenders face. Whereas the formal sector has access to unlimited funds, it is unable to prevent opportunistic behavior. Meanwhile, the informal sector can control the use of funds, but may instead be credit constrained. The challenge is thus to investigate how the interaction between these constraints defines the pattern of lending.

By allowing for the possibility of a credit-rationed informal sector, the theory establishes that entrepreneurial and informal lender assets are complements for low levels of wealth and substitutes when informal assets increase. Intuitively, when neither the informal lender nor the entrepreneur is sufficiently affluent to support first-best investment, the two complement one another by drawing on formal funds. However, if the informal lender's debt capacity does not constrain investment, the entrepreneur substitutes away from informal to formal finance, as she prefers the latter.

Entrepreneurs' preference for formal funds partly explains why they borrow from multiple lenders simultaneously. In the model, each entrepreneur utilizes the maximum amount of formal credit extended since the supply of formal funds yields a stronger bargaining position with the informal lender. At the same time, credit from the informal lender serves as an implicit commitment device for the entrepreneur in her dealings with the formal sector since, by assumption, the informal loan is always invested. In fact, the formal sector's willingness to directly fund an entrepreneur increases in tandem with the informal lender's wealth, as it makes the entire project less prone to opportunistic behavior.[3] Hence, in this framework all but the wealthiest entrepreneurs resort to both

[3] This differs from other theories of multiple lending. In Berglöf and von Thadden (1994), Dewatripont and Tirole (1994), and Bolton and Scharfstein (1996) the optimal contract distributes the

the formal and informal financial sector, a finding consistent with empirical evidence provided by Ghate et al. (1992), Bell et al. (1997), Conning (2001), and Giné (2005).

With sufficiently improved institutions, the model predicts that informal finance becomes obsolete. For low levels of creditor vulnerability, entrepreneurs borrow exclusively from the formal sector. Indeed, the ratio of informal to total intermediation decreases as legal protection of creditors improves. These predictions, unique to the present model, explain why informal lending is virtually non-existent in developed credit markets with well-functioning creditor protection, while prominent in developing markets.

The paper also contributes to the ongoing debate of how to allocate wealth across credit market participants, demonstrating that the same level of investment is obtained when one entrepreneur and one informal lender interact, regardless of whom the wealth belongs to. Extending the theory to capture the difference in technology endowments between the lender and the entrepreneur yields additional insight. Specifically, while entrepreneurs' production technology applies to one project, lenders' monitoring technology is applicable to many entrepreneurs. Reallocating wealth from entrepreneurs to informal lenders thus facilitates higher investment as lenders interact with multiple entrepreneurs. If lending also entails repeated formal sector interaction, the informal lender attaches more value to such a relationship, enabling the formal sector to extend funds more generously. Finally, as it is optimal for informal lenders to equalize their return across entrepreneurs, a more affluent lender—as opposed to a wealthy entrepreneur—increases the likelihood that entrepreneurs are efficiently served. Moreover, increasing the informal sector's share of total intermediation at the expense of the formal sector further improves investment at low levels of wealth. The reason is that more formal funds induce unsound behavior while extra informal funds encourage investment. The significance of the informal sector's assets underscores the importance of wealth concentration over an equal distribution of income when markets are underdeveloped, an idea that dates back to Lewis (1954), Kuznets (1955), and Kaldor (1956). My conclusion differs from recent dynamic growth models that emphasize the negative effects of inequality on growth (Banerjee and Newman, 1993; Galor and Zeira, 1993).[4] Whereas this literature stresses the effects of formal sector credit rationing, it does not consider the importance of informal sector assets.

The model's findings offer important policy implications. In general, better functioning institutions improve efficiency and ease access to formal sector financing. As institutional deficiency is difficult to affect in the short-run, policies that explicitly or implicitly tax wealth at low levels of income should be avoided. Indeed, allowing the informal sector to accumulate wealth to be used in multiple projects and to attract more formal capital improves intermediation. In addition, policies such as land reforms

project claims as to avoid strategic default, while also preventing costly liquidation of the firm.

[4] See also Aghion and Bolton (1997), Piketty (1997), and Mookherjee and Ray (2002).

with a clear intention of redistributing assets may in fact reduce the aggregate level of investment in the economy if informal lenders are made worse off. Finally, more liquidity in the financial system is not good per se. If scarce resources of the informal sector are a bottleneck, a response such as mobilizing domestic savings will not necessarily translate into more funds invested.

Existing theoretical work has rationalized multiple lending from formal and informal lenders as an outcome either of exogenous formal credit limits set by the government (Bell et al., 1997) or because the formal sector co-finances projects to benefit from the informal sector's advantage in screening out bad loans (Jain, 1999; Conning, 2001) or in recovering repayments (Varghese, 2005). These theories cannot account for formal lending to the informal sector, however, which is central to the present model. Also, Kochar (1997) empirically invalidates the existence of exogenous constraints as proposed by Bell et al.[5]

The model builds on Burkart and Ellingsen's (2004) analysis of trade credit in a perfectly competitive banking and input supplier market.[6] The bank and the entrepreneur in their model are analogous to the formal lender and the entrepreneur in my setting. However, their input supplier and my informal lender differ substantially. While the input supplier, and the bank, offer a simple debt contract, the informal lender offers a more sophisticated project-specific contract, where the investment and subsequent repayment are determined using the Nash Bargaining Solution. More importantly, the informal lender is assumed to be able to ensure that investment is guaranteed, something that the trade creditor is unable to do.

Finally, a natural extension to the present paper is to allow for market power in the formal banking sector. In Madestam (2005*a*),[7] I demonstrate that entrepreneurs obtain credit in the informal sector alone, despite the coexistence of formal and informal lenders—credit that informal lenders themselves acquire from formal monopolists. Intuitively, a formal monopolist extracts more rent by channeling funds through informal lenders than by lending directly to entrepreneurs. When informal lenders are sufficiently rich relative to entrepreneurs, they are less prone to divert bank funds. Therefore, a monopolist need not share rents when it lends through the informal lender. The finding rationalizes the usury rates sometimes observed in the informal sector as the entrepreneurs have no real outside option in the segmented outcome—other than investing their own wealth—thus weakening their bargaining position with the informal lenders.

[5] Another point of difference is that formal-informal coexistence arises as an equilibrium outcome in my setting, while Jain, Conning, and Varghese derive it by allowing the formal sector to contract on the informal lenders' presence.

[6] Burkart and Ellingsen's theory is based on the notion that it is less profitable for the borrower to divert inputs than to divert cash. Thus, input suppliers may lend when banks are limited due to potential agency problems.

[7] See my homepage: `http://web.hhs.se/secs/gradstud/neam.htm` for more details.

The remainder of the paper is structured as follows. In the next section I introduce the model then in Section 3 present equilibrium outcomes. Section 4 examines the link between institutions and informal lending. Section 5 analyzes the effect of different wealth distributions on investment. In the concluding remarks I discuss implications of the paper's main assumptions and consider some extensions.

2 Model

Consider a credit market consisting of risk-neutral entrepreneurs, banks (who provide formal finance), and moneylenders (who provide informal finance). As noted in the Introduction, moneylenders have a monitoring advantage over banks. In particular, I assume that banks are unable to control the way their borrowers use extended funds, whereas moneylenders can ensure that credit granted is fully invested.[8] The entrepreneur is endowed with observable wealth $\omega_E \geq 0$. She has access to a deterministic production function, $Q(I)$, where I is the volume of investment. The production function is assumed to be concave and twice continuously differentiable. To ensure the existence of an interior solution, it is assumed that $Q(0) = 0$ and $Q'(0) = \infty$. In a perfect credit market with interest rate r, the entrepreneur would like to invest enough to attain the first-best level of investment given by $Q'(I^*) = 1 + r$.[9] However, the entrepreneur lacks sufficient capital to realize this level, $\omega_E < I^*(r)$, and is thus forced to resort to the bank and/or the moneylender for the remaining funds.[10]

The moneylender is endowed with observable wealth $\omega_M \geq 0$. To capture his superior ability in monitoring investment, the lender is assumed to be a monopolist.[11] For simplicity, the moneylender's occupational choice is restricted to lending.[12] A contract between the moneylender and the entrepreneur is given by a pair $(B, R) \in \mathbb{R}^2_+$, where B is the amount borrowed by the entrepreneur and R the repayment obligation. The contract terms are settled in a bilateral bargain, given by the generalized Nash Bargaining Solution. Assume for now that $R(B)$ is a primitive that shares the same properties as the production function.[13] Finally, if the moneylender requires additional funding he turns to the bank.

[8] See Section 6 for a discussion of alternative ways of modeling the moneylender's advantage.

[9] The output price, p, is normalized to one.

[10] As a tie-breaking rule, I assume that the entrepreneur prefers higher investment for the same level of utility and one lender over two lenders for the same level of utility and investment. I also assume that bank borrowing ceases when a borrower's debt capacity exceeds the first-best investment level.

[11] The assumption of exclusivity is also in line with empirical evidence, see Aleem (1993) and Siamwalla et al. (1993).

[12] Additional sources of income would not alter the main insights. See Section 6 for a discussion.

[13] Any simple sharing rule would do as long as the payment is increasing (decreasing) in the moneylender's (entrepreneur's) outside option.

The bank is competitive and has access to unlimited funds at a constant unit cost, ρ. As stressed above, however, investment or informal lending of bank funds cannot be taken for granted. Specifically, I assume that entrepreneurs (moneylenders) are unable to commit to invest bank funds (offer credit) and that diversion of assets yields private benefits. With diversion I denote any activity that is less productive than investment (lending), for example, using the assets for consumption or financial saving. The diversion activity yields benefit $\phi < 1$ for every unit diverted. While investment (lending) is unverifiable, the outcome of the entrepreneur's project (moneylender's lending operation) may be verified.

Entrepreneurs and moneylenders thus face the following trade-off: either the entrepreneur invests, in which case she realizes the net benefit of production after repaying the bank (and possibly the moneylender), or she profits directly from diverting bank funds (the entrepreneur will still have to pay the moneylender if she has borrowed from him).[14] In the case of partial diversion, the remaining amount must be repaid in full. Likewise, the moneylender may extend a loan to the entrepreneur (realizing the net-lending profit after compensating the bank), benefit directly from diverting the loan, or deposit his funds in the bank. In the case of partial diversion, the moneylender repays the remaining amount to the bank in full. The bank is assumed not to derive any benefit from resources that are diverted.

When ϕ is equal to zero, legal protection of banks is perfect and there is no agency problem. To make the problem interesting, assume that

$$\phi > \underline{\phi} \equiv \frac{Q\left(I^*\left(r\right)\right) - \left(1+r\right)\left(I^*\left(r\right) - \omega_E\right)}{I^*\left(r\right)}. \tag{1}$$

In other words, the marginal benefit of diversion yields higher utility than the average rate of return to a first-best investment. Finally, without loss of generality the bank offers a contract $\{(L_i, (1+r) L_i)\}_{L_i \leq \bar{L}_i}$, where L_i is the loan, $(1+r) L_i$ the amount to be repaid, and $\bar{L}_i$ the credit limit, $i = E, M$.[15] The contract implies that a borrower may withdraw any amount of funds until the bank credit limit binds. To keep things simple, borrowers only borrow from one bank at a time. In sum, lenders differ on two accounts: while the bank cannot ensure that investment actually takes place, the moneylender is able to control the entrepreneur's use of funds. Importantly, the bank has access to unlimited funds while the moneylender may be credit constrained.

As a bank loan is the entrepreneur's outside option in her bargaining with the moneylender, it is optimal for the entrepreneur to visit the bank before turning to the moneylender.[16] Likewise, if wealth constrained, the moneylender also considers the bank contract before bargaining with the entrepreneur.

[14] The entrepreneur repays the moneylender an amount corresponding to the specific investment of informal funds.

[15] Burkart and Ellingsen (2002) show that $\{(L_i, (1+r) L_i)\}_{L_i \leq \bar{L}_i}$ constitutes an optimal contract.

[16] The timing is also empirically supported by Bell et al. (1997).

The timing is depicted as follows:[17]

1. The bank offers a contract to the entrepreneur and she decides to invest/divert $\omega_E + L_E$.
2. The bank offers a contract to the moneylender and he decides to lend/divert $\omega_M + L_M$.
3. The entrepreneur decides how much she wants to borrow from the moneylender, B, and they bargain over the repayment, R.
   (i). If they agree, investment equals $\omega_E + L_E + B$ and the moneylender decides to divert/deposit $\omega_M + L_M - B$.
   (ii). If they disagree, investment equals $\omega_E + L_E$ and the moneylender decides to divert/deposit $\omega_M + L_M$.
4. Repayments are made.

3 Equilibrium Outcomes

I solve for the subgame perfect equilibrium outcome and begin with the Nash Bargaining between the entrepreneur and the moneylender.

The entrepreneur's utility from the agreement outcome is given by the net benefit of investing the funds extended from the bank and the moneylender, while the utility from the disagreement outcome is the residual return from investing the bank funds alone. The moneylender's agreement outcome is the repayment less the cost of borrowing the money from the bank, while the disagreement outcome, that is, the outside option is the utility from diverting and/or depositing his funds with the bank.[18] A successful agreement thus allows the entrepreneur to scale up the production level. The equilibrium repayment is given by

$$\max_{\{R\}} \left[Q\left(I\right) - \left(1+r\right)L_E - R - \left(Q\left(\omega_E + L_E\right) - \left(1+r\right)L_E\right)\right]^{\alpha} \\ \times \left[R - \left(1+r\right)L_M - \Gamma\right]^{1-\alpha}, \tag{2}$$

where $\alpha \in (0,1)$ represents the bargaining power of the entrepreneur and Γ the moneylender's outside option (to be determined below). If the entrepreneur and the monelender agrees, the investment level with credit extended by the bank and the moneylender equals $I = \omega_E + L_E + B$. If the bargaining breaks down, the entrepreneur's

[17] To distinguish the bank from the moneylender, I assume that the bank is unable to condition its contract on the moneylender's contract offer, an assumption empirically supported by Giné (2005).

[18] There are alternative ways of modeling the disagreement outcome, where the outside option instead appears as an outside constraint.

stand-alone investment level utilizing only bank funds is given by $\omega_E + L_E$. The bargaining outcome that solves (2) is

$$R^* = (1-\alpha)\left(Q\left(I\right) - Q\left(\omega_E + L_E\right)\right) + \alpha\left(\left(1+r\right)L_M + \Gamma\right).^{19} \tag{3}$$

The repayment function, R^*, and the loan to the entrepreneur, B, are positive only if both agree not to pursue their respective disagreement outcomes. In the moneylender's case, this option, Γ, depends in turn on whether or not he is wealth constrained. If the moneylender requires additional funding, he turns to the bank. As stressed above, informal lending of bank funds cannot be taken for granted however. Hence, the moneylender chooses the amount to lend to the entrepreneur, B, and the amount of credit, L_M, by maximizing

$$U_M = \max\left\{0, R^*(B) - \left(1+r\right)L_M\right\} + \phi(\omega_M + L_M - B), \tag{4}$$

subject to

$$\begin{aligned} \omega_M + L_M &\geq B, \\ \bar{L}_M &\geq L_M. \end{aligned}$$

The first part of expression (4) is the profit from lending, where $R^*(B)$ is a function of the amount lent to the entrepreneur for any given L_M. The second part denotes the profit from diversion. The full expression is maximized subject to available funds and the credit limit posted by the bank. It can be shown that the choice is essentially binary; either the moneylender chooses to lend all the money or he diverts the maximum possible, with $\Gamma = \phi\left(\omega_M + \bar{L}_M\right)$.[20] The moneylender will not be tempted to behave opportunistically if the contract satisfies the incentive constraint

$$R^*(\omega_M + L_M^u) - \left(1+r\right)L_M^u \geq \phi\left(\omega_M + \bar{L}_M\right), \tag{5}$$

where $L_M^u = \min\left\{I^*\left(r\right) - \omega_M - \omega_E - L_E, \bar{L}_M\right\}$. In other words, either the moneylender borrows and lends such that the first-best level of investment is achieved or he exhausts the maximum credit line extended by the bank.

If the moneylender is sufficiently wealthy to self-finance his lending operation, he no longer acquires bank funds. In this case, his outside option in the bargaining is given

[19] R^* captures the empirical regularity that interest rates tend to be much higher in the informal sector than the formal sector (see Banerjee, 2003 and references therein) and that wealthier entrepreneurs pay lower effective rates of informal interest. To see the last point, note that $d[\left(R^* - B\right)/B]d\omega_E < 0$.

[20] Neither partial lending nor diversion are optimal. Lending yields the moneylender at least $1+r$ on every dollar lent, while diversion leaves him with only ϕ. If the moneylender plans to divert resources, there is no reason to lend either borrowed or internal funds as the bank would claim all of the returns.

by the equivalent of depositing the funds in the bank instead of lending them to the entrepreneur. That is, $\Gamma = (1+r)\,B$.[21]

Similarly, the entrepreneur chooses the amount of bank funds to invest, I_B, and the amount of credit, L_E, by maximizing

$$U_E = \max\{0, Q(I_B + B) - (1+r)\,L_E - R^*(B)\} + \phi(\omega_E + L_E - I_B), \qquad (6)$$

subject to

$$\begin{aligned} \omega_E + L_E &\geq I_B, \\ \bar{L}_E &\geq L_E. \end{aligned}$$

Note that the amount borrowed from the moneylender is free from the entrepreneur's potential opportunistic behavior. The outcome is analogous to that of the moneylender, yielding the critical incentive constraint

$$Q\left(\omega_E + L_E^u + B\right) - (1+r)\,L_E^u - R^*(B) \geq \phi\left(\omega_E + \bar{L}_E\right), \qquad (7)$$

where $L_E^u = \min\left\{I^*(r) - \omega_E - B, \bar{L}_E\right\}$. In sum, whereas the entrepreneur contemplates whether or not she should invest the bank funds (expression (7) above), the moneylender's decision problem (if wealth constrained) concerns whether or not he should lend the bank funds to the entrepreneur (expression (5) above). Finally, the perfectly competitive bank market yields the equilibrium zero-profit interest rate of ρ.

I now proceed by stating resulting equilibrium constellations (Figure 1 below depicts the different outcomes). Specifically, for low levels of wealth the entrepreneur and the moneylender will be credit rationed by the bank. Here the temptation to divert for each of them is too strong to permit bank lending supporting a first-best investment. In this situation, the entrepreneur exhausts her credit line with the bank in addition to borrowing the maximum amount made available to her from the moneylender. Similarly, the moneylender utilizes all available bank funds and his own capital to service the entrepreneur.[22] Hence, the credit limits will be given by the following binding constraints

[21] If $\omega_M > B$ and the moneylender lends to the entrepreneur, $\omega_M - B$ is deposited in the bank while ω_M is deposited otherwise. $(1+r)\,B$ constitutes the difference between the two. Note that the deposit and lending rates will equal the alternative cost of funds in the economy, ρ, if deposits and bank funds are in excess supply.

[22] Although optimal, this choice represents the second-best outcome for both the entrepreneur and the moneylender. In fact, the entrepreneur would prefer to borrow from the bank and the moneylender, where the latter only lends his own capital. This increases the entrepreneur's outside option while keeping the outside option of the moneylender to a minimum. In other words, the entrepreneur would prefer to borrow less at a more favorable rate. Similar logic yields the result that the moneylender favors being the exclusive borrower of the bank, thus reducing the value of the entrepreneur's threat point. However, as each agent has access to bank funding, the common second-best option for both is to borrow from the bank. Note that the bank has no influence over resulting constellations as long as it breaks even.

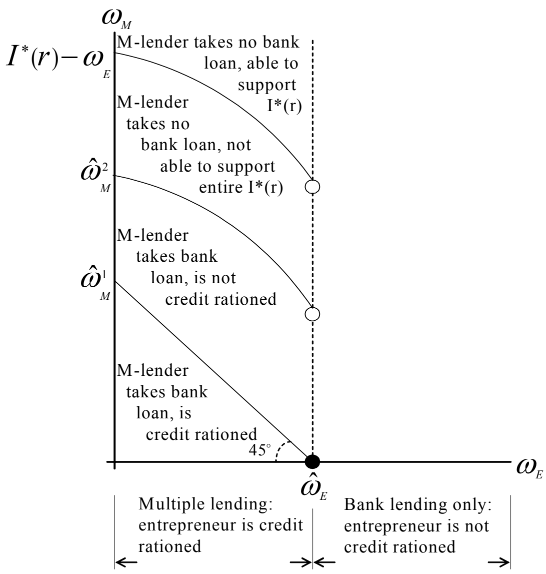

Figure 1: Lender Constellations and Wealth Thresholds

of the entrepreneur and the moneylender, depending on the bargaining outcome:

$$\begin{aligned}\alpha Q\left(I\right)+\left(1-\alpha\right)Q\left(\omega_E+\bar{L}_E\right)-\left(1+r\right)\bar{L}_E-\alpha\left(1+r\right)\bar{L}_M\\ -\alpha\phi\left(\omega_M+\bar{L}_M\right)-\phi\left(\omega_E+\bar{L}_E\right)=0\end{aligned} \quad (8)$$

and

$$Q\left(I\right)-Q\left(\omega_E+\bar{L}_E\right)-\left(1+r\right)\bar{L}_M-\phi\left(\omega_M+\bar{L}_M\right)=0, \quad (9)$$

with $I=\omega_E+\bar{L}_E+\omega_M+\bar{L}_M$.[23] The lower left corner of Figure 1 depicts the situation. As the moneylender becomes wealthier (moving up the vertical axis in Figure 1), his bank credit limit no longer binds and he is able to borrow and lend enough to satisfy the first-best level of investment. The outcome in this situation resembles the previous equilibrium, in which the entrepreneur borrows from both a bank and a moneylender who lends his own and bank funds.[24] Hence, in this equilibrium, the entrepreneur's credit limit is still given by equation (8), while the moneylender's credit line is determined by

$$Q'\left(I\right)-\left(1+r\right)=0. \quad (10)$$

That is, the equation $I^*\left(r\right)=\omega_E+\bar{L}_E+\omega_M+L_M$ determines L_M.

[23] Interestingly, when the moneylender's incentive constraint binds, he receives exactly his outside option in the bargaining, implying that the bargaining power of the entrepreneur has no effect on the final outcome.

[24] Note that the entrepreneur's and moneylender's preferences diverge in similar spirit to the previous equilibrium.

When the moneylender is wealthy enough to self-finance larger parts (or the entire amount) of a first-best investment, he no longer acquires bank funds. In this case, the entrepreneur borrows from both a bank and a moneylender, where the moneylender now services the entrepreneur with his own capital (upper left corner of Figure 1). In this instance, the entrepreneur's incentive constraint yields

$$\alpha Q\left(I^{*}\left(r\right)\right)+\left(1-\alpha\right)Q\left(\omega_{E}+\bar{L}_{E}\right)-\left(1+r\right)\bar{L}_{E}-\alpha\left(1+r\right)B-\phi\left(\omega_{E}+\bar{L}_{E}\right)=0, \quad (11)$$

with $I^{*}\left(r\right)=\omega_{E}+\bar{L}_{E}+B$ and $B\leq\omega_{M}$. As the informal lender has no bank loan, his outside option changes from $\phi\left(\omega_{M}+\bar{L}_{M}\right)$ to $\left(1+r\right)B$. Finally, a sufficiently wealthy entrepreneur will realize the first-best level by borrowing exclusively from the bank (moving along the horizontal axis in Figure 1). Equilibrium outcomes are summarized in Proposition 1.[25]

Proposition 1: *There are wealth thresholds $\hat{\omega}_{E}(r,\phi)>0$ and $\hat{\omega}_{M}^{2}(r,\phi)>\hat{\omega}_{M}^{1}(r,\phi)>0$ such that:*
(i) If $\omega_{E}<\hat{\omega}_{E}$ and $\omega_{M}<\hat{\omega}_{M}^{1}$ then investment is credit constrained ($I<I^{*}\left(r\right)$). The entrepreneur borrows from both a bank and a moneylender and this moneylender borrows from a bank.
(ii) If $\omega_{E}<\hat{\omega}_{E}$ and $\omega_{M}\in\left[\hat{\omega}_{M}^{1},\hat{\omega}_{M}^{2}\right)$ then the first-best level is invested ($I=I^{*}\left(r\right)$). The entrepreneur borrows from both a bank and a moneylender and this moneylender borrows from a bank.
(iii) If $\omega_{E}<\hat{\omega}_{E}$ and (a) $\omega_{M}\in\left[\hat{\omega}_{M}^{2},I^{*}\left(r\right)-\omega_{E}\right)$ or (b) $\omega_{E}+\omega_{M}\geq I^{*}\left(r\right)$ then the first-best level is invested ($I=I^{*}\left(r\right)$). The entrepreneur borrows from both a bank and a moneylender and this moneylender does not borrow from a bank.
(iv) If $\omega_{E}\geq\hat{\omega}_{E}$ then the first-best level is invested ($I=I^{*}\left(r\right)$) and the entrepreneur borrows exclusively from a bank.

Proof: See Appendix.

The entrepreneur's threshold, $\hat{\omega}_{E}$, refers to the debt capacity at which a first-best investment is realized without informal funds, whereas $\hat{\omega}_{M}^{1}$ denotes the level of moneylender wealth where first-best is attained given a bank-rationed entrepreneur. The moneylender's upper threshold, $\hat{\omega}_{M}^{2}$, shows the amount of informal wealth that satisfies

[25] The equilibrium outcomes are robust to collusion between the bank's borrowers. When the entrepreneur and the moneylender are constrained, the option of investing and lending is individually *and* jointly incentive compatible (the former is given by equations (8) and (9) and the latter by keeping the bargaining weights on the moneylender's utility and adding the utility of the two borrowers, resulting in $Q\left(I\right)-\left(1+r\right)\left(\bar{L}_{E}+\bar{L}_{M}\right)=\phi I$). If the entrepreneur is constrained while the moneylender is sufficiently wealthy, it is never rational for the moneylender to pretend to give the entrepreneur a loan that does not materialize but boosts the entrepreneur's credit line. The reason for this is that actual lending leaves the informal lender with a greater return than his outside option of either diverting the funds or depositing them with the bank.

the first-best level when the rationed entrepreneur alone takes bank credit. (Part (b) states that the same outcome is obtained when the moneylender is able to self-finance larger parts of the needed investment.)

Strikingly, the result indicates that a poor entrepreneur prefers utilizing the maximum amount of bank funding—regardless of the informal sector's wealth—as this choice increases the entrepreneur's outside option, keeping the repayment to the moneylender at a minimum. Since a wealthier entrepreneur needs less informal funds to satisfy first-best, and $\bar{L}_E$ is increasing in ω_E (shown below), this also explains the negative slope of the moneylender's thresholds depicted in Figure 1.[26]

Proposition 1 is consistent with a series of empirical studies on formal-informal sector interactions (Bell et al., 1997; Conning, 2001; Giné, 2005). For example, in Giné's study of 2880 households and 606 small businesses in rural Thailand, the wealthiest borrowers (measured both by wealth and income) resort exclusively to the formal sector. As wealth declines, borrowers take credit from both sectors.[27] Conning provides similar evidence from his study on rural Chile.[28]

With the lender constellations established, I now examine the sensitivity of equilibria to changes in the model's parameters, a summary of which is contained in Table 1. In particular, I explore implications of a credit-rationed informal sector and reasons for employing multiple lenders simultaneously.

Table 1: Properties of Bank Credit

	Entrepreneur and moneylender are credit rationed			Entrepreneur is credit rationed		
Parameters	I	$\bar{L}_E$	$\bar{L}_M$	I	$\bar{L}_E$	L_M
Wealth of entrepreneur, ω_E	+	+	−	0	+	−
Wealth of moneylender, ω_M	+	0	+	0	+	−
Creditor vulnerability, ϕ	−	−	±	0	−	+
Interest rate, r	−	−	±	−	−	±
Bargaining power of entrepreneur, α	0	0	0	0	+	−

Notes: I denotes aggregate investment; L_E and L_M bank credit extended to the entrepreneur and the moneylender. For proofs, see Appendix.

First, permitting opportunistic behavior by the informal sector shows that entrepreneurial and informal assets are complements when both agents are poor and

[26] The properties of the thresholds are provided in Lemma A4 in the Appendix.

[27] See Table 5 in Giné (2005).

[28] The empirical evidence further shows that poor entrepreneurs sometimes borrow from the informal sector alone. This is accommodated in the present framework by introducing a transaction cost associated with bank borrowing; see Section 6 for a discussion. See also Madestam (2005*a*) for an alternative explanation in which segmentation arises as a consequence of a banking monopoly in the formal sector.

substitutes when informal assets increase. Notably, when the entrepreneur and the moneylender are credit rationed, an increase in the entrepreneur's wealth, ω_E, positively affects the credit line, $\bar{L}_E$, by: (i) raising the return to investment and (ii) by strengthening the entrepreneur's outside option in her bargaining with the moneylender, thereby decreasing the repayment. As these two changes simultaneously make it less tempting to divert resources, the bank extends more funds to the entrepreneur. (The wealth of the moneylender, ω_M, has a similar effect on $\bar{L}_M$.) The assets ω_E and ω_M thus complement one another in raising investment at low levels of wealth.[29] Also note that the way in which the surplus is split, α, has no effect on the amount of bank credit that is extended because all available resources are used to cater the entrepreneur's project.

When the moneylender is wealthy enough to support first-best investment but needs bank funds to do so, the moneylender's and entrepreneur's wealth are substitutes in terms of credit lines and subsequent investment (Table 1, right panel). This can be seen by noting that an increase in the moneylender's wealth, ω_M, induces the moneylender to borrow less from the bank (L_M decreases). In addition, it makes the entire project less prone to opportunistic behavior, allowing extra bank credit to be extended to fund the venture. Since the entrepreneur prefers bank funds to moneylender funds, the additional increase in ω_M allows the entrepreneur to borrow more from the bank, explaining the increase in $\bar{L}_E$. Finally, the division of the surplus now makes a difference. A higher α leaves the entrepreneur a larger share of the bargaining outcome, thus increasing her return from investment and allowing the bank to forward more credit.

Another way of understanding these results is to note that lenders complement one another in providing external finance for low debt capacities, while acting as substitutes when the moneylender is wealthier.[30] This provides an explanation for when and why the informal sector competes with and/or channels the formal sector's funds.

The previous discussion also offers intuition as to why entrepreneurs employ multiple lenders. As the wealth of the moneylender increases, he gradually attracts proportionally more formal capital into the venture. This result follows directly from the twofold effect associated with the increase in ω_M, leading to a larger $\bar{L}_E$. With a larger stake in the project—in terms of internal funds—the moneylender reduces the risk of opportunistic behavior of the entire venture since, by assumption, his wealth is always invested. An interpretation of this finding is that moneylenders in equilibrium serve as

[29] The assets are not complements in a strict sense, however, since an increase in the entrepreneur's wealth, ω_E, reduces $\bar{L}_M$ by strengthening the entrepreneur's bargaining position, making diversion more tempting for the moneylender.

[30] The findings supplement Burkart and Ellingsen (2004), who find that bank and trade credit are complements for credit-constrained firms, while substitutes for firms with sufficient debt capacity. However, whereas their result relates to the supply of funds in response to entrepreneurs' assets, my concern is the dual role of informal assets (as wealth and external funds) in relation to the entrepreneurial venture.

an implicit commitment device for entrepreneurs versus banks by increasing the return to investment; wealthier moneylenders induce stronger entrepreneurial commitment. The value of commitment is maximized at the point where the informal lender refrains from bank borrowing altogether. Beyond that, incremental increases in ω_M will not be invested in the project, and hence not affect the extension of bank funds.

Taken together, formal lenders offer entrepreneurs a stronger bargaining position vis-à-vis the informal lender. Meanwhile, informal lenders provide entrepreneurs with a commitment device that improves their relationship with the formal sector—unless informal lenders themselves are credit rationed.

4 Institutions and Informal Finance

The equilibrium outcomes established in the preceding section were derived under the assumption that legal protection of creditors is less than perfect. As argued in the Introduction, the reason for informal finance in the first place is the inability of the formal sector to prevent misuse of its funds. I now show that informal finance is redundant for sufficiently low levels of creditor vulnerability.

Proposition 2: *There is a creditor vulnerability threshold $\phi^* (r, \omega_E) > 0$ such that:*
(i) If $\phi \leq \phi^*$ and $\omega_E < I^* (r)$ then entrepreneurs borrow from banks exclusively.
(ii) If $\phi > \phi^*$ and $\omega_E \in [\hat{\omega}_E, I^* (r))$ then entrepreneurs borrow from banks exclusively.
(iii) If $\phi > \phi^*$ and $\omega_E < \hat{\omega}_E$ then entrepreneurs borrow from banks and moneylenders.

Proof: See Appendix.

If $\phi \leq \phi^*$, entrepreneurs borrow exclusively from banks, regardless of their debt capacity (below first-best investment). In other words, as credit markets become more developed, informal finance looses its edge. The intuition is straightforward. The threshold ϕ^* defines the level of creditor vulnerability for which a penniless entrepreneur can attain first-best by resorting exclusively to bank funds. As the entrepreneur prefers bank to moneylender funds, she will borrow from the formal sector alone when given the opportunity.[31]

A related issue concerns how the ratio of informal to total intermediation varies in response to institutional change. Define the share of informal intermediation in total intermediation as

$$i = \frac{B}{B + \bar{L}_E}. \tag{12}$$

[31] Parts (ii) to (iii) of Proposition 2 are simply restatements of Proposition 1. Namely, that bank lending is preferable when this achieves first-best (part (ii)), but the entrepreneur resorts to both lenders if borrowing from the bank attains less than first-best (part (iii)).

An increase in (12) corresponds to a larger relative share of moneylender funds.[32]

Proposition 3: *If moneylenders are not credit rationed, the share of moneylender funds in total intermediation, i, increases in creditor vulnerability, ϕ.*

According to Table 1, right panel, the entrepreneur substitutes $\bar{L}_E$ for L_M when creditor vulnerability increases. Intuitively, the informal sector becomes the lender of choice if it has the financial means *and* the formal sector's ability to prevent opportunistic behavior deteriorates. When the moneylender's debt capacity declines (Table 1, left panel), two other effects come into play. A higher ϕ raises the utility of opportunistic behavior relative to lending money, leading to less bank credit extended to the moneylender (*diversion effect*). Meanwhile, an increase in ϕ lowers $\bar{L}_E$, which strengthens the moneylender's bargaining position, raising $\bar{L}_M$ (*bargaining effect*). If the latter effect dominates—that is, when $\omega_E + \bar{L}_E$ accounts for a substantial part of total investment—deteriorating institutions in fact induce more credit forwarded to the moneylender, even if he is credit rationed. When this is true, Proposition 3 holds globally.

Propositions 2 and 3 are novel predictions of the model that offer a striking yet simple explanation for why informal lending is prominent in developing markets but virtually non-existent in developed credit markets with well functioning legal protection of creditors.

5 Distribution of Wealth

Until now, the distribution of assets has been assumed given. It is interesting to ask how a reallocation of wealth across lenders and entrepreneurs would affect investment. As a preliminary analysis, I first consider a reallocation of wealth between the entrepreneur and the moneylender using the model outlined in Section 2. The theory is then extended to capture the difference in technology endowment that distinguishes the moneylender from the entrepreneur. Specifically, I assume that while entrepreneurs' production technology applies to one project, lenders' monitoring technology is applicable to more than one entrepreneur. This assumption is explored by considering a moneylender that interacts with two entrepreneurs in a multi-period setting. Besides providing additional insight into the relationship between inequality and investment, the modification allows for a comparison with related work (see, for example, Banerjee and Newman, 1993; Galor and Zeira, 1993).

[32] B may include bank loans and the moneylender's own wealth. Consistent with the empirical evidence referred to in the Introduction, I define the origin of intermediated funds to mean the final source of money lent to the entrepreneur.

Let me first consider the effects of a wealth reallocation between the entrepreneur and the moneylender within the model's present set-up. The comparative static exercise in Section 3 showed that the bargaining power of the entrepreneur, α, had no effect on bank credit at low levels of wealth. This suggests that a reallocation between the moneylender and the entrepreneur will be irrelevant for subsequent investment, which can be stated formally.

Proposition 4: *A reallocation of wealth from entrepreneurs to moneylenders has no effect on investment.*

Proof: See Appendix.

Intuitively, for low debt capacities an asset reallocation between the entrepreneur and the moneylender will not improve investment since they both invest or lend their entire wealth. When the moneylender becomes sufficiently wealthy such that first-best is realized, the outcome is the same but for a different reason; investment will not increase any further and the assets of the entrepreneur and moneylender are perfect substitutes. If credit market transactions were to be characterized as one-shot interactions, the distribution of wealth would have no effect on productive efficiency when comparing informal and entrepreneurial assets.

As noted above, however, the moneylender may lend to more than one entrepreneur, while the entrepreneur is engaged in one project only. Implications of this assumption are illustrated in the following three examples.

Example 1: Consider a sequence of two periods, with one entrepreneur in need of external finance in each period. First note that a reallocation of wealth from the period 2 entrepreneur to the moneylender leaves investment unchanged (similar to Proposition 4).

A wealth reallocation does, however, raise aggregate investment if reallocating wealth from the period 1 entrepreneur to the moneylender increases investment in period 2. Indeed, such an operation is possible as it leaves period 1 investment unchanged (Proposition 4), increases the lending capacity of the moneylender in period 2, thereby raising investment in period 2 *if* the moneylender and the period 2 entrepreneur are credit rationed. Hence, as the moneylender becomes richer on account of the period 1 entrepreneur, more is invested in the following period. When first-best is attained, redistribution ceases to have an effect.

Example 2: Using the set-up of *Example 1*, I turn to the frequency with which borrowers interact with the bank. So far, the interaction between the bank and its borrowers has been modeled as identical. Suppose, however, that the moneylender returns to the bank in the second period—if wealth constrained—while the period 1 entrepreneur only borrows once. If so, it is reasonable to assume that the moneylender has more to lose from a default, allowing the bank to extend funds more liberally to the moneylender than to the period 1 entrepreneur. In this instance, an additional dollar of wealth with the moneylender generates more bank credit on the margin. Again, this only holds for low levels of wealth. As soon as first-best investment is attained, investment will not increase any further.[33]

Example 3: Finally, consider a one period set-up with two possibly heterogeneous entrepreneurs, $\omega_E^i \lesseqgtr \omega_E^j$, $i \neq j \in (1,2)$, where $\omega_M \lesseqgtr \omega_E^i, \omega_E^j$. For simplicity, assume that the incentive constraint binds for all involved. As it is optimal for the moneylender to lend to the point where marginal returns to his loans are equalized, $R'(B^i) = R'(B^j)$. Because repayment is a function of amount invested, B will be set such that investment across entrepreneurs is equalized and productive efficiency maximized (see Lemma A7 in the Appendix for details). However, this assumes that the moneylender is sufficiently wealthy. Suppose, for example, that there are three asset levels (with corresponding credit lines), $\omega_E^i + \bar{L}_E^i = 5$, $\omega_E^j + \bar{L}_E^j = 3$, and $B = \omega_M + \bar{L}_M = 1$.[34] Here, the lender is unable to equalize assets to be invested, leading to lower overall production. It turns out that with two entrepreneurs and one moneylender, productive efficiency is maximized when the debt capacity of the moneylender exceeds the differential value of the entrepreneurs asset holdings and credit lines, that is, $\left|(\omega_E^i + \bar{L}_E^i) - (\omega_E^j + \bar{L}_E^j)\right| \leq B$ (see Lemma A8 in the Appendix for details). In terms of the example provided, B must equal 5 in order for the moneylender to equally satisfy the financing needs of the entrepreneurs.

Intuitively, because a wealthy moneylender is capable of smoothing lending and subsequent investment across entrepreneurs (unlike a wealthy entrepreneur), increased asset inequality in favor of the moneylender improves productive efficiency. Notably, an equalized distribution of wealth across all three agents serves the same purpose. A situation with a wealthy moneylender is therefore preferable to one with a more affluent entrepreneur, but just as efficient as one with a perfectly equal income distribution. However, as a wealthier moneylender reaps a higher repayment (by increasing the outside option in the bargaining), this leaves him with additional resources to be lent to future projects (similar to *Example 1*). More wealth also allows him to draw upon extra bank capital by considering future bank interaction (similar to *Example 2*).[35]

The examples demonstrate that wealth concentration must be accompanied by an ability to put money to work, which is exactly what moneylenders' monitoring technology achieves. Money must also be put to work where it is needed, i.e. when less than first-best is invested. Hence, asset inequality will not raise investment when firms and

[33] Similar conclusions are obtained if more frequent interaction with the bank implies a lower ϕ on the part of the moneylender.

[34] Since $\bar{L}$ increases in ω, higher wealth induces more bank credit.

[35] A noteworthy feature of the above result is that entrepreneurial income is identical ex-post if the moneylender sets B such that $R'\left(B^i\right) = R'\left(B^j\right)$. The effect on the overall income distribution is ambiguous as it depends on the initial value of ω_M.

lenders are more affluent.[36] These ideas are reminiscent of the work of Lewis (1954), Kuznets (1955), and Kaldor (1956). However, while Kuznets and Lewis saw inequality as inevitable in the development process, I merely claim that it may improve investment.[37] According to Kaldor, the marginal propensity to save was higher among the rich than the poor. As the gross domestic product was assumed to be directly related to the proportion of national income saved, the economy was presumed to grow faster for a less equal distribution of income. Kaldor's capitalists resemble somewhat my moneylenders, but I do not assume that the propensity to save is higher for richer individuals, nor that mobilization of domestic savings necessarily translates into more projects being undertaken.

Finally, I determine how an increase in the capital of the moneylender as opposed to the bank affects investment.

Proposition 5: *When entrepreneurs and moneylenders are credit rationed, investment increases in the share of moneylender funds in total intermediation, i (expression (12)).*

The result is straightforward once you take into account that neither the entrepreneur nor the moneylender's assets affect the other borrower's credit limit for low debt capacities (Table 1, left panel). From expression (12), it follows that an increase in the moneylender's wealth, ω_M, improves the credit limit, $\bar{L}_M$, the share of moneylender funds in total intermediation, and investment. Meanwhile, the credit limit of the entrepreneur, $\bar{L}_E$, remains unchanged. Extending more bank funds in this case (increasing $\bar{L}_E$) is not possible as it induces opportunistic behavior. The model thus suggests that more liquidity in the financial system is not good per se. If scarce resources of the informal sector act as a bottleneck, a mobilization of domestic savings in the formal sector will not necessarily translate into more funds invested, contradicting Kaldor's claim.[38]

The prediction complements recent empirical findings related to the theory of relationship banking.[39] Let the moneylender represent the small community bank and the

[36] The introduction of a (fixed) monitoring cost incurred by the lender does not alter these insights as a marginal reallocation of wealth still leaves investment unchanged, in parallel to Proposition 4. Similarly, Examples 1 to 3 remain intact. The only difference is that a transfer of the moneylender's full wealth to the entrepreneur (avoiding lending and hence the cost) leads to increased investment, except in Example 2, as the additional funds that the moneylender attracts may outweigh the cost. Note that investment increases both in *relative* and *absolute* inequality in favor of the moneylender.

[37] See Greenwood and Jovanovic (1990) for a more recent contribution along the lines of Kuznets and Lewis.

[38] For higher levels of moneylender wealth such that first-best is obtained, the results are indeterminate. The reason is that a higher level of moneylender assets, ω_M, simultaneously induces a decrease in L_M and an increase in $\bar{L}_E$ (see Table 1, right panel).

[39] Relationship banking implies that a lender develops a close relationship with a borrower over time, acquiring borrower-specific "soft" information facilitated through multiple interactions with the firm, the owner and the local community, as opposed to transaction-based lending based on "hard" information acquired at the time of the loan origination (see Boot, 2000 and Berger and Udell, 2002).

bank correspond to its transaction-based counterpart. The model then predicts that a greater share of community bank lending leads to higher gross domestic product growth at low levels of wealth since community banks fill a lending-gap otherwise not met, a result empirically supported by Berger et al. (2004). Using cross-sectional data from 49 developed and developing countries, they conclude that a greater share of small, private, domestically-owned banks is associated with improved economic performance, with the effect being more pronounced in the developing-country context. Hence, in less developed economies with high ϕ and low ω, increasing the assets of the community bank rather than its transaction-based counterpart increases overall investment.

6 Discussion and Concluding Remarks

Let me conclude by discussing implications of the paper's main assumptions and consider some extensions. Proposition 1 rests on the assumption that the moneylender is able to monitor investment ex-ante. An alternative would be to model the informal sector's advantage as one of ensuring repayments ex-post, where the moneylender prevents strategic default.[40] However, in the theory's one-period setup this reasoning excludes bank lending, as the entrepreneur would default on her formal loan and simply repay the moneylender. Introducing a second period potentially alleviates the problem as the bank could threaten to liquidate a successful entrepreneur in the first period to force repayment. This assumes, however, that bankruptcy law actually functions properly so that assets may be seized. Indeed, Claessens et al. (2003) show that creditors in East Asia only resort to bankruptcy as a means of securing debt ex-post if creditor vulnerability is low. By viewing the problem as one of ex-ante moral hazard, I arrive at multiple lending without needing to pay special consideration to the problems of seizing assets.[41]

This argument also distinguishes the moneylender, as outlined in the present paper, from the "extortionary" loanshark, where the latter is often associated with Mafioso-like methods to collect their loans. In situations where the informal sector's advantage is characterized by enforcing repayment through these more violent means, the model predicts that multiple lending should be less prevalent.[42]

[40] See, for example, Bolton and Scharfstein (1990).

[41] A way to salvage the ex post set-up would be to assume bank seniority over verifiable project claims. Again, proper enforcement of seniority clauses assumes functioning creditor rights. The problem of dysfunctional bankruptcy law could be avoided by introducing the notion of reputation building to prevent the entrepreneur from defaulting on the bank loan. However, this assumes frequent interaction between the bank and its borrowers. As discussed in Section 5, this may be true of a credit-constrained moneylender as he turns to the bank on a regular basis to lend money to entrepreneurs. However, for a single entrepreneur this is less likely.

[42] Moreover, whereas the typical mafioso is ignorant of a venture's circumstances, collecting repayment regardless of project outcome, my moneylender can be more lenient since he is knowledgeable of

A related concern is whether the paper's main insights would be altered if informal monitoring was less efficient. Nonetheless, it can be shown that the equilibrium outcomes remain the same, as do predictions related to the distribution of wealth (allowing for some slight alterations). To see the last point, suppose the entrepreneur fails to invest a fraction $\delta \in (0, 1)$ of the moneylender's funds.[43] In the one-period setup, it then matters whether the entrepreneur or the moneylender holds the wealth, since a reallocation that benefits the entrepreneur improves investment. In the context of the extensions discussed in Section 5, however, the results remain basically the same. Specifically, if the informal lender's value of future bank borrowing is much larger than the entrepreneur's (*Example 2*), and the inefficiency δ is sufficiently small, reallocating wealth to the moneylender is still beneficial. Similarly, a wealthier moneylender is preferred to a wealthier entrepreneur for reasons of productive efficiency and value of future bank interactions (*Example 3*) for sufficiently small δ.

Another worthwhile question is why the bank does not merge with the moneylender, rather than extending a loan, making him the local branch manager of the bank? The straightforward answer is that "bringing the market inside the firm" at best replicates the market outcome, as the branch manager now has to be incentivized to act responsibly with the bank funds. However, the merger also adds a new dimension, the employer-employee relationship, which opens up opportunistic behavior not only on the part of the newly hired moneylender, but also on the part of the bank itself.[44] Hence, the overall effect is likely to be efficiency reducing, confirming why this kind of organizational design is uncommon in developing credit markets.[45]

As the model stands, the informal lender's occupational choice is restricted to lending money. In a more general setting he may have additional sources of income, such as holding land or trading. This will not weaken the results. Complementary sources of income make it less tempting to behave opportunistically, enabling the bank to extend more funds.[46] The case examined thus provides the lower limit of bank funds flowing to the moneylender and the model's predictions therefore applies to a broader class of phenomena characterized as informal finance, including credit extended by traders, landlords, and distant family.[47]

Finally, a common feature of developing credit markets is segmentation of the fi-

the state of affairs. For example, the moneylender would know that a farmer invested her money in new plant seeds, and in the case of a bad harvest, also be able to reschedule the loan without inducing future opportunistic behavior.

[43] The value δ could be a deadweight loss or, alternatively, a benefit accruing directly to the entrepreneur.

[44] The reasoning resembles Williamson's arguments of why "selective interventions" are hard to implement (Williamson, 1985, chapter 6).

[45] See Varghese (2004) for a survey of the issue.

[46] The inclusion of collateral in the model has a similar effect.

[47] Additional reasons why a landlord, for example, engages in lending include the practice of linking credit and land transactions to increase the tenant's work effort, as in Braverman and Stiglitz (1982).

nancial sector in such a way that borrowers are restricted to the informal lender despite the existence of banks. To explore this topic in the current set-up, I suppose here that bank borrowing is associated with a fixed cost $k > 0$ while access to the informal sector is costless.[48] For expositional purposes I focus on the situation in which the bank credit limit binds for both the entrepreneur and the moneylender.[49] For sufficiently low values of k, the market outcome remains the same as described in Proposition 1, where the entrepreneur and the moneylender both acquire formal funds. However, as k increases relative to the utility of borrowing from the bank, formal funds become less attractive. Indeed, when the cost k rises over and above the entrepreneur's utility of obtaining a bank loan, she resorts to the moneylender alone to raise capital for her project. Meanwhile the moneylender takes bank credit. The asymmetry in formal access is explained by dispersion in the asset distribution between the entrepreneur and the moneylender, where segmentation occurs when the entrepreneur is relatively poor while the moneylender is relatively wealthy (see Lemma A9 in the Appendix for details).[50] Hence, transaction costs introduce a wedge for the least wealthy in their access to formal sector finance.

The current model may also be modified. In a companion paper (Madestam, 2005b), I explore the implications of a monopolistic formal sector, demonstrating that market power in banking leads to distortions that are especially large for less capitalized entrepreneurs. A related extension (Madestam, 2005a) further illustrates that banks' market power explains both the prevalence of moneylenders and the high effective interest rates in many developing credit markets. The paper shows that a monopoly bank extracts more rent by channeling funds through moneylenders than by lending directly to entrepreneurs. When moneylenders are sufficiently rich relative to entrepreneurs, they are less prone to divert bank funds. Therefore, a monopoly bank need not share rents when it lends through the moneylender. Bank market structure thus provides an explanation, in addition to transaction costs, for why formal-informal credit markets are segmented.

[48] The difference in transaction cost is meant to capture the fact that the moneylender is a local resource, whereas bank borrowing often entails traveling some distance and setting up an account.

[49] The analysis readily extends to the remaining cases.

[50] Similarly, the moneylender refrains from bank borrowing when he is relatively poor and the entrepreneur relatively rich. A complete segmentation (where the entrepreneur borrows from the moneylender who only lends his own funds) will not occur as the entrepreneur and the moneylender together never prefers full isolation to bank lending.

Appendix

The following result will be helpful in the subsequent analysis.

Lemma A1: *(i)* $Q'\left(\omega_E+\bar{L}_E\right)-(1+r+\phi)<0$*; and (ii)* $Q'\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)-(1+r+\phi)<0$.

Proof. Part (i): When the entrepreneur borrows exclusively from the bank and the credit limit binds,

$$Q\left(\omega_E+\bar{L}_E\right)-(1+r)\,\bar{L}_E-\phi\left(\omega_E+\bar{L}_E\right)=0.$$

This constraint is only binding if $Q'\left(\omega_E+\bar{L}_E\right)-(1+r+\phi)<0$. Otherwise, $\bar{L}_E$ could be increased without violating the constraint. Part (ii): When the credit limits for the entrepreneur and the moneylender bind,

$$\begin{aligned}\alpha Q(I)+(1-\alpha)\,Q\left(\omega_E+\bar{L}_E\right)-(1+r)\,\bar{L}_E-\alpha(1+r)\,\bar{L}_M&\\-\alpha\phi\left(\omega_M+\bar{L}_M\right)-\phi\left(\omega_E+\bar{L}_E\right)=0&\end{aligned}\tag{A1}$$

and

$$(1-\alpha)\left(Q(I)-Q\left(\omega_E+\bar{L}_E\right)-(1+r)\,\bar{L}_M-\phi\left(\omega_M+\bar{L}_M\right)\right)=0,\tag{A2}$$

with $I=\omega_E+\bar{L}_E+\omega_M+\bar{L}_M$. Adding the two expressions yields the maximum incentive-compatible investment level:

$$Q(I)-(1+r)(I-\omega_E-\omega_M)-\phi I=0.\tag{A3}$$

Given that it is maximal, the term must have a negative derivative, i.e. $Q'(I)-(1+r+\phi)<0$. ■

Proof of Proposition 1

I first show the existence and the uniqueness of $\hat{\omega}_E(r,\phi)$, $\hat{\omega}_M^2(r,\phi)$, and $\hat{\omega}_M^1(r,\phi)$, proceed with the lender constellations that arise, and finally derive the properties of the thresholds depicted in Figure 1.

Lemma A2: *There exist unique thresholds* $\hat{\omega}_E(r,\phi)>0$*,* $\hat{\omega}_M^2(r,\phi)$*, and* $\hat{\omega}_M^1(r,\phi)$ *such that:*

(i) $Q\left(\omega_E+\bar{L}_E\right)-(1+r)\,\bar{L}_E-\phi\left(\omega_E+\bar{L}_E\right)=0$*, for* $\omega_E=\hat{\omega}_E(r,\phi)$ *and* $\omega_E+\bar{L}_E=I^*(r)$*;*

(ii) $\alpha Q\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)+(1-\alpha)\, Q\left(\omega_E+\bar{L}_E\right)-(1+r)\,\bar{L}_E-\alpha\,(1+r)\,\bar{L}_M-\alpha\phi\left(\omega_M+\bar{L}_M\right)-\phi\left(\omega_E+\bar{L}_E\right)=0$ *and* $Q\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)-Q\left(\omega_E+\bar{L}_E\right)-(1+r)\,\bar{L}_M-\phi\left(\omega_M+\bar{L}_M\right)=0$*, for* $\omega_M=\hat{\omega}_M\,(r,\phi)$ *and* $\omega_E+\bar{L}_E+\omega_M+\bar{L}_M=I^*\,(r)$*;*

(iii) $(1-\alpha)(Q(\omega_E+\bar{L}_E+\omega_M+L_M)-Q(\omega_E+\bar{L}_E+\omega_M)-(1+r)\bar{L}_M)\;+\;\alpha\phi(\omega_M+\bar{L}_M)-\alpha\,(1+r)\,\omega_M>0$*, for* $\omega_M=\hat{\omega}_M^2\,(r,\phi)$ *and* $\omega_E+\bar{L}_E+\omega_M=I^*\,(r)$*; and*

(iv) $\hat{\omega}_M^2(r,\phi)>\hat{\omega}_M^1(r,\phi)>0$.

Proof. Part (i) is analogous to Lemma A1 in Burkart and Ellingsen (2004) and hence omitted. Part (ii): The threshold $\hat{\omega}_M^1\,(r,\phi)$ is the smallest wealth level that satisfies $I=I^*\,(r)$ when the entrepreneur and the moneylender utilize bank funds. As (A3) yields the maximum incentive compatible investment level for a given level of entrepreneurial wealth, ω_E, $\hat{\omega}_M^1\,(r,\phi)$ must satisfy

$$Q\left(I^*\,(r)\right)-(1+r)\left(I^*\,(r)-\omega_E-\hat{\omega}_M^1\right)-\phi I^*\,(r)=0. \tag{A4}$$

The threshold is unique if $\bar{L}_M$ is increasing in ω_M. Define $\Delta=(Q'(\omega_E+\bar{L}_E)-(1+r+\phi))^2$. Totally differentiating (A1) and (A2) using Cramer's rule yields

$$\frac{d\bar{L}_M}{d\omega_M}=\frac{\left(\phi-Q'\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)\right)\left(Q'\left(\omega_E+\bar{L}_E\right)-(1+r+\phi)\right)}{\Delta}>0,$$

where the determinant, Δ, is positive by Lemma A1 and the inequality follows from Lemma A1, $Q'\,(I)\geq(1+r)$, and $\phi<1$. Finally, $\hat{\omega}_M^1\,(r,\phi)>0$ is a result of the assumption $\phi>\underline{\phi}$. Part (iii): The threshold $\hat{\omega}_M^2\,(r,\phi)$ is the smallest wealth level that satisfies $I=I^*\,(r)$ when the moneylender services the entrepreneur with his own capital, i.e. when the utility of self-financing the entrepreneur, U^s, is greater than the utility of obtaining a bank loan, U^b, where $U^s=(1-\alpha)\left(Q\left(\omega_E+\bar{L}_E+\omega_M\right)-Q\left(\omega_E+\bar{L}_E\right)\right)+\alpha\,(1+r)\,\omega_M$ and $U^b=(1-\alpha)\left(Q\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)-Q\left(\omega_E+\bar{L}_E\right)-(1+r)\,\bar{L}_M\right)+\alpha\phi\left(\omega_M+\bar{L}_M\right)$. Define $f\,(\omega_M)=U^b-U^s=(1-\alpha)\,Q\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)-(1-\alpha)\left(Q\left(\omega_E+\bar{L}_E+\omega_M\right)+(1+r)\,\bar{L}_M\right)+\alpha\left(\phi\left(\omega_M+\bar{L}_M\right)-(1+r)\,\omega_M\right)$. Let $\omega_M=\hat{\omega}_M^2\,(r,\phi)$ be the threshold where $\omega_E+\bar{L}_E+\omega_M+L_M=I^*\,(r)$, for $L_M=0$ and a given level of entrepreneurial wealth, ω_E. When $\omega_M\in\left[\hat{\omega}_M^1\,(r,\phi)\,,\hat{\omega}_M^2\,(r,\phi)\right)$, $f\,(\omega_M)>0$ by concavity, $Q'\,(I)\geq(1+r)$, and the fact that $\phi\left(\omega_M+\bar{L}_M\right)-(1+r)\,\omega_M>0$ (shown below). In addition, when $\omega_E<\hat{\omega}_E\,(r,\phi)$ and $\omega_M\in\left[\hat{\omega}_M^1\,(r,\phi)\,,\hat{\omega}_M^2\,(r,\phi)\right)$, the relevant constraints are given by

$$\alpha Q\left(\omega_E+\bar{L}_E+\omega_M+L_M\right)+(1-\alpha)\,Q\left(\omega_E+\bar{L}_E\right)-(1+r)\,\bar{L}_E-\alpha\,(1+r)\,L_M$$
$$-\alpha\phi\left(\omega_M+\bar{L}_M\right)-\phi\left(\omega_E+\bar{L}_E\right)=0, \tag{A5}$$
$$Q'\left(\omega_E+\bar{L}_E+\omega_M+L_M\right)-(1+r)=0, \tag{A6}$$

and

$$I - \omega_E - \bar{L}_E - \omega_M - L_M = 0. \tag{A7}$$

Define $\Theta = Q'' \left(\omega_E + \bar{L}_E + \omega_M + L_M\right) \left((1-\alpha)\left(Q'\left(\omega_E + \bar{L}_E\right) - (1+r)\right) - \phi\right)$. Differentiating equations (A5) to (A7) with respect to I, $\bar{L}_E$, L_M, and ω_M using Cramer's rule I obtain

$$\begin{aligned} \frac{dI}{d\omega_M} &= \frac{0}{\Theta} = 0, \\ \frac{d\bar{L}_E}{d\omega_M} &= \frac{-(1+r)\, Q'' \left(\omega_E + \bar{L}_E + \omega_M + L_M\right)}{\Theta} > 0, \end{aligned}$$

and

$$\frac{dL_M}{d\omega_M} = \frac{Q'' \left(\omega_E + \bar{L}_E + \omega_M + L_M\right) \left((1-\alpha)\left(\phi - Q'\left(\omega_E + \bar{L}_E\right)\right) + 1 + r\right)}{\Theta} < 0,$$

where the determinant, Θ, is positive by concavity and Lemma A1 and the two inequalities follow from concavity, Lemma A1, and $\phi < 1$. As $\bar{L}_E$ (L_M) increases (decreases) in ω_M, there exists a $\omega_M = \hat{\omega}_M^2(r,\phi)$, at which $\omega_E + \bar{L}_E + \omega_M = I^*(r)$, where $L_M = \bar{L}_M = 0$ by the assumption that bank borrowing ceases when an agent's debt capacity exceeds the first-best investment level, and $f\left(\hat{\omega}_M^2(r,\phi)\right) = \hat{\omega}_M^2(r,\phi)\left(\phi - (1+r)\right) < 0$, as $\phi < 1$. The threshold is unique as $\bar{L}_E$ is increasing in ω_M. Part (iv): $\hat{\omega}_M^2(r,\phi) > \hat{\omega}_M^1(r,\phi)$ follows from continuity and $d\bar{L}_E/d\omega_M > 0$, showed in Part (iii) above. Finally, $\hat{\omega}_M^1(r,\phi) > 0$ is a result of the assumption $\phi > \underline{\phi}$. ■

Lemma A3: *If (i) $\omega_E < \hat{\omega}_E(r,\phi)$ and $\omega_M < \hat{\omega}_M^1(r,\phi)$; or (ii) $\omega_E < \hat{\omega}_E(r,\phi)$ and $\omega_M \in \left[\hat{\omega}_M^1(r,\phi), \hat{\omega}_M^2(r,\phi)\right)$ then the entrepreneur borrows from both a bank and a moneylender and this moneylender borrows from a bank. If (iii) $\omega_E < \hat{\omega}_E(r,\phi)$ and (a) $\omega_M \in \left[\hat{\omega}_M^2(r,\phi), I^*(r) - \omega_E\right)$ or (b) $\omega_E + \omega_M \geq I^*(r)$ then the entrepreneur borrows from both a bank and a moneylender and this moneylender does not borrow from a bank. Finally, if (iv) $\omega_E \geq \hat{\omega}_E(r,\phi)$ then the entrepreneur borrows from a bank exclusively.*

Proof. The entrepreneur may borrow from: (1) the bank exclusively; (2) both lenders with the moneylender lending bank funds; (3) the moneylender exclusively with the moneylender lending bank funds; (4) the moneylender exclusively with the moneylender lending his own funds; (5) both lenders with the moneylender lending his own funds (let U_E^i and U_M^i denote the entrepreneur's and the moneylender's utility respectively).

Part (i): Case (1) renders $U_E^1 = Q\left(\omega_E + \bar{L}_E\right) - (1+r)\bar{L}_E$; $U_M^1 = 0$. Case (2) renders $U_E^2 = \alpha Q\left(\omega_E + \bar{L}_E + \omega_M + \bar{L}_M\right) + (1-\alpha) Q\left(\omega_E + \bar{L}_E\right) - (1+r)\bar{L}_E - \alpha(1+r)\bar{L}_M - \alpha\phi\left(\omega_M + \bar{L}_M\right)$; $U_M^2 = (1-\alpha) Q\left(\omega_E + \bar{L}_E + \omega_M + \bar{L}_M\right) - (1-\alpha) Q\left(\omega_E + \bar{L}_E\right) - (1-\alpha)(1+r)\bar{L}_M + \alpha\phi\left(\omega_M + \bar{L}_M\right)$. Case (3) renders $U_E^3 = \alpha Q\left(\omega_E + \omega_M + \bar{L}_M\right) +$

$(1-\alpha) Q(\omega_E) - \alpha(1+r)\bar{L}_M - \alpha\phi\left(\omega_M + \bar{L}_M\right)$; $U_M^3 = (1-\alpha) Q\left(\omega_E + \omega_M + \bar{L}_M\right) - (1-\alpha)\left(Q(\omega_E) + (1+r)\bar{L}_M\right) + \alpha\phi\left(\omega_M + \bar{L}_M\right)$. Case (4) renders $U_E^4 = \alpha Q(\omega_E + \omega_M) + (1-\alpha) Q(\omega_E) - \alpha(1+r)\omega_M$; $U_M^4 = (1-\alpha)(Q(\omega_E+\omega_M) - Q(\omega_E)) + \alpha(1+r)\omega_M$. Case (5) renders $U_E^5 = \alpha Q\left(\omega_E + \bar{L}_E + \omega_M\right) + (1-\alpha) Q\left(\omega_E + \bar{L}_E\right) - \alpha(1+r)\omega_M - (1+r)\bar{L}_E$; $U_M^5 = (1-\alpha)\left(Q\left(\omega_E + \bar{L}_E + \omega_M\right) - Q\left(\omega_E + \bar{L}_E\right)\right) + \alpha(1+r)\omega_M$.

Starting with the entrepreneur, $U_E^1 = U_E^2$ (using equation (9) in the main text). However, she prefers U_E^2 by the assumption that for the same level of utility, the agent chooses the outcome with the higher investment. Also, $U_E^3 = Q(\omega_E)$ (using the moneylender's incentive constraint in Case (3)). Hence, $U_E^2 - U_E^3 = U_E^1 - U_E^3 = Q\left(\omega_E + \bar{L}_E\right) - Q(\omega_E) - (1+r)\bar{L}_E > 0$, by concavity and $Q'(I) \geq (1+r)$. However, $U_E^2 \gtreqless U_E^4$. Finally, $U_E^4 - U_E^3 = Q(\omega_E + \omega_M) - Q(\omega_E) - (1+r)\omega_M > 0$, $U_E^5 - U_E^2 = Q\left(\omega_E + \bar{L}_E + \omega_M\right) - Q\left(\omega_E + \bar{L}_E\right) - (1+r)\omega_M > 0$, and $U_E^5 - U_E^4 = \alpha\left(Q\left(\omega_E + \bar{L}_E + \omega_M\right) - Q(\omega_E + \omega_M)\right) + (1-\alpha)\left(Q\left(\omega_E + \bar{L}_E\right) - Q(\omega_E)\right) - (1+r)\bar{L}_E > 0$, by concavity and $Q'(I) \geq (1+r)$. This yields the following preference orderings: (i) $U_E^5 > U_E^2 > U_E^1 > U_E^4 > U_E^3$; or (ii) $U_E^5 > U_E^4 > U_E^2 > U_E^1 > U_E^3$.

As for the moneylender, $U_M^3 - U_M^2 = Q\left(\omega_E + \omega_M + \bar{L}_M\right) - Q\left(\omega_E + \bar{L}_E + \omega_M + \bar{L}_M\right) + Q\left(\omega_E + \bar{L}_E\right) - Q(\omega_E) > 0$, $U_M^3 - U_M^4 = (1-\alpha)\left(Q\left(\omega_E + \omega_M + \bar{L}_M\right) - Q(\omega_E + \omega_M)\right) - (1-\alpha)(1+r)\bar{L}_M + \alpha\left(Q\left(\omega_E + \omega_M + \bar{L}_M\right) - Q(\omega_E) - (1+r)\left(\omega_M + \bar{L}_M\right)\right) > 0$, and $U_M^2 - U_M^5 = (1-\alpha)\left(Q\left(\omega_E + \bar{L}_E + \omega_M + \bar{L}_M\right) - Q\left(\omega_E + \bar{L}_E + \omega_M\right) - (1+r)\bar{L}_M\right) + \alpha\left(Q\left(\omega_E + \bar{L}_E + \omega_M + \bar{L}_M\right) - Q\left(\omega_E + \bar{L}_E\right) - (1+r)\left(\omega_M + \bar{L}_M\right)\right) > 0$, by concavity and $Q'(I) \geq (1+r)$ (where $\phi\left(\omega_M + \bar{L}_M\right) - (1+r)\omega_M = Q\left(\omega_E + \omega_M + \bar{L}_M\right) - Q(\omega_E) - (1+r)\left(\omega_M + \bar{L}_M\right)$ and $Q\left(\omega_E + \bar{L}_E + \omega_M + \bar{L}_M\right) - Q\left(\omega_E + \bar{L}_E\right) - (1+r)\left(\omega_M + \bar{L}_M\right)$ for $U_M^3 - U_M^4$ and $U_M^2 - U_M^5$ respectively). Finally I have, $U_M^4 - U_M^5 = Q(\omega_E + \omega_M) - Q\left(\omega_E + \bar{L}_E + \omega_M\right) + Q\left(\omega_E + \bar{L}_E\right) - Q(\omega_E) > 0$, by concavity, while $U_M^4 \gtreqless U_M^2$. This yields the following preference orderings: (i) $U_M^3 > U_M^2 > U_M^4 > U_M^5 > U_M^1$; or (ii) $U_M^3 > U_M^4 > U_M^2 > U_M^5 > U_M^1$.

Although Case (5) is the entrepreneur's first choice but the moneylender prefers Case (3), Case (2) is the common second-best outcome for the pair of preference orderings $((i),(i))$, $((i),(ii))$, and $((ii),(i))$. When the entrepreneur and the moneylender hold the ordering, $((ii),(ii))$, Case (4) is preferred. However, in this instance, it can be shown that there does not exist any $\alpha \in (0,1)$ that simultaneously satisfies $U_E^4 > U_E^2$ and $U_M^4 > U_M^2$. Hence, Case (2) is the outcome when $\omega_E < \hat{\omega}_E(r,\phi)$ and $\omega_M < \hat{\omega}_M(r,\phi,\omega_E)$.

Part (ii): When $\omega_M \in \left[\hat{\omega}_M^1(r,\phi), \hat{\omega}_M^2(r,\phi)\right)$ then $\omega_E + \omega_M$ accounts for the interval of credit lines such that $\omega_M < I^*(r) - \omega_E - \bar{L}_E$, for a given ω_E and ω_M. Proceeding in a similar manner to Part (i), starting with the entrepreneur, yields $U_E^2 > U_E^1$; $U_E^2 > U_E^3$; $U_E^5 > U_E^4$; and $U_E^5 > U_E^1$, while $U_E^1 \gtreqless U_E^3$; $U_E^1 \gtreqless U_E^4$; $U_E^2 \gtreqless U_E^4$; $U_E^2 \gtreqless U_E^5$; $U_E^3 \gtreqless U_E^4$; and $U_E^3 \gtreqless U_E^5$. This renders 16 possible preference orderings on the part of the entrepreneur. In Part (i), I demonstrated that $\phi\left(\omega_M + \bar{L}_M\right) > (1+r)\omega_M$ to prove that $U_M^2 > U_M^5$. As $d\bar{L}_M/d\omega_M > 0$ (Table 1, right panel), this relationship still holds and $U_M^2 > U_M^5$.

The moneylender thus holds the same pair of preference orderings as before. Analogous to Part (i), Case (2) is preferred except when $U_E^4 > U_E^2$ and $U_M^4 > U_M^2$. Again there is no $\alpha \in (0,1)$ that jointly satisfies these two preference orderings. Hence, Case (2) is the outcome when $\omega_M \in \left[\hat{\omega}_M^1(r,\phi), \hat{\omega}_M^2(r,\phi)\right)$.

Part (iii): When (a) $\omega_M \in \left[\hat{\omega}_M^2(r,\phi), I^*(r) - \omega_E\right)$; or (b) $\omega_E + \omega_M \geq I^*(r)$, $\omega_E + \omega_M$ accounts for the interval of credit lines such that $\omega_M \geq I^*(r) - \omega_E - \bar{L}_E$, for a given ω_E and ω_M. When the moneylender is wealthy enough to self-finance large parts (or the entire amount) of the first-best investment, he no longer borrows from the bank and Case (2) ceases to exist (Lemma A2). Excluding Case (2), I get the following outcomes for $\omega_M \in \left[\hat{\omega}_M^2(r,\phi), I^*(r) - \omega_E\right)$: $U_E^5 > U_E^1$; $U_E^5 > U_E^3$; $U_E^5 > U_E^4$, while $U_E^1 \gtreqless U_E^3$; $U_E^1 \gtreqless U_E^4$; and $U_E^3 \gtreqless U_E^4$. Also, $U_M^3 > U_M^4 > U_M^5 > U_M^1$. The exclusion of Case (2) and the entrepreneur's preference for Case (5) leaves the moneylender no other option but to concede to Case (5). When $\omega_E + \omega_M \geq I^*(r)$, Case (3) ceases as an option as well. Here I have $U_E^5 > U_E^1$; $U_E^5 > U_E^4$; and $U_M^4 > U_M^5 > U_M^1$, again resulting in Case (5). Hence, Case (5) is the outcome when (a) $\omega_M \in \left[\hat{\omega}_M^2(r,\phi), I^*(r) - \omega_E\right)$; or (b) $\omega_E + \omega_M \geq I^*(r)$.

Part (iv): In this instance I have $U_E^1 > U_E^2$; $U_E^1 > U_E^3$; $U_E^1 > U_E^4$; and $U_E^1 > U_E^5$, regardless of the moneylender's wealth. Hence, Case (1) is the outcome when $\omega_E \geq \hat{\omega}_E(r,\phi)$. ■

The properties of the thresholds as depicted in Figure 1.

Lemma A4: *(i) The threshold $\hat{\omega}_M^1(r,\phi)$ is a negative function of ω_E with slope -1. (ii) The threshold $\hat{\omega}_M^2(r,\phi)$ is a negative and concave function of ω_E.*

Proof. Part (i): The threshold $\hat{\omega}_M^1(r,\phi)$ and the corresponding investment level is given by (A4) and

$$Q'(I) - (1+r) = 0. \tag{A8}$$

Differentiating (A4) and (A8) with respect to $\hat{\omega}_M^1(r,\phi)$ and ω_E using Cramer's rule yields

$$\frac{d\hat{\omega}_M^1(r,\phi)}{d\omega_E} = \frac{-Q''(I)(1+r)}{Q''(I)(1+r)} = -1.$$

Part (ii): The threshold $\hat{\omega}_M^2(r,\phi)$ is given by the function $f\left(\hat{\omega}_M^2(r,\phi)\right)$ derived in Lemma A2. Differentiating $f\left(\hat{\omega}_M^2(r,\phi)\right)$ with respect to ω_E yields

$$\frac{df\left(\hat{\omega}_M^2(\cdot)\right)}{d\omega_E} = (1-\alpha)\left(Q'\left(\omega_E + \bar{L}_E + \omega_M + L_M\right) - Q'\left(\omega_E + \bar{L}_E + \omega_M\right)\right) < 0$$

and

$$\frac{df\left(\hat{\omega}_M^2(\cdot)\right)}{d\omega_E d\omega_E} = (1-\alpha)\left(Q''\left(\omega_E + \bar{L}_E + \omega_M + L_M\right) - Q''\left(\omega_E + \bar{L}_E + \omega_M\right)\right) < 0,$$

where the two inequalities follow from concavity. The line $\omega_M = I^*(r) - \omega_E$ has the same properties since $f(\omega_M)$ increases continuously in ω_M. ■

Proof of Properties in Table 1

I establish the properties of bank credit as reported in Table 1.

Proof. Table 1, right panel: when $\omega_E < \hat{\omega}_E(r,\phi)$ and $\omega_M < \hat{\omega}_M^1(r,\phi)$, the relevant constraints are given by

$$\begin{aligned} \alpha Q\left(\omega_E + \bar{L}_E + \omega_M + \bar{L}_M\right) + (1-\alpha) Q\left(\omega_E + \bar{L}_E\right) - (1+r)\bar{L}_E - \alpha(1+r)\bar{L}_M \\ -\alpha\phi\left(\omega_M + \bar{L}_M\right) - \phi\left(\omega_E + \bar{L}_E\right) = 0, \quad \text{(A9)} \\ Q\left(\omega_E + \bar{L}_E + \omega_M + \bar{L}_M\right) - Q\left(\omega_E + \bar{L}_E\right) - (1+r)\bar{L}_M - \phi\left(\omega_M + \bar{L}_M\right) = 0, \quad \text{(A10)} \end{aligned}$$

and

$$I - \omega_E - \bar{L}_E - \omega_M - \bar{L}_M = 0. \quad \text{(A11)}$$

Differentiating equations (A9) to (A11) with respect to I, $\bar{L}_E$, $\bar{L}_M$, and ω_E using Cramer's rule I obtain

$$\begin{aligned} \frac{dI}{d\omega_E} &= \frac{(1+r)\left(1+r+\phi-Q'\left(\omega_E+\bar{L}_E\right)\right)}{\Delta} > 0, \\ \frac{d\bar{L}_E}{d\omega_E} &= \frac{\left(Q'\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)-(1+r+\phi)\right)\left(\phi-Q'\left(\omega_E+\bar{L}_E\right)\right)}{\Delta} > 0, \end{aligned}$$

and

$$\frac{d\bar{L}_M}{d\omega_E} = \frac{(1+r)\left(Q'\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)-Q'\left(\omega_E+\bar{L}_E\right)\right)}{\Delta} < 0,$$

where the determinant, Δ, (defined in Lemma A2) is positive by Lemma A1. The inequalities follow from concavity, Lemma A1, and $\phi < 1$. Differentiating the equations with respect to I, $\bar{L}_E$, and ω_M using Cramer's rule I obtain

$$\frac{dI}{d\omega_M} = \frac{(1+r)\left(1+r+\phi-Q'\left(\omega_E+\bar{L}_E\right)\right)}{\Delta} > 0$$

and

$$\frac{d\bar{L}_E}{d\omega_M} = \frac{0}{\Delta} = 0,$$

where the inequalities follow from Lemma A1 and $\phi < 1$ (the proof that $d\bar{L}_M/d\omega_M > 0$ is provided in Lemma A2). Differentiating the equations with respect to I, $\bar{L}_E$, $\bar{L}_M$, and ϕ using Cramer's rule I obtain

$$\begin{aligned} \frac{dI}{d\phi} &= \frac{\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)\left(Q'\left(\omega_E+\bar{L}_E\right)-(1+r+\phi)\right)}{\Delta} < 0, \\ \frac{d\bar{L}_E}{d\phi} &= \frac{\left(\omega_E+\bar{L}_E\right)\left(Q'\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)-(1+r+\phi)\right)}{\Delta} < 0, \end{aligned}$$

and

$$
\begin{aligned}
\frac{d\bar{L}_M}{d\phi} &= \frac{\left(\omega_M+\bar{L}_M\right)\left(Q'\left(\omega_E+\bar{L}_E\right)-(1+r+\phi)\right)}{\Delta} \\
&\quad -\frac{\left(\omega_E+\bar{L}_E\right)\left(Q'\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)-Q'\left(\omega_E+\bar{L}_E\right)\right)}{\Delta},
\end{aligned}
$$

where the sign of $d\bar{L}_M/d\phi$ is indeterminate. The inequalities follow from concavity and Lemma A1. Differentiating the equations with respect to I, $\bar{L}_E$, $\bar{L}_M$, and r using Cramer's rule I obtain

$$
\begin{aligned}
\frac{dI}{dr} &= \frac{\left(\bar{L}_E+\bar{L}_M\right)\left(Q'\left(\omega_E+\bar{L}_E\right)-(1+r+\phi)\right)}{\Delta}<0, \\
\frac{d\bar{L}_E}{dr} &= \frac{\bar{L}_M\left(Q'\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)-(1+r+\phi)\right)}{\Delta}<0,
\end{aligned}
$$

and

$$
\begin{aligned}
\frac{d\bar{L}_M}{dr} &= \frac{\bar{L}_M\left(Q'\left(\omega_E+\bar{L}_E\right)-(1+r+\phi)\right)}{\Delta} \\
&\quad -\frac{\bar{L}_E\left(Q'\left(\omega_E+\bar{L}_E+\omega_M+\bar{L}_M\right)-Q'\left(\omega_E+\bar{L}_E\right)\right)}{\Delta},
\end{aligned}
$$

where the sign of $d\bar{L}_M/dr$ is indeterminate. The inequalities follow from concavity and Lemma A1. Differentiating the equations with respect to I, $\bar{L}_E$, $\bar{L}_M$, and α using Cramer's rule I obtain

$$
\begin{aligned}
\frac{dI}{d\alpha} &= \frac{0}{\Delta}=0, \\
\frac{d\bar{L}_E}{d\alpha} &= \frac{0}{\Delta}=0,
\end{aligned}
$$

and

$$
\frac{d\bar{L}_M}{d\alpha}=\frac{0}{\Delta}=0.
$$

Table 1, right panel: when $\omega_E<\hat{\omega}_E(r,\phi)$ and $\omega_M\in\left[\hat{\omega}_M^1(r,\phi),\hat{\omega}_M^2(r,\phi)\right)$, the relevant constraints are given by

$$
\begin{aligned}
\alpha Q\left(\omega_E+\bar{L}_E+\omega_M+L_M\right)+(1-\alpha)\,Q\left(\omega_E+\bar{L}_E\right)-(1+r)\,\bar{L}_E-\alpha(1+r)\,L_M \\
-\alpha\phi\left(\omega_M+\bar{L}_M\right)-\phi\left(\omega_E+\bar{L}_E\right)=0, \qquad \text{(A12)} \\
Q'\left(\omega_E+\bar{L}_E+\omega_M+L_M\right)-(1+r)=0, \qquad \text{(A13)}
\end{aligned}
$$

and

$$
I-\omega_E-\bar{L}_E-\omega_M-L_M=0. \qquad \text{(A14)}
$$

Differentiating equations (A12) to (A14) with respect to I, $\bar{L}_E$, L_M, and ω_E using Cramer's rule I obtain

$$\begin{aligned}\frac{dI}{d\omega_E} &= \frac{0}{\Theta} = 0,\\ \frac{d\bar{L}_E}{d\omega_E} &= \frac{Q''\left(\omega_E + \bar{L}_E + \omega_M + L_M\right)\left(\phi - (1-\alpha)\, Q'\left(\omega_E + \bar{L}_E\right) - \alpha\,(1+r)\right)}{\Theta} > 0,\end{aligned}$$

and

$$\frac{dL_M}{d\omega_E} = \frac{(1+r)\, Q''\left(\omega_E + \bar{L}_E + \omega_M + L_M\right)}{\Theta} < 0,$$

where the determinant, Θ, (defined in Lemma A2) is positive by concavity and Lemma A1. The inequalities follow from concavity, Lemma A1, and $\phi < 1$. The remaining comparative-static results with respect to ω_M, ϕ, r, and α are derived in a similar manner and hence omitted. ■

Proof of Proposition 2

The first part establishes the existence and uniqueness of $\phi^*(r, \omega_E)$. The second part shows subsequent lender constellations.

Lemma A5: *There exists a unique threshold, $\phi^*(r, \omega_E)$, such that: $Q(I) - (1+r)\bar{L}_E - \phi\bar{L}_E = 0$, for $\phi = \phi^*(r, \omega_E)$ and $I = I^*(r)$.*

Proof. The threshold $\phi^*(r, \omega_E)$ is the highest level of creditor vulnerability that yields $I = I^*(r)$, when the entrepreneur utilizes bank funds and attains first-best with zero wealth. Hence, $\phi^*(r, \omega_E)$ must satisfy

$$\frac{Q(I^*(r)) - (1+r)\, I^*(r)}{I^*(r)} = \phi^*(\omega_E). \tag{A15}$$

The threshold is unique if $\bar{L}_E$ is decreasing in ϕ. Totally differentiating (A15) yields

$$\frac{d\bar{L}_E}{d\phi} = \frac{\bar{L}_E}{Q'\left(\bar{L}_E\right) - (1+r+\phi)} < 0,$$

where the inequality is a result of Lemma A1, $Q'(I) \geq (1+r)$, and $\phi < 1$. Finally, $\phi^*(r, \omega_E) > 0$ follows from concavity and $Q'(I) \geq (1+r)$. ■

Lemma A6: *If (i) $\phi \leq \phi^*(r, \omega_E)$ and $\omega_E < I^*(r)$ then entrepreneurs borrow from banks exclusively. If (ii) $\phi > \phi^*(r, \omega_E)$ and $\omega_E < \hat{\omega}_E(r, \phi)$ then entrepreneurs borrow from both banks and moneylenders. Finally, if $\phi > \phi^*(r, \omega_E)$ and $\omega_E \in [\hat{\omega}_E(r, \phi), I^*(r))$ then entrepreneurs borrow from banks exclusively.*

Proof. Part (i): Follows from Lemma A4 and the result of Proposition 1, i.e. that the entrepreneur prefers bank lending to moneylender funds. Parts (ii) to (iii) follow from Proposition 1. ■

Proof of Proposition 4

Proof. There are three relevant cases: (i) $\omega_E < \hat{\omega}_E(r,\phi)$ and $\omega_M < \hat{\omega}_M^1(r,\phi)$; (ii) $\omega_E < \hat{\omega}_E(r,\phi)$ and $\omega_M \in \left[\hat{\omega}_M^1(r,\phi), \hat{\omega}_M^2(r,\phi)\right)$; and (iii) $\omega_E < \hat{\omega}_E(r,\phi)$ and (a) $\omega_M \in \left[\hat{\omega}_M^2(r,\phi), I^*(r) - \omega_E\right)$; or (b) $\omega_E + \omega_M \geq I^*(r)$. Part (i): The equilibrium is given by equations (A9) to (A11). Differentiation with respect to I, ω_M, and ω_E using Cramer's rule while setting $d\omega_M = -d\omega_E$ yields

$$\frac{dI}{d\omega_M} = \frac{0}{\Delta} = 0,$$

where the determinant, Δ, (defined in Lemma A2) is positive by Lemma A1. Part (ii): The equilibrium is given by equations (A12) to (A14). Differentiating these equations with respect to I, ω_M, and ω_E using Cramer's rule while setting $d\omega_M = -d\omega_E$ yields

$$\frac{dI}{d\omega_M} = \frac{0}{\Theta} = 0,$$

where the determinant, Θ, (defined in Lemma A2) is positive by concavity and Lemma A1. Part (iii): The equilibrium is given by

$$\begin{aligned} \alpha Q\left(\omega_E + \bar{L}_E + B\right) + (1-\alpha) Q\left(\omega_E + \bar{L}_E\right) - (1+r)\bar{L}_E \\ -\alpha(1+r)B - \phi\left(\omega_E + \bar{L}_E\right) = 0, \end{aligned} \tag{A16}$$

$$Q'(I) - (1+r) = 0, \tag{A17}$$

and

$$I - \omega_E - \bar{L}_E - B = 0. \tag{A18}$$

Define $\Lambda = Q''\left(\omega_E + \bar{L}_E + B\right)\left((1-\alpha)\left(Q'\left(\omega_E + \bar{L}_E\right) - (1+r)\right) - \phi\right)$. Differentiating these equations with respect to I, ω_M, and ω_E using Cramer's rule while setting $d\omega_M = -d\omega_E$ yields

$$\frac{dI}{d\omega_M} = \frac{0}{\Lambda} = 0,$$

where the determinant, Λ, is positive by concavity and Lemma A1. ■

Wealth Reallocation With Heterogeneous Entrepreneurs

I first demonstrate the equality and optimality of investment across the entrepreneurs, given a sufficiently wealthy moneylender (Lemma A7). I then show the conditions for which this holds (Lemma A8).

Lemma A7: *Suppose there are two entrepreneurs and one moneylender with respective wealth* $\omega_E^i < \hat{\omega}_E(r,\phi), \omega_E^j < \hat{\omega}_E(r,\phi)$, *and* $\omega_M < \hat{\omega}_M^1(r,\phi)$ $i \neq j \in (1,2)$. *Then investment is (i) equalized and (ii) productive efficiency optimal when the moneylender is sufficiently wealthy to equally satisfy the entrepreneurs' financing needs.*

Proof. Part (i): If the moneylender lends to both entrepreneurs, the repayment obligation is given by $R^i = (1-\alpha)\left(Q\left(I^i\right) - Q\left(\omega_E^i + \bar{L}_E^i\right)\right) + \alpha\left(\left(1+r\right)\bar{L}_M^i + \phi\left(B^i\right)\right)$ (similarly with respect to R^j). Optimality on part of the moneylender yields $R'\left(B^i\right) = R'\left(B^j\right) \Rightarrow Q'\left(I^i\right) = Q'\left(I^j\right)$ or $I^i = I^j$ by concavity.

Part (ii): Suppose not. The moneylender sets B such that $I^i : I - \epsilon$, $I^j : I + \epsilon$. But then total production decreases, as $Q\left(I-\epsilon\right) + Q\left(I+\epsilon\right) < 2Q\left(I\right)$ by concavity. Hence $I^i = I^j$ maximizes total production. ■

Lemma A8: *Investment is (i) equalized and (ii) production maximized when* $\left|\left(\omega_E^i + \bar{L}_E^i\right) - \left(\omega_E^j + \bar{L}_E^j\right)\right| \leq B$, $i \neq j \in (1,2)$.

Proof. Part (i): Suppose not. If $\left|\left(\omega_E^i + \bar{L}_E^i\right) - \left(\omega_E^j + \bar{L}_E^j\right)\right| > B$, then B is insufficient to satisfy $\omega_E^i + \bar{L}_E^i + \delta B = I^i = I^j = \omega_E^j + \bar{L}_E^j + (1-\delta)\, B$, where $\delta \in (0,1)$. Hence, when $\left|\left(\omega_E^i + \bar{L}_E^i\right) - \left(\omega_E^j + \bar{L}_E^j\right)\right| \leq B$, $I^i = I^j$.

Part (ii): Follows from Lemma A7. ■

Lender Constellations with a Transaction Cost k

Lemma A9: *Suppose* $\omega_E < \hat{\omega}_E\left(r,\phi\right)$ *and* $\omega_M < \hat{\omega}_M^1\left(r,\phi\right)$ *and bank borrowing entails a transaction cost* $k > 0$. *If (i)* $k < Q\left(\omega_E + \bar{L}_E\right) - Q\left(\omega_E\right) - \left(1+r\right)\bar{L}_E \equiv k_E$ *and* $k < Q\left(\omega_E + \bar{L}_E + \omega_M + \bar{L}_M\right) - \alpha Q\left(\omega_E + \bar{L}_E\right) - \left(1-\alpha\right) Q\left(\omega_E + \bar{L}_E + \omega_M\right) - \alpha\left(1+r\right)\omega_M - \left(1+r\right)\bar{L}_E \equiv k_M$ *then the entrepreneur borrows from both a bank and a moneylender and this moneylender borrows from a bank. If (ii)* $k < k_E$ *and* $k > k_M$ *then the entrepreneur borrows from both a bank and a moneylender and this moneylender does not borrow from a bank. Finally, if (iii)* $k > k_E$ *and* $k < k_M$ *then the entrepreneur borrows from a moneylender and this moneylender borrows from a bank.*

Proof. Adding a cost $k > 0$ associated with bank borrowing then proceeding in a manner similar to the proof of Lemma A3 yields the following cases (the definitions and simplifications of Cases (1) to (5) follow the proof of Lemma A3). Case (1): $U_E^1 = Q\left(\omega_E + \bar{L}_E\right) - \left(1+r\right)\bar{L}_E - k$; $U_M^1 = 0$. Case (2): $U_E^2 = Q\left(\omega_E + \bar{L}_E\right) - \left(1+r\right)\bar{L}_E - k$; $U_M^2 = Q\left(\omega_E + \bar{L}_E + \omega_M + \bar{L}_M\right) - Q\left(\omega_E + \bar{L}_E\right) - \left(1+r\right)\bar{L}_M - k$. Case (3): $U_E^3 = Q\left(\omega_E\right)$; $U_M^3 = Q\left(\omega_E + \omega_M + \bar{L}_M\right) - Q\left(\omega_E\right) - \left(1+r\right)\bar{L}_M - k$. Case (4): $U_E^4 = \alpha Q\left(\omega_E + \omega_M\right) + \left(1-\alpha\right) Q\left(\omega_E\right) - \alpha\left(1+r\right)\omega_M$; $U_M^4 = \left(1-\alpha\right)\left(Q\left(\omega_E + \omega_M\right) - Q\left(\omega_E\right)\right) + \alpha\left(1+r\right)\omega_M$. Case (5): $U_E^5 = \alpha Q\left(\omega_E + \bar{L}_E + \omega_M\right) + \left(1-\alpha\right) Q\left(\omega_E + \bar{L}_E\right) - \alpha\left(1+r\right)\omega_M - \left(1+r\right)\bar{L}_E - k$; $U_M^5 = \left(1-\alpha\right)\left(Q\left(\omega_E + \bar{L}_E + \omega_M\right) - Q\left(\omega_E + \bar{L}_E\right)\right) + \alpha\left(1+r\right)\omega_M$.

The entrepreneur's preference orderings are given by: (i) $U_E^5 > U_E^2 > U_E^1 > U_E^4 > U_E^3$; (ii) $U_E^5 > U_E^4 > U_E^2 > U_E^1 > U_E^3$; (iii) $U_E^4 > U_E^3 > U_E^5 > U_E^2 > U_E^1$; (iv) $U_E^4 > U_E^5 > U_E^3 > U_E^2 > U_E^1$; or (v) $U_E^4 > U_E^5 > U_E^2 > U_E^1 > U_E^3$. Similarly, the moneylender's preference orderings: (i) $U_M^3 > U_M^2 > U_M^4 > U_M^5 > U_M^1$; (ii) $U_M^3 > U_M^4 > U_M^2 > U_M^5 > U_M^1$; (iii) $U_M^3 > U_M^4 > U_M^5 > U_M^2 > U_M^1$; (iv) $U_M^4 > U_M^5 > U_M^3 > U_M^2 > U_M^1$;

or (v) $U_M^4 > U_M^3 > U_M^5 > U_M^2 > U_M^1$. Taken together, this renders 25 possible pairs. However, as in the proof of Lemma A3, there is no $\alpha \in (0,1)$ that simultaneously satisfies $U_E^4 > U_E^2$ and $U_M^4 > U_M^2$, leaving 9 pairs to be analyzed.

Part (i): When k is sufficiently small relative to the entrepreneur's and the moneylender's utility of simultaneously obtaining bank funds, ($k < Q\left(\omega_E + \bar{L}_E\right) - Q\left(\omega_E\right) - (1+r)\,\bar{L}_E \equiv k_E$ and $k < Q(\omega_E + \bar{L}_E + \omega_M + \bar{L}_M) - \alpha Q(\omega_E + \bar{L}_E) - (1-\alpha)\,Q(\omega_E + \bar{L}_E + \omega_M) - \alpha\,(1+r)\,\omega_M - (1+r)\,\bar{L}_E \equiv k_M$), Case (2) is the common second-best outcome for the pair of preference orderings: $((i),(i))$, $((i),(ii))$, $((ii),(i))$, and $((v),(i))$.

Part (ii): When k is large relative to the utility of obtaining bank funds for the moneylender, $k > k_M$ (and $k < k_E$) and the moneylender is relatively poor (ω_M is close to zero) while the entrepreneur is relatively rich ($\omega_E \gg 0$), the moneylender and the entrepreneur prefer Case (5) for the following pairs: $((i),(iii))$, $((i),(iv))$, and $((i),(v))$.

Part (iii): Vice versa to Part (ii), when k is large relative to the utility of obtaining bank funds for the entrepreneur, $k > k_E$ (and $k < k_M$) and the entrepreneur is relatively poor (ω_E is close to zero) while the moneylender is relatively rich ($\omega_M \gg 0$), the moneylender and the entrepreneur prefer Case (3) for the following pairs: $((iii),(i))$ and $((iv),(i))$. ■

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