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How Do Banks Pick Safer Ventures?
A Theory Relating the Importance of Risk Aversion and Collateral to Interest Margins and Credit Rationing[*]

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The paper augments the asymmetric information literature on bank lending to new ventures by focusing on the more neglected area of moral hazard; specifically the relationship between risk aversion, an entrepreneur's wealth and the provision of collateral. The results highlight some interesting nuances which are not characteristic of the properties of models that have dominated the literature and which mainly focus on the problems of adverse selection. Contrary to models such as Evans and Jovanovic (1989) Blanchflower and Oswald (1998) our model shows that credit rationing does not necessarily have to be negatively related to an entrepreneur's initial wealth. Our model shows that banks can use collateral as a means of affecting an entrepreneur's risk aversion – the tactic being least effective for both very low and high wealth individuals. We show that this can cause banks to ration credit at both tails of the wealth distribution. Furthermore, we argue that credit rationing is likely to be less applicable to

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low wealth individuals, as a small increase in their initial wealth can have very dramatic effects on access to bank finance as it *both* increases the risk aversion of the borrower as well as the usual affect of raising the amount of the debt that is effectively securitized through borrower collateral. Thus, through this mechanism, low wealth individuals who can provide at least some collateral would have greater access to finance than previously supposed. The results also indicate why collateral to debt ratio need not be negatively related to interest rate margins.

Section 1: Introduction

Over the last three decades there has been a considerable volume of literature on the behavior of banks in terms of their practice of lending to new ventures (see Parker, 2002 for a review). The major concern inherent in this literature is in explaining why and how banks might ration credit to ventures, demand collateral and charge differential interest rates to new businesses. The main motivation behind such analyses has been the central issue of whether or not bank lending practice constrains the performance of the enterprise economy. A general conclusion of the theoretical literature is that in cases where collateral is used, there is a positive monotonic relationship between an entrepreneur's wealth and her ability to secure loans from a bank. Most argue that relaxing the wealth constraint would be positive for enterprise performance (e.g. Evans and Jovanovic 1989, Blanchflower and Oswald 1998, and Burke, Fitzroy and Nolan 2000, 2002). However, some argue that this will not be the case if banks are largely efficient in rationing credit to low quality entrepreneurs (Cressy, 1996), or if entrepreneurs are overoptimistic (de Meza and Webb 1989, de Meza and Southey, 1996 and de Meza 2002). The premise for these conclusions is generally based on models of asymmetric information where the borrower (entrepreneur) knows more about the venture than the lender. Furthermore, in this environment, the analyses mainly focus on the problem of adverse selection – namely, asking the question of "how does a bank choose a high quality venture?"

In this paper, we focus on the alternative and more neglected problem of moral hazard. Thus, we consider a model where banks can identify a high quality venture but cannot influence the venture to adopt a safe/less risky strategy. We argue that depending on an entrepreneur's wealth, the bank can or cannot influence her tendency to adopt low risk strategies. We argue that banks will have most difficulty affecting risk taking behavior at the tails of the wealth distribution. Since banks do not share in the upside gains of a venture, we show that banks will, therefore, tend to ration credit to both very low and high wealth individuals. Thus, our model highlights some plausible cases where credit constraints are not monotonically related to an entrepreneur's wealth but, in contrast, apply to both high and low wealth individuals. Furthermore, our model indicates that a bank's ability to affect risk taking behavior can be quite effective when an entrepreneur does not have enough wealth to offer collateral commensurate (even in illiquid terms) with the (liquid) financial value of the loan. Thus, the model suggests that banks may be much more willing to lend to low wealth individuals who cannot securitize the loan than has been previously thought. The model also indicates that the interest rate margins are not necessarily negatively related to the extent to which a loan is covered by collateral, simply due to the fact that bank can ensure that low wealth individuals will adopt less risky strategies. Thus, the model offers additional insights into the properties of other models of asymmetric information focusing on bank lending behavior. The stark difference in the results stemming from our focus on moral hazard indicate that some of the stronger conclusions of models emphasizing the implications of adverse selection may be less clear cut than previously imagined.

The paper is short and the structure reflects this feature. The next section sets the existing literature in context in order to highlight differences from our analysis. The following section outlines our model. The paper closes with an overview and conclusions.

Section 2: Theoretical framework

Theoretical analyses which investigate the relationship between the interest margin and risk present several models dealing with the theme. These include interest margin and risk (1) with/ without considering the role of collateral, (2) with/without considering the role of borrower wealth and (3) in the context of borrower motivation. Below, we provide a brief tour of this literature. Our aim is to provide a collective theoretic perspective in order to guide and interpret our empirical results.

In situations of uncertainty where borrowers' and lenders' information and optimism are symmetric, banks can classify lending by risk type. High risk borrowers can compete for loan funds with their lower risk counterparts by either insuring banks against this risk through the provision of collateral, and/or by rewarding banks for taking on extra risk by paying a higher interest rate on loans. Of course, borrowers who have insufficient wealth to offer complete insurance through collateral, have only the option of offering to pay higher interest rates. One of the motivations for the theoretical literature on asymmetric information and credit rationing, is an observation that frequently banks do not apparently vary the lending rate by risk category.[1] Thus, quantity (credit rationing) rather than price constraints are used to clear the market.

A variety of hypotheses have been put forward to explain the justification for, and the manner in which banks carry out this rationing process. The literature emanates from the work of Stiglitz and Weiss (1981) who argue that banks cannot compensate for risk and uncertainty when it is manifested in an asymmetry where borrowers know more about the viability of a venture than the bank. In this case, higher interest rates cause adverse selection as disproportionately less risky borrowers drop out of the market leaving the bank with a higher proportion of high-risk customers. Similarly, high interest rates may stimulate entrepreneurs to increase the riskiness of their project (moral hazard). Thus, in this case, Stiglitz and Weiss argue that banks attempt to level the risk across borrowers (insuring against loss) by requiring that loans are secured through collateral. An implication of their model is that we should observe a positive correlation between default and the interest margin if these two premises apply.

Bester (1985, 1987) develops Stiglitz and Weiss' trajectory and considers the case where banks can simultaneously set interest rates and collateral. This flexibility allows banks to supply interest rate and collateral pairings, which cause borrowers to self-select (or from the bank's perspective, signal) into high and low risk pools. Thus, high-risk borrowers opt for higher interest rates and lower collateral pairings, as compared with the preferred margin/ collateral pairing opted for by their low risk counterparts. Thus, one would expect interest rate margins to be negatively related to *ex post* defaults. Bester points out that as long as borrowers are not constrained by access to collateral, no credit rationing takes place. However,

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[1] It is, of course, true that banks frequently vary the interest rate by the size of the loan – attempting to recoup the fixed cost of loan processing by charging higher interest rates to small borrowers. Interestingly, the evidence presented in Churchill and Lewis (1986) also shows that part of the higher interest rate is used to offset the higher risk of lending to small firms. Therefore, the frequently held view that quantity rather than price is used to ration funds in the credit markets, must be treated with some caution.

consistently highly skewed wealth distributions as well as a plethora of empirical analyses of the self-employed, indicate the non-generality of this state of affairs.[2] Besanko and Thakor (1987a; 1987b) address some of the resulting implications. They argue that binding collateral constraints prevent banks from enticing high and low risk borrowers to self-select into appropriate interest rate/collateral pairings. In this case, rationing credit becomes a useful means of achieving more efficient self-selection; mainly by deterring high-risk borrowers from accessing the interest rate/collateral pairing which banks intend for low risk borrowers.

Another perspective in the literature that takes on board the relationship between interest margin and risk focuses on a borrower's motivation to default. According to Boot et al. (1991), if a borrower posts sufficient collateral he will be loathe to default, since in this event his security will be repossessed. Therefore, he will invest more time and effort in his project and his default probability will decrease. However, with a higher interest rate and lower collateral requirement, motivation will be less and risk higher because the borrower pockets the immediate finance drawn down from the bank and has little incentive to repay the bank. Their model concludes that if private information prevails and good quality entrepreneurs achieve higher rates of project success for every unit of effort expended, lower risk entrepreneurs will have lower interest margins.

Section 3: A model of entrepreneur risk aversion and the use of bank collateral

The premise of our model entails a slightly different type of asymmetry of information than that dealt with in the aforementioned papers. Our purpose here is to augment these perspectives rather than supplant them. Therefore, we consider one extra possibility in terms of the specific nature of an asymmetry of information between bank and borrower in order to focus on a neglected aspect of moral hazard. We assume that the bank can accurately ascertain the quality (in this case entrepreneurial ability) of the borrower but cannot control (successfully monitor) how the entrepreneur chooses to allocate these funds between high and low risk activities. Thus, the risk is in the tactics and strategy employed by the entrepreneur, not the quality of the entrepreneur's type or proposed venture. Let us assume that the expected reward for entrepreneurship is defined as

$$R = P\,[\pi(k) - rL] + PZ + (1-P)A \tag{1}$$

$P\ \{0 \le P \le 1\}$ is the probability of entrepreneurial success, π is entrepreneurial profit (before interest repayments), k is the amount of capital invested in the venture (comprising loan and equity finance), L is the loan amount $\{0 \le L \le k\}$, r is the interest rate on the loan and Z is the initial wealth (assets) of the entrepreneur. Brackets in equation *(1)* represent multiplicative relationships apart from $\pi(k)$ which is in functional form $\{\pi'(k) > 0 \text{ and } \pi''(k) < 0\}$. $A = Z - \alpha(1+r)L \ge 0$ represents the residual wealth of the entrepreneur if the venture fails, where $\alpha\ \{0 \le \alpha \le 1\}$ is the proportion of the outstanding debt that is covered by collateral. A is assumed to be strictly non-negative implying that collateral for a venture must be provided by the entrepreneur and nobody else[3]. Note that the entrepreneur's wealth Z puts an upward bound on

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[2] For example, Evans and Jovanovic (1989), Black, de Meza and Jeffreys (1996), Blanchflower and Oswald (1998) and Burke, FitzRoy and Nolan (2000).
[3] This may sound like a restrictive assumption. However, it is not concealing in terms of our main focus of investigation which is to ascertain how an entrepreneur alters her risk-taking behavior as a result of putting up more collateral on a loan.

the amount of collateral that the entrepreneur can offer. Thus, if $Z \leq (1+r)L$ and if the entrepreneur is offering all her wealth as collateral on outstanding debt then equation *(1)* becomes $R = P\,[\pi(k) - rL] + PZ$ so that the expected outcome is entirely independent of the debt outstanding if the venture fails.

Suppose now that on obtaining bank loan finance an entrepreneur has opportunities to utilize that finance in high and low risk initiatives denoted by the terms R_l and R_h respectively. They can be defined to represent a scenario where an entrepreneur with some degree of risk aversion will consider both options.

$$R_l = P_l\,[\pi_l(k) - rL] + P_l Z + (1- P_l)A \tag{2}$$

$$R_h = P_h\,[\pi_h(k) - rL] + P_h Z + (1 - P_h)A \tag{3}$$

$$R_h - R_l > 0, \quad \pi_h(k) - \pi_l(k) > 0, \quad P_l - P_h > 0$$

The entrepreneur's utility function for each of initiatives *l* and *h* is of the form

$$U_l = U_l(R_l) \qquad U_l'(R_l) > 0, \quad U_l''(R_l) < 0 \tag{4}$$

Therefore, the entrepreneur will choose to use the loan for a high risk project if

$$G = U_h - U_l > 0 \tag{5}$$

Since U_h and U_l are positive and concave functions of wealth, it follows that for any given R_l and R_h, G is more likely to be positive for higher values of Z. In other words, the entrepreneur becomes less risk averse at higher levels of guaranteed wealth Z and is more likely to choose the high risk strategy.

The bank's expected profits from lending to an entrepreneur are defined

$$\Pi = \gamma(1+r)L - C + (1-\gamma)[(1+r)L - F] \tag{6}$$

where *C* is the cost of the loan amount *L* to the bank. The probability of repayment is γ. If the entrepreneur defaults, then the bank will recover an amount *L-F*, where *F* denotes the part of the loan that is not recoverable. Thus *F* is increasing in the extent to which the loan is not covered by collateral, lower liquidation value of collateralized assets, and transactions costs (legal and business) associated with liquidising assets. We let *x* denote the fixed cost component of retrieving collateral from defaulting borrowers.

$$F = f(Z,L) + x \tag{7}$$

Since $P_l > P_h$, it follows that the bank will earn higher expected profits if entrepreneurs invest in low risk projects. Since lower values of *A* increase risk aversion and hence the probability that an entrepreneur will choose a low risk venture, the bank can influence this behavioral preference by using collateral to reduce *A*. That is by attempting to guarantee that the loan will be repaid, regardless of the success of the venture. Formally, $\gamma = v\,P_l + (1-v)\,P_h$ where $v(Z)$.

Therefore, in reduced form the probability, γ, that the borrower does not default on the loan, is a function of Z.

In order to understand the properties of the function $\gamma(Z)$ it is important to consider that the bank's ability to affect the entrepreneur's aversion to risk is non-monotonic. In fact, the bank will find it hard to alter the risk preferences of entrepreneurs at either extreme of the wealth distribution. On the low end, we can see that the marginal affect of requiring collateral is eroded as the entrepreneur's wealth falls from $Z > (1+r)L$ to $Z \leq (1+r)L$. For values of $Z \geq (1+r)L$ the bank can impose a reduction of Z by a discrete amount equal to $(1+r)L$. Thus, for $Z > (1+r)L$ reductions in Z imply a familiar movement towards, but not reaching the origin, of a concave expected utility function thereby increasing the risk averseness of the borrower. Therefore, in the region $Z > (1+r)L$ and for imposition of collateral equal to $(1+r)L$ it follows that $\gamma'(Z) < 0$ when $A > 0$.

However, for amounts $Z \leq (1+r)L$, the bank can only reduce A by the proportion $Z/(1+r)L$. This has the affect of moving the worse case scenario $(1-P)$ for both high and low risk strategies to the origin of the expected utility function. In other words, the amount of collateral taken by the bank ensures that all of a borrower's wealth Z will be lost if the worse outcome occurs for either the high or low risk strategy. It follows from the concavity of the expected utility function that in this zone, individuals with higher levels of Z are more likely to adopt the less risky strategy. In other words, an increase in Z by a fixed amount has no effect on expected utility of the worse outcome $(1-P)$ but increases expected utility from the low risk strategy by a greater amount than the high risk strategy - because incremental increases in wealth cause a greater marginal increase in utility for low wealth individuals. Therefore, in this region $(A=0)$, $\gamma'(Z) > 0$..

Thus, the bank's ability to affect the entrepreneur's risk averseness declines as Z falls below $(1+r)L$ i.e. for low wealth individuals. At the other extreme, where values of Z are much greater than $(1+r)L$, the guaranteed wealth of an entrepreneur can be so far along the concave portion of the expected utility function U, that reductions in Z (due to demands for collateral) which are limited to amount $(1+r)L$, have only a marginal impact on utility and hence on an entrepreneur's willingness to avoid risk. Therefore, in this domain also, the bank's ability to influence entrepreneurs to adopt low risk strategies is limited.

It follows that the bank's profit maximizing strategy has a stimulus towards specialisation of lending towards entrepreneurs whom it can influence to take the low risk strategy. Specifically, $\gamma(Z)$ can be depicted as in Figure 1.

The entrepreneur's initial wealth Z and residual wealth $A = Z - \alpha(1+r)L$ are represented on the horizontal axis. For any given loan amount, the bank is able to reduce an entrepreneur's residual wealth by a maximum value equal to the loan (i.e. $\alpha = 1$). The concavity of the expected utility function implies that the bank is decreasingly able to influence the entrepreneur to adopt the low risk strategy as Z increases. Thus, the probability that the bank receives $(1+r)L$ drops as Z increases for values of $A \geq 0$. For negative values of $Z-(1+r)L$ the bank is only able to secure collateral amounting to less than the full amount of the loan. Thus, the ability of the bank to influence entrepreneurs in the negative quadrant decreases at an increasing rate, causing the function $\gamma(Z)$ to diminish.

We now combine the above effect with the role of collateralisation in order to ascertain how bank lending behavior is affected by initial wealth Z. Differentiating the expected profit function equation (6) with respect to Z yields equation (8).

$$\frac{\partial \Pi}{\partial Z} = \frac{\partial \gamma}{\partial Z} F - (1-\gamma)\frac{\partial F}{\partial Z}$$ (8)

Equation (8) contains two terms which impact on a bank's expected profits. The sign of the first term depends on an entrepreneur's residual wealth. For values of $A = Z - \alpha(1+r)L < 0$ the sign is positive so, for this effect on its own, an increase in wealth for a low wealth borrower makes the individual behave more risk aversely and hence tends to increase a bank's expected profits. Alternatively, in cases of relatively high wealth borrowers where $A > 0$, the derivate becomes negative on the first term and hence an increase in wealth makes these individuals less risk averse – thereby reducing expected bank profits. Thus, this affect alone would tend to cause banks to avoid lending to very high wealth individuals.

The second term explains why banks do not only concentrate lending to low wealth individuals and deals with the impact of collateral. This term represents the increase in the amount of the debt that cannot be repatriated if the bad state occurs and is negatively related to an entrepreneur's wealth. Thus, for low wealth individuals an increase in Z can have very dramatic effects on access to finance as it *both* increases the risk aversion of the borrower and the amount of the debt that is effectively securitized through borrower collateral. For loans which can never be fully securitized, banks may choose not to lend to high wealth/low risk averse individuals (where the derivate on the second term has become zero and the derivative on the first term is negative). If the loan is fully securitized then both F and $\partial F/\partial Z$ are equal to zero. In this case an increase in Z has no effect on expected bank profits because the bank receives the same payoff in both the good and bad state and hence profits are independent of $\gamma(Z)$. However, it may also be realistic to assume that F reaches a lower limit which is strictly positive as banks often find that it is either not possible or politically unwise to call on all collateral options.

We summarize the likely impact of an increase in a borrower's wealth on banks' expected profits in table 1. The rows relate to the two demarcation regimes defined in Figure 1 and are broadly labelled 'low' and 'high' wealth. The two columns relate to the two regimes associated with cases where collateral is and is not used. One may be tempted to say that these two cases related to instances where $(L - F(Z,L)) - x > 0$ and $(L - F(Z,L)) - x < 0$ respectively. However, the fact that the presence of collateral can cause an entrepreneur to adopt a less risky strategy and reduce the probability of loan default, could inspire some banks to demand collateral even when $(L - F(Z,L)) - x < 0$. The table traces through the impact of an increase in an entrepreneur's wealth on risk aversion and the securitization of a loan on bank profit and ultimately the interest rate charged. The derivative on the interest rate is drawn from equation (6) which can be illustrated for a perfectly competitive market where bank profits are zero and hence $r = -1 + [C + (1-\gamma)F]/L$. For cases such as this, or other less than perfectly competitive environments where the bank must achieve a profit objective, interest rate margins (the base rate is depicted as zero for the above case) are positively related to γ.

A number of propositions follow which distinguish our model from some of the other insights into new venture lending markets.

> **Proposition 1:** *Credit rationing is more likely to be confined to entrepreneurs who are on the tails of the wealth distribution. Therefore credit rationing is not necessarily negatively related to an entrepreneur's wealth or assets.*

Thus, in this model, liquidity constraints driven by a lack of collateral are far less binding than that depicted by the extensive range of theoretical models based on the work of Evans and Jovanovic (1989) where borrowers are constrained to a fixed multiple of their initial wealth Z. In our model, a low initial wealth borrower in fact empowers a bank to require less collateral in order to cause the entrepreneur to choose the less risky strategy. Hence low borrower wealth can inspire the bank to lend to the venture. Through this mechanism, low (but not lowest) wealth individuals could have a greater access to finance than previously supposed. Of course, as depicted in Figure 1, at the extreme where wealth is well below the required loan amount, the bank's ability to influence the entrepreneur's risk behavior becomes impaired and liquidity constraints apply.

> ***Proposition 2:*** *Extremely high wealth individuals who are not offered credit due to their high risk behavior but who can nonetheless self-finance their venture, are more likely to fail.*

Proposition 2 follows from proposition 1 and indicates that extremely high wealth individuals are more prone to risk taking and hence may under perform relative to the population of entrepreneurs.[4] This proposition goes some way to explain the empirical results of Burke, Fitzroy and Nolan (2000) and Taylor (2001) both of whom find that the performance of the self-employed is related to the wealth of the entrepreneur in a concave manner − a negative relationship appearing after the entrepreneur's wealth moves beyond a threshold point. Also the possibility that entrepreneurs become risk prone beyond some point (for example, Friedman and Savage, 1948) would not change the form of our model but in fact exaggerate the magnitude of our propositions.

We now consider proposition 3 which is based on the observation that collateral can be either positively related to the interest rate margin as the value of $\partial \gamma / \partial Z$ can be either positive or negative depending on the level of initial wealth Z.

> ***Proposition 3:*** *In terms of the ability of collateral to increase the bank's expected profits by affecting the probability that an entrepreneur adopts low risk strategies, ceteris paribus, the risk of default while related to the existence of some collateral may not be related to the level of such collateral. This is especially the case if there is a prevalence of relatively low wealth entrepreneurs among the bank's borrowers.*

Proposition 3 indicates the existence of an important feature for econometric analysis, which contrasts with Evans and Jovanovic's (1989) framework where collateral would be expected to be positively related to the interest rate margin. In our model interest rates are also determined by the risk taking behavior of the entrepreneur and the ability of the bank to affect this is not determined by the level of collateral relative to the loan amount, but rather by collateral relative to an entrepreneur's initial wealth. Thus, for any given level of debt, higher amounts of collateral do not necessarily raise a bank's expected profits and hence allow a bank to charge

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[4] Of course, high wealth individuals can choose to self-fund and thereby not need to seek bank finance in the first place.

lower interest rates to entrepreneurs who provide more collateral. This insight may explain why econometric analysis which does not account for an entrepreneur's wealth may have difficulty finding a positive relationship between securitization and interest rate margins.

Conclusion

The paper augments the asymmetric information literature on bank lending practice to new ventures by focusing on the more neglected area of moral hazard; specifically the relationship between risk aversion, an entrepreneur's wealth and the provision of collateral. The results highlight some interesting nuances which are not characteristic of the properties of models which have dominated the literature and which mainly focus on the problems of adverse selection. The model highlights that the baseline assumption underlying the plethora of analyses emanating from the work of Stiglitz and Weiss (1981), and Evans and Jovanovic (1989), is not as general as previously claimed. This perspective takes the view that entrepreneurial credit constraints are, by definition, negatively related to the entrepreneur's initial wealth. Our model shows that banks can use collateral as a means of affecting an entrepreneur's risk aversion – the tactic being least effective for both very high and low wealth individuals. We show that this can cause banks to ration credit at both tails of the wealth distribution.

Furthermore, we argue that credit rationing is likely to be less applicable to low wealth individuals than depicted in models based on adverse selection. We show that for low wealth individuals, a small increase in their initial wealth can have very dramatic effects on access to bank finance as it *both* increases the risk aversion of the borrower, as well as the usual affect of raising the amount of the debt that is effectively securitized through borrower collateral. In other words, in our model, a low initial wealth entrepreneur in fact empowers a bank to demand less collateral in order to cause her to choose the less risky strategies. Hence low borrower wealth can inspire the bank to lend to the venture. Thus, through this mechanism, low wealth individuals who can provide at least some collateral would have a greater access to finance than previously supposed. High wealth individuals who can offer much collateral to banks can still pose a problem due to the concavity of the expected utility function which indicates that these individuals will be much less risk averse than the low wealth counterparts. The results also indicate why collateral to debt ratio need not be negatively related to interest rate margins.

REFERENCES

Besanko D. and A.V. Thakor, 1987a. 'Competitive equilibrium in the credit market under asymmetric information'. *Journal of Economic Theory*, v42, n1, pp.167-182.

Besanko D. and A.V. Thakor, 1987b. 'Collateral and rationing: sorting equilibria in monopolistic and competitive credit markets'. *International Economic Review*, v28, n3, pp.671-689.

Bester, H., 1985. 'Screening vs. rationing in credit markets with imperfect information', *American Economic Review*, v75, n4, pp. 850-855.

Bester, H., 1987. 'The role of collateral in credit markets with imperfect information', *European Economic Review*, v31, n4, pp. 887-899.

Black, J., de Meza, D. and Jeffreys, D., 1996. 'House Prices, the Supply of Collateral and the Enterprise Economy', *Economic Journal*, v106, n434, pp. 60-75.

Blanchflower, D. and Oswald, A., 1998. 'What Makes an Entrepreneur?', *Journal of Labor Economics*, v16, n1, pp.26-60.

Boot A.W.A., A.V. Thakor, and G.F. Udell, 1991, 'Secured lending and default risk; equilibrium analysis, policy implications and empirical results', *The Economic Journal*, v101, n3, pp.458-472.

Burke, A.E., FitzRoy, F.R and Nolan, M., (2000). 'When Less is more: Distinguishing Between Entrepreneurial Choice and Performance', *Oxford Bulletin of Economic and Statistics*, v62, n5, pp. 565-587.

Burke A.E., Fitzroy F.R. and Nolan, M.A. (2002), Self-employment Wealth and Job Creation: The Roles of Gender, Non-Pecuniary Motivation and Entrepreneurial Ability, *Small Business Economics*, 19: 255-270.

Churchill, N. and Lewis, V.L., 1986. 'Bank Lending to New and Growing Enterprises', *Journal of Business Venturing*, v1, pp.193-206.

Cressy, R. 1996. 'Are business start-ups debt-rationed?', *The Economic Journal*, v106, n438 (September), pp.1253-1270.

de Meza, D., 2002. ' Overlending?', *Economic Journal*, v112, n477, pp. F17-31.

de Meza, D. and Southey, C., 1996. 'The borrower's curse: Optimism, Finance and Entrepreneurship', *Economic Journal*, v106, n435, pp. 375-386.

de Meza, D. and Webb, D.C., 1987. 'Too much investment: A problem of asymmetric information', *Quarterly Journal of Economics*, v102, n2, pp.281-292.

Evans, D. and Jovanovic, B., 1989. 'An Estimated model of Entrepreneurial Choice under Liquidity Constraints', *Journal of Political Economy*, v97, n4, pp.519-535.

Friedman, M. and Savage, L.J., 1948, The Utility Analysis of Choice Involving Risk, *Journal of Political Economy*, v56, n4, 279-304.

Parker, S. C., 2002, 'Do Banks Ration Credit to New Enterprises? And Should Governments Intervene?', *Scottish Journal of Political Economy*, v49, n2, pp.162-195.

Stiglitz, J.E. and Weiss, A., 1981. 'Credit Rationing Markets with Imperfect Information', *American Economic Review*, v71, n3, pp.393-410.

Taylor, M.,2001. 'Self-Employment and Windfall Gains in Britain: Evidence from Panel Data', *Economica*, v68, n272, pp. 539-565.

Table 1

Expected Profitability and Interest Rate Margin

	Smaller Loans No Collateral	Larger Loans Collateral
Low Wealth: $Z-(1+r)L< 0$ Default Margin	$\partial F/\partial Z = 0: F=L$ $\partial \gamma /\partial Z < 0$ $\partial \Pi /\partial Z < 0$ $\partial r /\partial Z > 0$	$0<F<L: \partial F/\partial Z < 0$ $\partial \gamma /\partial Z > 0$ $\partial \Pi /\partial Z > 0$ $\partial r /\partial Z < 0$
High Wealth $Z-(1+r)L> 0$ Default Margin	$\partial F/\partial Z = 0: F=L$ $\partial \gamma /\partial Z < 0$ $\partial \Pi /\partial Z < 0$ $\partial r /\partial Z> 0$	$0\leq F<L: \partial F/\partial Z= 0$ $\partial \gamma /\partial Z < 0$ $\partial \Pi /\partial Z < 0$ $\partial r /\partial Z> 0$

Figure 1
The Probability of an Entrepreneur Adopting a Low Risk Strategy

$Z-(1+r)L<0: A=0$ $Z-\alpha(1+r)L =A=0$ $A = Z-\alpha(1+r)L>0$