Credit rationing or entrepreneurial risk aversion? An alternative explanation for the Evans and Jovanovic finding

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Abstract

Evans and Jovanovic (‘EJ’) [Evans, D., Jovanovic, B., 1989. An estimated model of entrepreneurial choice under liquidity constraints. Journal of Political Economy 97 (4), 808–827.] claimed that in a credit market with collateral-based lending, credit rationing occurs if more collateral increases startups. Adjusting the model to incorporate uncertainty and decreasing absolute risk aversion, this relationship can be explained as a risk averter’s response to the lowered riskiness of self- over wage-employment. © 2000 Elsevier Science S.A. All rights reserved.

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1. Introduction

Evans and Jovanovic (1989) (henceforth ‘EJ’) showed that in a credit market with certainty and collateral-based lending the presence of credit rationing could be detected by a positive correlation of assets and the rate of business startups.1 By contrast, an earlier paper in this area, Kihlstrom and Laffont (1979) (henceforth ‘KL’), echoing the seminal work of Knight, had postulated an uncertain entrepreneurial environment and individual risk aversion as a central plank in the theory of entrepreneurial choice. Allowing individuals to be distributed by attitudes to risk they found that less risk averse individuals set up in risky business, whilst more risk averse individuals took up more stable wage employment. This awareness of entrepreneurship as a risky activity is moreover, not


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1Or, equivalently, by a negative correlation of assets and business failures.
confined to theory; it has also informed some recent empirical modelling of the choice of self employment versus than paid work over time (see, e.g., Parker, 1996).

Whilst it must be considered a major advance in the literature, the KL model was not devised to examine the influence of credit market imperfections on the switching decision. Accordingly it does not incorporate a role for assets and borrowing behaviour based thereon. However, in the present paper we are by contrast, and like EJ, concerned to evaluate the credit market’s role in the entrepreneurship decision. We, therefore, take the KL risk and risk aversion aspects of entrepreneurship as a key tenet and re-analyse the EJ model with uncertainty and risk aversion incorporated. Unlike KL we allow attitudes to risk to be endogenous, and assume absolute risk aversion decreases with wealth. With this seemingly small change we are able to explain the finding that assets and startups are positively correlated without reference to credit market imperfections. It arises simply from the fact that greater wealth makes the individual more prone to take risks. In effect, if the marginal entrepreneur is risk averse, an increase in assets increases the expected marginal utility of self employment relative to that from their current job causing her to switch into entrepreneurship. This implies the positive correlation observed between assets and birth rates. We conclude that more information (e.g., on risk aversion) is thus required to interpret EJ’s empirical findings and to correctly specify an econometric model of the entrepreneurship decision.2

2. The model

An individual currently in wage employment has known ability as an entrepreneur $\theta$ and assets $z$ and can consider switching to self employment. She works at a fixed wage $w$ and collects interest at rate $r$ on her assets $z$. Alternatively, she can enter business and earn a risky income $y$. If she chooses the latter, she can borrow $k - z$ at a rate of interest $r$ to supplement her initial capital $z$. Gross income from business is either low ($a_1$) or high ($a_2$) with probabilities $p_1$ and $p_2$, respectively. She values income $y$ in both states at a level $U(y)$, where $U$ is a concave utility function. We assume in line with empirical reality that the entrepreneur has unlimited liability enforced by the bank as a consequence of personal guarantees from the entrepreneur herself. Thus, the entrepreneur will incur losses in the bad state of the world that are not removed by legal provision.3

Current wage income of the individual is thus

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2 The potential implications for small firms’ policy of a reinterpretation of the data based on our model are considerable, since much government intervention in the provision of loan guarantees is predicated on the assumption that startups are capital constrained in the manner suggested by EJ.

3 Whilst this assumption might seem to go against the stream of theoretical literature, two facts are worth mentioning. Firstly, much of the literature, whilst making no explicit reference to firm legal type, is actually predicated on the assumption of a limited company. However, most startups and indeed most businesses, are unincorporated (for example, Cressy, 1993, showed that three quarters of startups were unincorporated businesses). Secondly, much of the literature assumes no market power on the part of the bank, which in the case of small firms is also implausible. Whilst we make no attempt to incorporate market power explicitly into the analysis, it is worth noting that the bank’s ability to enforce limited liability via personal guarantees is much less for large than for small firms. (This has been documented in the small firm literature in the form of the proportion of loans that have personal guarantees attached to them — see Binks, 1992.) Even the owners of limited companies who are protected by law at least in theory are subject to this requirement for personal guarantees. Bearing these two considerations in mind, in the present author’s opinion it would be inadvisable to reject realism in favour of academic respectability.
\[ y_0 = w + rz \]  
\[ \tilde{y} = \theta \tilde{a}k - r[k - z] \]

where
\[ \tilde{a} = a_1, a_2 \quad \text{w.p.} \quad p_1, p_2 \text{ resp.} \]

and
\[ a_1 < a_2 \]

Expected utility from wage and self employment is thus
\[ U(y_0) = U(w + rz) \]  
\[ EU(\tilde{y}) = p_1 U(y_1) + p_2 U(y_2) \]

where
\[ y_i = (\theta a_i - r)k + rz \]

The individual’s problem is to choose \( k \) to maximise (6) subject to (7). She will then choose self employment if optimised (6) exceeds (5). The first-order condition for an interior solution is
\[ \frac{\partial EU(\tilde{y})}{\partial k} = p_1 U'(y_1)(\theta a_1 - r) + p_2 U'(y_2)(\theta a_2 - r) = 0 \]

which implies that
\[ - p_1 U'(y_1)(\theta a_1 - r) = p_2 U'(y_2)(\theta a_2 - r) \]

This condition is satisfied as long as
\[ \theta a_1 < r < \theta a_2 \]

which we assume to be the case in what follows. The second-order condition
\[ p_1 U''(y_1)(\theta a_1 - r)^2 + p_2 U''(y_2)(\theta a_2 - r)^2 < 0 \]

is automatically satisfied under the assumption of the concavity of \( U \).

We now demonstrate that under the assumption of decreasing absolute risk aversion, optimal capital and the relative return to entrepreneurship are increasing in assets, \( z \). Thus, wealthier entrepreneurs set up bigger businesses, and the marginal entrepreneur will switch into business with an increase in her assets regardless of the existence or otherwise of capital constraints.

**Proposition 1.** Optimal entrepreneurial capital \( k^* \) is increasing in assets \( z \).

**Proof.** Differentiating the first-order condition totally and rearranging we get
\[
\frac{dk^*}{dz} = \frac{p_2 U_2'' A_2 - p_1 U_1'' A_1}{p_1 U_1'' A_1^2 + p_2 U_2'' A_2^2}
\]  \tag{12}

where
\[
A_1 = -(a_1 - r), \quad A_2 = a_2 - r > 0
\]  \tag{13}

Expression 12 is positive if and only if
\[
p_2 U_2'' A_2 > p_1 U_1'' A_1
\]  \tag{14}

It is easy to show that if \( U \) satisfies decreasing absolute risk aversion (DARA) we must have \( U'' > 0 \). Differentiating \( -U''/U' \), the coefficient of absolute risk aversion we get
\[
\frac{d}{dy} \left( -\frac{U''}{U'} \right) = -\left( \frac{U''U' - (U')^2}{(U')^2} \right) < 0 \quad \text{only if} \quad U'' > 0
\]  \tag{15}

Thus, under the assumption of DARA 14 holds. \( \Box \)

**Proposition 2.** Under DARA utility the relative return to entrepreneurship for the marginal entrepreneur is increasing in individual wealth.

**Proof.** We now want to examine the dependence of indirect utility on the level of assets \( z \). Taking the derivative of (6), with the optimal capital level given by (13), we get, using the envelope theorem:
\[
\frac{dEU^*}{dz} = \frac{\partial EU^*}{\partial z} = [p_1 U_1' + p_2 U_2'] r > 0
\]  \tag{16}

Thus, entrepreneurial utility is increasing in the individual’s assets. So is her wage income:
\[
\frac{dU(y_0)}{dz} = U'(y_0) r > 0
\]  \tag{17}

Consider now the marginal entrepreneur, the individual who is just indifferent between staying in wage employment and switching to self employment. She must satisfy the following budget equation:
\[
EU^* = U(y_0)
\]  \tag{18}

Then the relative marginal return to entrepreneurship will increase in assets if
\[
\frac{\partial EU^*}{\partial z} > \frac{dU(y_0)}{dz}
\]  \tag{19}

Using the definition of \( EU \) and \( U_0 \) this requires that
\[
p_1 U'(y_1) + p_2 U'(y_2) > U'(w + rz)
\]  \tag{20}

i.e., the expected marginal utility of the extra income in entrepreneurship generated by the additional assets should exceed the expected marginal utility of the same increment in wage employment. But
we know from Jensen’s inequality applied to the marginal utility function that this will be the case if the marginal utility function is convex. But from DARA (see (15)) we know that

\[
\frac{d}{dy}(U'') = - \left( \frac{U''U' - (U')^2}{(U')^2} \right) < 0 \quad \text{only if} \quad U'' > 0
\]

and this is equivalent to marginal utility being convex in income. □

3. Conclusion

Evans and Jovanovic (1989) (or ‘EJ’) developed a model that seemed to provide as simple criterion for the existence of credit rationing, namely that credit rationing exists if assets and business startups (business deaths) are positively (negatively) correlated. This was apparently supported by the empirical evidence from a number of studies (Evans and Jovanovic, 1989; Holtz-Eakin et al., 1994a,b; Xu, 1998). Whilst the results have not been exempt from econometric criticism (see Cressy, 1996) the nature of their theoretical model has received less attention (see, however, Xu, 1998). The present paper concentrated on the latter issue and found that it was possible to generate an alternative explanation to credit rationing for the EJ finding. We constructed a model in the EJ vein, but following Kihlstrom and Laffont (1979) allowed for the fact that income in self employment is more risky than in wage employment, and that typically risk aversion will influence the decision to start a business. Unlike Kihlstrom and Laffont, however, we endogenised risk aversion by allowing it to be a decreasing function of wealth. We then showed that the EJ results can then be explained simply by the influence of wealth on attitudes to risk. In effect, if the marginal entrepreneur was risk averse an increase in her assets increased the expected marginal utility of self employment relative to that from their current job. Hence, she would switch. This implied the positive correlation observed between assets and birth rates and the negative correlation of assets and death rates. We concluded that more information (e.g., on risk aversion and income) is thus required to interpret EJ’s (and other’s) empirical findings and to avoid potential bias in empirical estimates.

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