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Consumption-Leisure Preference Structure: A New Explanation of the Evans-Jovanovic Results for Entrepreneurial Choice

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ABSTRACT. This paper extends Evans and Jovanovic's (1989) (EJ) model to explicitly consider the latent entrepreneur's consumption-leisure preference structure, and shows that an increase in his or her assets encourages entrepreneurial activity. This result indicates that EJ's finding may hold without the assumption of liquidity constraints.

1. Introduction

It is well known that Evans and Jovanovic (1989) (henceforth referred to as EJ) developed a model for entrepreneurial activity under liquidity constraints based on Lucas (1978) and Jovanovic (1982). They concluded from the estimated results that there are liquidity constraints due to the significantly positive relationship between the probability of starting a business and the amount of the person's own assets. They stated that: "If one assumes a zero correlation between assets and entrepreneurial ability, our model has two implications." One of their two implications is that "there is a positive correlation between the probability of starting a business and assets *if and only if* there are liquidity constraints" (EJ, p. 819).

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However, Xu (1998) and Quadrini (1999) pointed out the possibility of reverse causality; i.e., the latent entrepreneur may intend to accumulate assets. Cressy (1999) showed that the existence of liquidity constraints is not a necessary and sufficient condition for the existence of a positive relationship between the probability of starting a business and assets. Gentry and Hubbard (2000) indicated that costly external financing (e.g., borrowing from banks) boosts the preference for using the entrepreneur's own assets for financing. Cressy (2000), by introducing business uncertainty into the EJ model, demonstrated that the positive relationship between the probability of starting a business and assets could be explained by the behavior of a risk averter.

This study provides another possible explanation of the EJ results. We develop an entrepreneurial choice model with the latent entrepreneur's consumption-leisure preference structure, based on the EJ model. We then show that an increase in his or her own assets encourages entrepreneurial choice, even without assuming liquidity constraints or business uncertainty.

In the model, entrepreneurs can choose their level of leisure, whereas wage workers cannot. Suppose leisure is normal goods. A wealthy person will wish to consume more of it (as shown in the simulations in Table I), but as a worker he or she cannot do so because the working hours are set institutionally. The wealthy person therefore can gain control over his or her hours by becoming an entrepreneur. Hence wealth and entrepreneurship can be positively related even without liquidity constraints.

The remainder of the paper is structured as follows. Section 2 constructs the model and presents the condition for entrepreneurial choice.

Section 3 provides further analysis on the optimum solution and maximized utility of an entrepreneur. Section 4 solves the model by numerical simulations and reports the results. Section 5 concludes the paper.

2. Theoretical model

EJ assumed the entrepreneur's production function to be

$$y = \theta \times k^{\alpha}\varepsilon, \tag{1}$$

where $\theta \geq 0$ is entrepreneurial ability, $k \geq 0$ is the capital invested in the business, ε is a disturbance, and $0 < \alpha < 1$ is a parameter. EJ and their successors have simply supposed that entrepreneurial ability can be described by a constant value θ. However, the actual effect of potential entrepreneurial ability should vary with the amount of labor input; i.e., the less the entrepreneur works, the less ability he or she tends to exhibit, and the smaller the gain he or she should receive, and vice versa. Thus, this paper generalizes θ so that it varies with the entrepreneur's labor input. In particular, we assume a constant elasticity of the input; i.e.,

$$\theta = \phi(1 - l)^{\rho}, \tag{2}$$

$\phi \geq 0$ is constant and denotes the maximum potential entrepreneurial ability, while $0 \leq l \leq 1$ is the proportion of leisure, and $0 < \rho < 1$ is a parameter.

According to the assumptions of EJ, the entrepreneur has assets $z \geq 0$. If $z < k$, he or she must borrow $k - z$ at the gross interest rate $r \geq 1$ to supplement his or her lack of assets. Hence, the entrepreneur's net income is written as

$$\phi(1 - l)^{\rho} \times k^{\alpha} - r(k - z). \tag{3}$$

To address the latent entrepreneur's trade-off problem between consumption and leisure, we assume a utility function that explicitly takes into account the utility of leisure, which has not been considered by EJ and their successors. Following the formulation of De Fraja (1996), we set up a Cobb-Douglas utility function U for the latent entrepreneur,

$$U(c, l) = c^{\sigma_1} \times l^{\sigma_2}, \tag{4}$$

where $\sigma_1 > 0$ and $\sigma_2 > 0$ are preference parameters.[1]

The utility maximization problem of an entrepreneur is therefore described as

$$\max_{c,\, l} c^{\sigma_1} \times l^{\sigma_2} \tag{5}$$

$$\text{s.t.} \quad c \leq [\phi(1 - l)^{\rho} \times k^{\alpha} - r(k - z)].$$

We denote the solutions by k^* and l^*, and the maximized utility level by U^*. Because, according to (5), all income is consumed under the assumption of strong monotonicity of the utility function, we can write

$$U^* = [\phi(1 - l^*)^{\rho}k^{*\alpha} - r(k^* - z)]^{\sigma_1} \times l^{*\sigma_2}. \tag{6}$$

If $l^* = 1$, the result indicates that the person achieves the highest utility by not working and receiving only property income. In this case, $k = 0$ is optimal, and we can translate (6) to

$$U^* = (rz)^{\sigma_1}. \tag{7}$$

Hereafter, we refer to the person who chooses this option as a "rentier".

Following EJ, we further assume that the latent entrepreneur can choose to be a wage worker. In this case, his or her net income is written as

$$w(1 - l) + rz, \tag{8}$$

where $w \geq 0$ is the wage rate. His or her utility maximization problem is described as

$$\max_{c,\, l} c^{\sigma_1} \times l^{\sigma_2} \quad \text{s.t.} \quad c \leq [w(1 - l) + rz]. \tag{9}$$

In this paper, we suppose that the wage worker cannot choose his or her own working hours; they are exogenously determined institutionally or by his or her employer as $(1 - \bar{l})$. Then, from (9), the maximized utility of a wage worker is described as

$$[w(1 - \bar{l}) + rz]^{\sigma_1} \times \bar{l}^{\sigma_2}. \tag{10}$$

By comparing all three cases, we can obtain the condition for entrepreneurial choice. The person decides to become an entrepreneur if and only if,

$$[\phi(1 - l^*)^{\rho}k^{*\alpha} - r(k^* - z)]^{\sigma_1} \times l^{*\sigma_2} > \max\{[w(1 - \bar{l}) + rz]^{\sigma_1} \times \bar{l}^{\sigma_2}, (rz)^{\sigma_1}\}. \tag{11}$$

3. Maximized utility as an entrepreneur

Of the three terms in (11), two terms on the right side have been solved. However, the term on the

left side has not been presented as a solved form: indeed, though we can derive k^* as

$$k^* = \left[\frac{\alpha\phi(1-l^*)^{\rho}}{r}\right]^{\frac{1}{1-\alpha}}, \tag{12}$$

from the first-order condition of the maximized utility problem (5) in relation to k, it is rather difficult to express l^* in the same way.[2]

Hence, hereafter we focus our analysis and simulations on the case where $\rho = 1 - \alpha$. At first in this section, we examine the utility maximization problem and provide additional analysis on the optimum solution of leisure and invested capital, and maximized utility as an entrepreneur. Then, in section 4, we will conduct numerical simulations under the same condition.

Since we have $\rho = 1 - \alpha$, (12) is written as

$$k^* = \left(\frac{\alpha\phi}{r}\right)^{\frac{1}{1-\alpha}}(1-l^*). \tag{13}$$

From (6), the maximized utility can be converted to a simple form

$$\begin{aligned} U^* &= \left[\phi\left(\frac{\alpha\phi}{r}\right)^{\frac{\alpha}{1-\alpha}}(1-l^*) - \right. \\ &\quad \left.(\alpha\phi)^{\frac{1}{1-\alpha}}\left(\frac{1}{r}\right)^{\frac{\alpha}{1-\alpha}}(1-l^*) + rz\right]^{\sigma_1} \times l^{*\sigma_2} \\ &= [A(1-l^*) + rz]^{\sigma_1} \times l^{*\sigma_2}, \end{aligned} \tag{14}$$

where $A = \frac{1-\alpha}{\alpha} \times (\alpha\phi)^{\frac{1}{1-\alpha}} \times \left(\frac{1}{r}\right)^{\frac{\alpha}{1-\alpha}}$ which is constant.

From the first order condition of (14) in relation to l,

$$l^* = \frac{\sigma_2}{\sigma_1 + \sigma_2}\left(1 + \frac{rz}{A}\right). \tag{15}$$

By inserting (15) into (13) and (14), we have

$$k^* = \left(\frac{\alpha\phi}{r}\right)^{\frac{1}{1-\alpha}} \frac{1}{\sigma_1 + \sigma_2}\left(\sigma_1 - \sigma_2 \frac{rz}{A}\right) \tag{16}$$

$$U^* = \frac{\sigma_1^{\sigma_1}\sigma_2^{\sigma_2}}{(\sigma_1 + \sigma_2)^{\sigma_1 + \sigma_2}} \times \frac{(A + rz)^{\sigma_1 + \sigma_2}}{A^{\sigma_2}}. \tag{17}$$

From (15), (16) and (17), we obtain the following relationships of l^*, k^*, and U^* to the asset z.

$$\begin{aligned} \frac{dl^*}{dz} &= \frac{\sigma_2}{} \times \frac{r}{A} > 0, \\ \frac{dk^*}{dz} &= -\frac{\sigma_2}{} \times \frac{\alpha}{1-\alpha} < 0, \\ \frac{d \ln U^*}{dz} &= \frac{(\sigma_1 + \sigma_2)r}{A + rz} > 0. \end{aligned} \tag{18}$$

Suppose the amount of his or her own assets z increases. Then, the results imply that the optimum leisure ratio l^* increases, and the optimum amount of invested capital k^* decreases while the maximized utility level U^* increases. Above all, the result for k^* intuitively seems paradoxical since it indicates the entrepreneur who has more assets tends to invest less capital to his or her new business.

Next, regarding l^*, two additional properties can be obtained from (15):

$$l^* \geq \frac{\sigma_2}{}, \quad \text{and} \quad l^* < 1 \Leftrightarrow z < \frac{\sigma_1}{} \times \frac{A}{r}. \tag{19}$$

The former result evaluates the minimum value of l^*, and the latter result provides the condition to ensure that l^* is realized within the feasible range.

Furthermore, when we have $\rho = 1 - \alpha$, we may compare the maximized utility (17) as an entrepreneur with the utility $[w(1-\bar{l}) + rz]^{\sigma_1} \times \bar{l}^{\sigma_2}$ as a wage worker and the utility $(rz)^{\sigma_1}$ as a rentier.[3] However, strict analysis comparing their utilities would become too complicated while providing only a little insight, because the primary intention of the model is not to facilitate the algebraic analysis, but to develop a model that directly extends EJ's model, as mentioned in the note 2. Thus, we carry out numerical simulations.

4. Numerical simulations

We solve the model by numerical simulations, along the lines of De Fraja's (1996) approach. Let the exogenous parameters be given by $\rho = 2/3$, $\sigma_1 = 1$, $\sigma_2 = 2/3$, $\alpha = 1/3$, $\phi = 20$, $r = 1$, $w = 40$, $\bar{l} = 1/3$. In this case, based upon (17), (10) and (7), the simulated results for l^*, k^*, and utility levels as an entrepreneur, wage worker, and

rentier, in relation to assets z, are summarized by Table I.[4] The italicized cells show the most preferred option of the three alternatives according to the asset z. The table shows three important results. (i) First, the optimal leisure ratio l^* increases and the optimal capital k^* decreases, as z increases. These solutions gradually approach $l^* = 1$ and $k^* = 0$ (i.e., a rentier situation). (ii) In the case of an entrepreneur, a wage worker, and a rentier, the maximized utility increases as z increases. (iii) If assets are less than 12.71, the latent entrepreneur chooses to be a wage worker; if assets are between 12.71 and 51.5, he or she chooses to be an entrepreneur; and if assets are 51.5 or over, he or she chooses to be a rentier and receives only property income.

The first and second results in (iii), which is that a person prefers to be an entrepreneur rather than a wage worker if the value of his or her assets exceeds some break-even point, provides another possible explanation of the EJ finding. The result indicates that an increase in assets encourages entrepreneurial choice without the assumption of liquidity constraints. This result is mainly derived from the assumptions that the production function includes entrepreneur's labor inputs, the utility function includes leisure, and the working hours of a wage worker are determined exogenously.[5]

The last result in (iii), which is that a person prefers to be a rentier if he or she has sufficient assets, seems to have some validity, except for the possibility that the latent entrepreneur is influenced by the income tax system, as discussed by Gordon (1998). That is, a rentier may set up firms to seek the relative advantages of the corporate income tax system over the personal income tax system. In fact, the EJ result (Table 2, p. 819) shows that the effect of a latent entrepreneur having their own assets describes a quadratic concave curve peaking at $265,000, which indicates that too much wealth deters a person from becoming an entrepreneur (see also the results of Holtz-Eakin et al., 1994; and Blanchflower and Oswald, 1998). These wealthy people, however, must be a quite small proportion of the whole.

5. Conclusions

In this paper, we extended the EJ model to explicitly consider the latent entrepreneur's consumption-leisure preference structure, and showed that he or she prefers to be an entrepreneur rather than a wage worker if his or her assets exceed some break-even point. This result indicates that the EJ finding may hold without the assumptions of liquidity constraints made in EJ or of business uncertainty made in Cressy (2000).

To present as clear an argument as possible, we developed a model, and simulations, that were very simple. However, it is true that there are entrepreneurs who are wealthier, and yet take far less leisure than the average wage workers. This could partly be explained by differences between parameters in the functions, whereas some extension of the model would be required to deal completely with variations between entrepreneurs. Our

TABLE I
Simulation results

	l^*	k^*	Maximized utility		
			as an entrepreneur	as a wage worker	as a rentier
$z = 0$	0.4000	10.3280	11.2138	*12.8200*	0
$z = 5$	0.4581	9.3280	14.0576	*15.2237*	5
$z = 10$	0.5162	8.3279	17.1527	*17.6275*	10
$z = 12.71$	0.5477	7.7860	*18.9318*	18.9303	12.71
$z = 15$	0.5743	7.3280	*20.4894*	20.0312	15
$z = 20$	0.6324	6.3280	*24.0591*	22.4350	20
$z = 51.49$	0.9983	0.0294	*51.4901*	37.5738	51.49
$z = 51.5$	1	0	–	37.5786	*51.50*

Note: The italicized cells show the most preferred option of the three alternatives.

aim in this paper is limited to the questions addressed by our model. Further research is required to deal with these other problems.

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Notes

[1] De Fraja (1996) studied the problem of choosing between becoming an entrepreneur and a manager with business uncertainty. The former retains the right of receiving residual returns while the latter receives a performance related salary by an outside investor. The paper assumed a Cobb-Douglas utility function, which consists of the two factors of consumption and leisure, and, by numerical simulations, it showed that either choice may be preferred.

[2] The complexity arises because our primary intention was to develop a model that directly extends EJ's model. Although there may be room for further improvement, probably such a model must depart from the EJ model.

[3] For example, a comparison of the slopes of the utility functions of the entrepreneur and the wage worker is described as follows. From (10) and (17),

$$\frac{d}{dz}\ln\left(\frac{U^*}{[w(1-\bar{l})+rz]^{\sigma_1}\times}\right) = \frac{(\sigma_1+\sigma_2)r}{A+rz} - \frac{\sigma_1 r}{w(1-\bar{l})+rz}. \quad (20)$$

This takes a positive value if asset z is more than $B = \frac{\sigma_1 A - (\sigma_1+\sigma_2)w(1-\bar{l})}{\sigma_2 r}$, while it is negative if z is less than B. When $w(1-\bar{l})$ is more than $\frac{\sigma_1}{\sigma_2(\sigma_1+\sigma_2)}\times\frac{A}{r}$, B becomes a negative value, and thus (20) indicates a positive value in the entire range of possible values of z, which is greater than or equal to 0. The numerical example presented in section 4 is such a case.

[4] Under these settings of the parameters, A in (14) is approximately 34.43, and B in note 3 is approximately −15.02.

[5] The last term is intuitively understood to mean that the person has more advantages for achieving a higher utility level if he or she can choose his or her working hours at will. A further explanation is provided as follows. The form $[A(1-l^*)+rz]^{\sigma_1}\times l^{*\sigma_2}$ in (14), which is the maximized utility of an entrepreneur, presents the same form as $[w(1-\bar{l})+rz]^{\sigma_1}\times\bar{l}^{*\sigma_2}$ in (10), which is the maximized utility of the wage worker, except for the term of A and w. Therefore, if persons can choose their working hours as a wage worker, the difference in the utility level of an entrepreneur and a wage worker depends only on whether the value of A or w is larger. The amount of z has no effect on the preference between these situations (i.e., $\max_l[A(1-l)+rz]^{\sigma_1}\times l^{\sigma_2} \Leftrightarrow \max_l[w(1-l)+rz]^{\sigma_1}\times l^{\sigma_2}$ if $A \Leftrightarrow w$). Consequently, the assumption of the exogenity of the working hours of the wage worker is required.

References

Blanchflower, David G. and Andrew Oswald, 1998, 'What Makes an Entrepreneur?', *Journal of Labor Economics* **16**(1), 26–60.

Cressy, Robert, 1999, 'The Evans and Jovanovic Equivalence Theorem and Credit Rationing: Another Look', *Small Business Economics* **12**(4), 295–297.

Cressy, Robert, 2000, 'Credit Rationing or Entrepreneurial Risk Aversion? An Alternative Explanation for the Evans and Jovanovic Finding', *Economics Letters* **66**(2), 235–240.

De Fraja, Gianni., 1996, 'Entrepreneur or Manager: Who Runs the Firm?', *Journal of Industrial Economics* **44**(1), 89–98.

Evans, David and Boyan Jovanovic, 1989, 'An Estimated Model of Entrepreneurial Choice under Liquidity Constraints', *Journal of Political Economy* **97**(4), 808–827.

Gentry, William M., R. Glenn and G. Hubbard, 2000, 'Entrepreneurship and Household Saving', NBER Working Paper 7894.

Gordon, Roger H., 1998, 'Can High Personal Tax Rates Encourage Entrepreneurial Activity?', *International Monetary Fund Staff Papers* **45**(1), 49–80.

Holtz-Eakin, Douglas, David Joulfaian and Harvey S. Rosen, 1994, 'Sticking It Out: Entrepreneurial Survival and Liquidity Constraints', *Journal of Political Economy* **102**(1), 53–75.

Jovanovic, Boyan, 1982, 'Selection and the Evolution of Industry', *Econometrica* **50**(3), 649–670.

Lucas, Robert E., 1978, 'On the Size Distribution of Business Firms', *Bell Journal of Economics* **9**(2), 508–230.

Quadrini, Vincenzo, 1999, 'The Importance of Entrepreneurship for Wealth Concentration and Mobility', *Review of Income and Wealth* **45**(1), 1–19.

Xu, Bin, 1998, 'A Re-Estimation of the Evans-Jovanovic Entrepreneurial Choice Model', *Economics Letters* **58**(1), 91–95.