



## Credit rationing or entrepreneurial risk aversion? A comment



Claudio A. Bonilla<sup>a,\*</sup>, Marcos Vergara<sup>b</sup>

<sup>a</sup> University of Chile, Chile

<sup>b</sup> Universidad del Desarrollo, Chile

### HIGHLIGHTS

- Cressy (2000)'s results can be generalized.
- Prudence guarantees a positive correlation between assets and entrepreneurship.
- Prudence is consistent with DARA, IARA or CARA.
- Under IARA preferences, wealth and substitution effects have opposite directions.
- Prudence guarantees that in IARA the wealth effect offsets the substitution effect.

### ARTICLE INFO

#### Article history:

Received 13 December 2012

Received in revised form

3 May 2013

Accepted 4 May 2013

Available online 10 May 2013

#### JEL classification:

M2

M13

G3

L2

#### Keywords:

Credit rationing

Risk aversion

Prudence

Entrepreneurship

### ABSTRACT

Cressy (2000) argues that the positive correlation between assets and the rate of business startups is due to DARA preferences. We show however that the required property is prudence, and prudence is consistent with DARA, IARA or CARA.

© 2013 Elsevier B.V. All rights reserved.

## 1. Introduction

Cressy (2000) argues that the positive correlation between assets and the rate of business startups is due to decreasing absolute risk aversion (DARA) preferences. The intuition behind these results is straightforward. The more assets a decision maker owns, the less risk averse he becomes. In consequence, as assets increase, more decision makers will switch from being employees to risky self-employment (entrepreneurial activities), thus increasing the rate of business startups.

Cressy's idea is significant because he incorporates uncertainty into the entrepreneurial decision (Khilstrom and Laffont, 1979) and challenges the classic empirical contribution of Evans and

Jovanovic (1989), which asserts that the positive correlation between assets and entrepreneurship is due mainly to credit rationing in a collateral-based lending environment. Evans and Jovanovic argue that as the economy develops, the greater quantity of assets relaxes the credit-rationing constraint for some individuals, increasing their likelihood of obtaining financing to develop startups and therefore increasing the chances that they will switch to self-employment.

We discuss Cressy's paper, showing that his results are not in fact based on DARA preferences. Prudence is the only requirement for his conclusions to be true. However, prudence is consistent with DARA, IARA or CARA. We provide the intuition behind why, even under IARA preferences, more business startups occur when assets increase.

## 2. A sketch of Cressy's main result

An individual decision maker has a known entrepreneurial ability  $\theta$  and assets  $z$ . He can enter self-employment and earn a

\* Correspondence to: Diagonal Paraguay 257, Suite 1304, Santiago de Chile, Chile. Tel.: +56 2 2 9783331; fax: +56 2 9783326.

E-mail address: [cbonilla@fen.uchile.cl](mailto:cbonilla@fen.uchile.cl) (C.A. Bonilla).

risky net income  $\tilde{y}$  by borrowing  $k - z$  at interest rate  $r$ , obtaining a stochastic gross income that may be low ( $a_1$ ) or high ( $a_2$ ) with probabilities of  $p_1$  and  $p_2$ , respectively. Let  $u$  be a concave (risk-averse) utility function, where  $u' > 0$  and  $u'' < 0$ . The decision maker will choose the value of  $k$  that maximizes his expected utility given by

$$Eu(\tilde{y}) = p_1u(y_1) + p_2u(y_2) = p_1u(\theta a_1k - r(k - z)) + p_2u(\theta a_2k - r(k - z)). \tag{1}$$

The first-order conditions (FOC) of (1) are given by

$$p_1u'(y_1)[\theta a_1 - r] + p_2u'(y_2)[\theta a_2 - r] = p_1u'(y_1)[-A_1] + p_2u'(y_2)[A_2] = 0 \tag{2}$$

where  $A_1$  and  $A_2$  are positive since it is assumed that  $\theta a_1 < r < \theta a_2$ , and the assumption that  $u'' < 0$  guarantees the second order condition (SOC) will be negative.

If we call (2)  $F(k^*, r, z, \theta, a_1, a_2) = 0$ , then, by applying the implicit function theorem, we have

$$\frac{\partial k^*}{\partial z} = -F_z/F_k = -r[p_1u''(y_1)(-A_1) + p_2u''(y_2)(A_2)]/SOC. \tag{3}$$

For (3) to be positive, the expression  $p_1u''(y_1)(-A_1) + p_2u''(y_2)(A_2)$  must be positive, which is equivalent to having  $p_1u''(y_1)A_1 < p_2u''(y_2)A_2$ , and since  $y_1 < y_2$  because  $a_1 < a_2$ , this condition is true only if  $u''' > 0$ , that is, if  $u'$  is a convex function. Therefore,  $u''' > 0$  guarantees that  $\partial k^*/\partial z > 0$ , which means that more assets lead to increased business startups.

From this result, Cressy develops his theory to explain the positive correlation between assets and entrepreneurship, arguing that DARA preferences guarantee  $u''' > 0$ . The problem with this claim is that proving  $u''' > 0$  must hold in order for assets to increase startups rates does not mean that preferences must be DARA.  $u''' > 0$  is in fact consistent with DARA, IARA or CARA preferences, as has previously been shown in the literature (Kimball, 1990, Eeckhoudt et al., 2005).

**3. Prudence**

$u''' > 0$  is a property denoted as prudence in decision making under uncertainty. The term was coined by Kimball (1990) and is related to third-order risk effects on preferences (Menezes et al., 1980). As an example, in the context of intertemporal savings under uncertainty, prudence ensures that in the face of an increase in the risk of future income (such as the introduction of an independent background risk), the decision maker will increase saving in the present. In the words of Eeckhoudt and Schlesinger (2006), “we are more willing to accept an extra risk when wealth is higher, rather than when wealth is lower”. This explains why the wealthier we get, the more risky investment we undertake (Dreze and Modigliani, 1972) and the more likely we are to become entrepreneurs (Cressy, 2000).

Pratt (1964) offers a good example of a prudent ( $u''' > 0$ ), risk-averse utility function that possesses the IARA property. Consider the following preferences:

$$u(x) = -(b - x)^c \tag{4}$$

with  $x \leq b$  and  $c \geq 2$ . Observe that the Arrow–Pratt absolute risk-aversion coefficient is given by  $r(x) = (c - 1)/(b - x)$  and it is increasing in  $x$  since  $\partial r(x)/\partial x = (c - 1)/(b - x)^2 > 0$ . However, these preferences are also prudent because  $u''' = c(c - 1)(c - 2)(b - x)^{c-3} > 0$ . Therefore, we have a risk-averse utility function that is IARA and prudent at the same time. Which means that Cressy’s argument is not wrong, merely incomplete.  $u''' > 0$  also requires an argument for IARA preferences that results in an increase in business startups when assets are increasing.<sup>1</sup>

<sup>1</sup> Following Eeckhoudt et al. (2005), the degree of absolute prudence relative to the degree of absolute risk aversion defines whether the preferences are DARA or

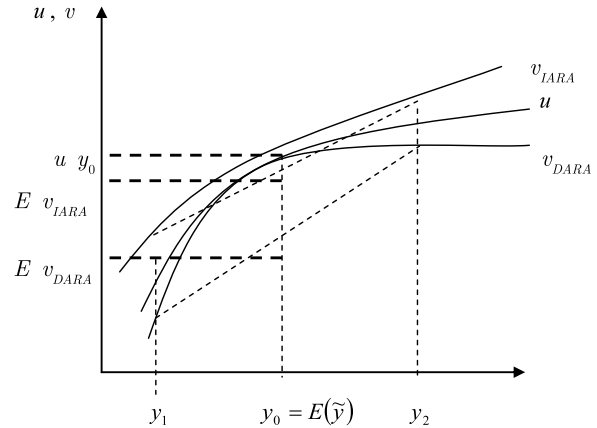


Fig. 1. Risk aversion.

**4. Completing Cressy’s argument**

Kimball (1990) develops an analysis based on Dreze and Modigliani (1972) regarding how the effect of an income risk can be divided into two effects on present consumption, a wealth effect and a substitution effect. In a simple two-period model, when a risk-averse and prudent individual faces an increase in income risk, first-period consumption decreases and precautionary savings takes place. The first component of the reduction in the first-period consumption is associated with the level of consumption consistent with the reduction of utility due to the increase in income risk. This is the wealth effect and is always negative for first-period consumption. The reduction of first-period consumption beyond what is expected by looking at the utility reduction due to the increase in income risk is the substitution effect.

Dreze and Modigliani (1972) showed that the substitution effect is negative under DARA preferences and positive under IARA preferences. Prudence, however, guarantees the precautionary savings effect and therefore also ensures that with IARA preferences, if the two effects have opposite signs the wealth effect will be larger than the substitution effect.

The same logic applies in our entrepreneurial context. Prudence guarantees that even with IARA preferences, an increase in individuals’ assets brings about an increase in business startups. The reason is that the positive wealth effect on entrepreneurship is larger than the negative substitution effect due to the increase in risk aversion experienced by the now-wealthier decision makers.

The above intuition is illustrated in Figs. 1 and 2. Let  $-u'(w) = v(w)$ ,  $P(w)$  be the concavity of  $v(w)$  and  $A(w)$  be the concavity of  $u(w)$ . If an individual has DARA preferences, then  $v(w)$  is more averse than  $u(w)$ . In the IARA case, the opposite is true.

In marginal utility space as shown in Fig. 2, DARA preferences are more convex than IARA, which means that  $E(u'_{DARA}) > E(u'_{IARA}) > u'(y_0)$ . This intuition goes beyond Proposition 2 in Cressy’s paper. As he states, the relative return to entrepreneurship is increasing in individual wealth for the marginal entrepreneur, but in addition, the effect is stronger in the case of DARA than IARA.

**5. Conclusions**

This paper extended Cressy’s argument to provide a more complete intuitive explanation of his results. It was shown that

IARA. Let  $P(w) = -u'''/u'$  be the absolute prudence and  $A(w) = -u''/u'$  the degree of absolute risk aversion. Then  $A'(w) = A(w)[A(w) - P(w)]$  defines the type of preferences.

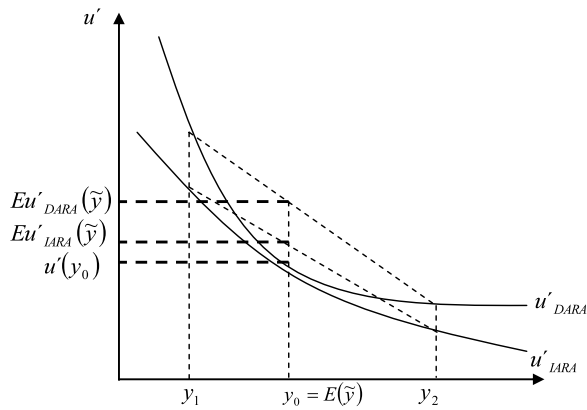


Fig. 2. Prudence, DARA and IARA.

prudence is the only requirement for the utility function to ensure that there is an increase in business startups when assets increase, regardless of whether preferences are DARA, IARA or CARA.

Since prudence captures two effects, the wealth effect in our context of increasing assets induces an increase in the level of investment and therefore also in startups. In the case of DARA, the substitution effect operates in the same direction as the wealth

effect, but in the case of IARA the two effects operate in the opposite directions. Prudence, however, guarantees that the wealth effect always offsets the substitution effect in the IARA case, and since it is a less restrictive condition than DARA, it is a sufficient requirement for obtaining Cressy's results.

## References

- Cressy, R., 2000. Credit rationing or entrepreneurial aversion? An alternative explanation for the Evans and Jovanovic finding. *Economics Letters* 66 (2), 235–240.
- Dreze, J., Modigliani, F., 1972. Consumption decisions under uncertainty. *Journal of Economic Theory* 5, 308–335.
- Eckhoudt, L., Gollier, C., Schlesinger, H., 2005. *Economic and Financial Decisions under Risk*. Princeton University Press.
- Eckhoudt, L., Schlesinger, H., 2006. Putting risk in its proper place. *American Economic Review* 96 (1), 280–289.
- Evans, D.S., Jovanovic, B., 1989. An estimated model of entrepreneurial choice under liquidity constraints. *Journal of Political Economy* 97 (4), 808–827.
- Khilstrom, R., Laffont, J.J., 1979. A general equilibrium entrepreneurial theory of firm formation based on risk aversion. *The Journal of Political Economy* 87 (4), 719–748.
- Kimball, M., 1990. Precautionary savings in the small and in the large. *Econometrica* 58, 53–73.
- Menezes, C., Charles, G., Tressler, J., 1980. Increasing downside risk. *American Economic Review* 70 (5), 921–932.
- Pratt, J., 1964. Risk aversion in the small and in the large. *Econometrica* 32 (1–2), 122–136.