E C O N O M I C S B U L L E T I N

Which firms do the entrepreneurs come from?

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Abstract

Entrepreneurs who found new firms tend to work as employees in small rather than large firms prior to start-up and have previous experience of entrepreneurship. We provide a model of self-selection based on heterogeneous risk preferences which can explain these stylized facts.

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1. Introduction

Recent research has shown that entrepreneurs who found new firms tend to work as employees of small rather than large firms prior to start-up (Boden, 1996; Wagner, 2004), and to have had previous experience of entrepreneurship (Evans and Leighton, 1989; van Praag and van Ophem, 1995). While a possible explanation of the first of these facts is that small firms have a comparative advantage in furnishing their employees with productive experience which is conducive to entrepreneurship, there is presently no direct evidence demonstrating this to be the case. Nor is it the only possible explanation: this article explores an alternative one, whereby individuals possess different degrees of risk aversion, with less risk-averse individuals self-selecting into small firms and entrepreneurship at different stages of their lives.[1] As we will show, this explanation tallies with both of the stylised facts outlined above, without requiring strong assumptions about technology and skills. And, by proposing a new theory of the entrepreneurship-firm size relationship, the prospect of a lively future empirical research agenda emerges.

Section 2 sets up the model, and Section 3 uses it to derive a sequence of results regarding the sorting of workers between large and small firms, and the identities of the workers who become entrepreneurs. Section 4 concludes with a very brief sketch of how empirical researchers might test the new theory against the alternative one of productive experience conveyed by small firms.

2. The Model: Assumptions and Notation

The economy comprises three types of firm: 'large', 'small', and 'outside'. These three types are discrete and have the following characteristics. Large firms are protected by entry barriers, so neither small firm owners nor their employees can become large firms. Occupational choice between being a small

[1] Kihlstrom and Laffont (1979) were the first to recognise that less risk-averse individuals would prefer risky entrepreneurship to less risk-averse entrepreneurship, but they did not explore the firm-size/entry issue.

firm owner and a worker is limited by the existence of product niches. Each small firm owner profitably exploits one and only one niche. The total number of niches is initially fixed, preventing entry into small firms; later on we study occupational choice when the number of niches increases exogenously.[2] Large firms maximize expected returns, either because they are risk neutral or because they are fully diversified. In contrast, small firm owners and workers are risk averse and maximize expected utility, having utility functions $U(x; r)$, where x is the (possibly state-dependent) payoff and r indexes risk aversion (see below). The third type of firm, called 'outside firms', offers workers a fixed wage $w > 0$.

Workers produce output in a single period by exerting contractible effort (an assumption that can be relaxed — see below) and produce a high level of output $\overline{S}$ with a common exogenous probability $\pi \in [0, 1]$ and a low level of output $\underline{S}$ with probability $1 - \pi$, where $\overline{S} > \underline{S} > 0$. Owners receive the output and remunerate workers with transfers, derived below, denoted by t^* if they are state-independent, and by $(\overline{t}^*, \underline{t}^*)$ if they are state-dependent. More workers just scale up firm owners' total output, so a worker can always match with an owner. All actors have complete information apart from future realizations of $\tilde{S} \in \{\overline{S}, \underline{S}\}$. To make the problem interesting, we assume that small business owners cannot perfectly smooth their incomes via a stock market or comprehensive income insurance — as observed in practice.

There are two types of worker in the economy, who differ only in terms of their risk aversion; in all other respects they are identical. The type of a worker is indexed by r, where $r \in \{\alpha, \beta\}$. Workers with $r = \beta > \alpha$ have greater risk aversion than workers with $r = \alpha$. We will write the transfers received by workers of a given type by t_r^* [or $(\overline{t}_r^*, \underline{t}_r^*)$]. The owners of small firms have risk aversion $\gamma > 0$. Denote by ψ_r a worker r's expected utility from the next best alternative occupation to being a worker in their chosen firm; the values of the $\{\psi_r\}$ are endogenous and will be derived below.

Two final assumptions rank the payoffs from being owners or workers. First we stipulate

$$\text{A1}: \qquad \overline{S} - \overline{t}_r^* > \underline{S} - \underline{t}_r^* \geq \overline{t}_r^* \geq \underline{t}_r^* \qquad \text{for each } r\,.$$

Thus net profits from being a firm owner in the good state exceed those in the bad state, which in turn exceed worker's wages in the good state.[3] Second,

[2]Niches could alternatively be replaced with a market imperfection such as borrowing constraints, in which only the richest and least risk-averse individuals have access to and a preference for entrepreneurship. While this would generate qualitatively similar results, the advantage of constructing a model with niches rather than borrowing constraints is that one can abstract from secondary issues related to credit markets.

[3]In fact, this assumption is stronger than we need, which is that all individuals receive

we assume that

$$\text{A2}: \qquad \gamma = \min\{\alpha, \beta\} = \alpha\,,$$

i.e., small firm owners are as risk averse as the least risk-averse worker. Given A1, assumption A2 ensures that the expected utility of being an owner is unambiguously higher than that of a worker: i.e., entrepreneurial niches are valuable.

3. The Model: Assumptions and Notation

The first two parts of this section focus on the allocation of workers to firms when the number of product niches is fixed. The third part establishes which firms generate the entrepreneurs when the number of niches increases.

3.1 Offered contracts

The small firm owner designs a contract for agents with risk aversion r that solves the following problem:

$$\max_{\{(\bar{t}_r, \underline{t}_r)\}} \quad \pi U(\overline{S} - \bar{t}_r; \gamma) + (1-\pi)U(\underline{S} - \underline{t}_r; \gamma) \tag{1}$$

$$\text{s.t.} \quad \pi U(\bar{t}_r; r) + (1-\pi)U(\underline{t}_r; r) \geq \psi_r \tag{2}$$

where (1) is the expected utility of the owner and (2) is worker r's participation constraint.

Let λ denote the Lagrange multiplier for this concave programming problem. The first order conditions are:

$$-\pi U'(\overline{S} - \bar{t}_r^*; \gamma) + \lambda \pi U'(\bar{t}_r^*; r) = 0 \tag{3}$$

$$-(1-\pi)U'(\underline{S} - \underline{t}_r^*; \gamma) + \lambda(1-\pi)U'(\underline{t}_r^*; r) = 0 \tag{4}$$

From (3) and (4) it follows that

$$\lambda = \frac{U'(\overline{S} - \bar{t}_r^*; \gamma)}{U'(\bar{t}_r^*; r)} = \frac{U'(\underline{S} - \underline{t}_r^*; \gamma)}{U'(\underline{t}_r^*; r)} > 0 \tag{5}$$

$$\frac{U'(\bar{t}_r^*; r)}{U'(\underline{t}_r^*; r)} = \frac{U'(\overline{S} - \bar{t}_r^*; \gamma)}{U'(\underline{S} - \underline{t}_r^*; \gamma)} \tag{6}$$

It follows from (5) that the constraint (2) binds and can be imposed as an equality below. However, the trial solution $\bar{t}_r^* = \underline{t}_r^*$ does not allow (5) to hold with equality, so we must have $\bar{t}_r^* > \underline{t}_r^*$. Hence there is incomplete insurance

unambiguously higher *expected* payoffs as an owner than as a worker. That ensures there will be market entry (i.e., entrepreneurship) when the number niches expands.

across states for both small firm owners and workers. In contrast, the risk-neutral large firm owner optimally sets $\overline{t}_r^* = \underline{t}_r^* = t_r^*$, i.e., they completely insure their workers.

3.2 Allocation of workers to firms

Next we study the participation constraints in greater detail and derive an equilibrium allocation of workers to firms. Recall that there are two types of worker (α and β) and three types of firm (small — with risk averse owners; large — with risk neutral owners; and outside — offering a fixed wage w). Suppose to start with that the less risk-averse α types are employed by small firms, while the more risk-averse β types are employed by large firms, so we can define two compensation contracts $\Gamma_\alpha := (\overline{t}_\alpha^*, \underline{t}_\alpha^*)$ and $\Gamma_\beta := t_\beta^*$. Consider a deviation from this rule, whereby β types covet the contract Γ_α. This contract would have to satisfy

$$EU(\Gamma_\alpha; \beta) \geq U(\Gamma_\beta; \beta)\,, \tag{7}$$

where E is the expectations operator. As $\beta > \alpha$, it follows using (6) that

$$\frac{U'(\overline{t}_\alpha^*; \beta)}{U'(\underline{t}_\alpha^*; \beta)} < \frac{U'(\overline{t}_\alpha^*; \alpha)}{U'(\underline{t}_\alpha^*; \alpha)} = \frac{U'(\overline{S} - \overline{t}_\alpha^*; \gamma)}{U'(\underline{S} - \underline{t}_\alpha^*; \gamma)} \tag{8}$$

Γ_α is not optimal for β types because it offers them too little insurance: (7) cannot hold. But an alternative contract $\Gamma_\beta^\Delta := (\overline{t}_\beta^*, \underline{t}_\beta^*)$ such that $EU(\Gamma_\beta^\Delta; \beta) \geq U(\Gamma_\beta; \beta)$ must have $\overline{t}_\beta^* < \overline{t}_\alpha^*$ and $\underline{t}_\beta^* > \underline{t}_\alpha^*$, because of the greater concavity of the utility function of β types. However, risk-averse small firm owners will not accept this because $EU(\tilde{S} - \Gamma_\beta^\Delta; \gamma) < EU(\tilde{S} - \Gamma_\alpha; \gamma)$: i.e., the alternative contract that suits β types leaves the small firm owners bearing too much risk. Hence the contracts sought by β types in small firms are always dominated by the contracts that α types would take.

Would α types want to deviate from the contract Γ_α? Large firm owners have the incentive to reduce Γ_β until the participation constraint (2) holds with equality for βs: i.e., until $U(\Gamma_\beta; \beta) = \psi_\beta = EU(\Gamma_\alpha; \beta)$. Because $\alpha < \beta$ $\Rightarrow EU(\Gamma_\alpha; \alpha) > EU(\Gamma_\alpha; \beta)$, it follows that[4]

$$EU(\Gamma_\alpha; \alpha) > U(\Gamma_\beta; \alpha)\,, \tag{9}$$

i.e., α types will not covet the other contract, Γ_β. Finally, consider a contract t_α^* that α types would find acceptable in large firms. This would have to satisfy

$$EU(\Gamma_\alpha; \alpha) \leq U(t_\alpha^*; \alpha) \tag{10}$$

[4]Strictly speaking, the inequality in (9) requires only marginal differences in risk aversion between the types such that $U(x; \alpha) \approx U(x; \beta)$ for any *certain* payoff x.

But by comparing (9) and (10), this requires $t^*_\alpha > t^*_\beta$. Hence the contracts sought by α types in large firms are always dominated (outbid) by the contracts that β types would take.

This establishes that α types match with small firms and receive Γ_α, while β types match with large firms and receive Γ_β. To complete the characterization of equilibrium, notice that by offering $w > 0$, the outside firm enables large firm owners to force t^*_β down as far as, but no further than, w, so $\psi_\beta = U(w;\beta)$. Thus βs receive $\Gamma_\beta = t^*_\beta = w$ from large firm owners, and are indifferent between working for a large or an outside firm. Likewise for α types the equality $EU(\Gamma_\alpha;\alpha) = \psi_\alpha = U(w;\alpha)$ together with (3) and (4) determine (Γ_α, λ), where $\overline{t}^*_\alpha > t^*_\beta > \underline{t}^*_\alpha$. This constitutes a competitive separating equilibrium because none of the owners or workers has any incentive to deviate from it.

Finally, we note that this separating equilibrium is robust to introducing non-contractible worker effort into the model. A formal analysis of this moral hazard problem is provided by Parker (2006): the basic logic of the solution is that both small and large firm owners must make wages more variable when effort is non-contractible in order to elicit high levels of effort from their workers. However, small firm owners still provide less insurance to their workers than large firm owners do, so once again, less risk-averse workers match with small firm owners (principals). Thus our matching results are robust to this extension of the model.

3.3 Which firms do entrepreneurs come from?

When a new niche becomes available, all workers have the opportunity to set up a firm in an attempt to establish the dominant firm in the niche. Competition ensures that the dominant firm is drawn from among the set of entrepreneurs with the lowest costs. To determine the characteristics of the lowest cost entrepreneurs, suppose first that the potential entrant has relatively high risk aversion of $\delta > \gamma$. For these individuals

$$\frac{U'(\overline{t}^*_\alpha;\alpha)}{U'(\underline{t}^*_\alpha;\alpha)} = \frac{U'(\overline{S}-\overline{t}^*_\alpha;\gamma)}{U'(\underline{S}-\underline{t}^*_\alpha;\gamma)} > \frac{U'(\overline{S}-\overline{t}^*_\alpha;\delta)}{U'(\underline{S}-\underline{t}^*_\alpha;\delta)}\,. \tag{11}$$

Analogous to (8), to equate the first and third terms of (11) it is necessary to change the transfers from Γ_α to something else. Denote the transfers offered to α workers by owners with risk aversion δ by $\Gamma_{\alpha\delta} = (\overline{t}^*_{\alpha\delta}, \underline{t}^*_{\alpha\delta})$, to distinguish them from those (namely Γ_α) offered by owners with risk aversion $\gamma < \delta$. Then it follows that $\overline{t}^*_{\alpha\delta} > \overline{t}^*_\alpha$ and $\underline{t}^*_{\alpha\delta} < \underline{t}^*_\alpha$. But then $EU(\Gamma_\alpha;\alpha) > EU(\Gamma_{\alpha\delta};\alpha)$ for all risk averse α workers. Hence no α workers would work for δ owners: all would prefer to work for γ owners. Effectively, δ owners ask their workers

to bear an unacceptable amount of risk compared with what is available elsewhere. The only way that a δ individual could attract workers is by incorporating a risk premium into the contract; but this makes them a higher cost producer than a γ type.

Hence for new entrants to compete they must have risk aversion $\delta \leq \gamma$. From A2 earlier $\gamma = \alpha < \beta$, so if new niches are to be exploited at all, $\delta = \alpha = \gamma$. Clearly, α types are lower cost producers in the new niche than β types are, since α types do not have to pay their workers the risk premium that β types do; hence the new entrepreneurs are the less risk-averse α types, who have the same risk attitudes as incumbent small firm owners.[5] These α types have already sorted themselves into small firms, as established earlier: hence small firms generate the entrepreneurs, as observed empirically by previous researchers (Boden, 1996; Wagner, 2004).

The foregoing logic can also be used to predict that if the number of niches declines, the entrepreneurs who exit return to work as employees in small firms. So if the number of entrepreneurial opportunities then expanded again, these workers, with experience of business ownership — but more fundamentally, with low risk aversion — are more likely to re-enter business ownership than workers without this experience (which includes employees of large firms). Hence one would expect to observe a positive association between previous experience of entrepreneurship and the likelihood of entry into entrepreneurship — even in the absence of any productivity-enhancing benefit from experience. Numerous previous empirical studies have detected an association of this kind (Evans and Leighton, 1989; van Praag and van Ophem, 1995).

4. Future research

This article has proposed a new self-selection theory about where entrepreneurs come from. Empirical research is now needed to test the theory against alternative explanations, including one based on the idea that small firms have a comparative advantage in furnishing their employees with productive experience which is conducive to entrepreneurship.

The data needed to test the competing theories is a panel survey which elicits responses about worker, firm and job characteristics from a random sample of respondents. Panel data are necessary in order to track employees observed to work in small or large firms in one period making transitions into entrepreneurship subsequently. Binary choice econometric models can then be used to test the self-selection hypothesis by estimating whether personal

[5] The prediction that less risk-averse individuals are likelier to become entrepreneurs accords with a growing body of empirical evidence (van Praag *et al*, 2002; Ekelund *et al*, 2005).

characteristics associated with risk attitudes (e.g., responses to hypothetical gambling questions as in PSID 1996 or risky lifestyle choices as in Brown *et al*, 2006) are significantly related to transitions to entrepreneurship. Likewise, the hypothesis that small firms promote entrepreneurship by giving their employees useful experience can be tested by checking whether transitions to entrepreneurship are related to job characteristics including measures of experience, exposure to customers, diverse job tasks and length of job tenure. If the hypothesis that small firms transmit experience is correct, one would expect these job characteristics when interacted with indicator variables for small firm status to be significantly positively related to entrepreneurship transitions. Performing tests of this kind represent the first steps of an exciting new research agenda.

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