

Business Survival and Entrepreneurial Learning

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Objectives: This paper sets out to test the theory of entrepreneurial learning. Is there evidence that entrepreneurial talent θ improves with the length of time after start-up?

Prior Work: The paper draws on an extensive body of literature using the concept of 'trading as learning'. Key among these are Jovanovic (1982) and Ericson and Pakes (1989). The former presents a model where the owner-manager's ability to accurately assess θ improves with time, the latter a model where it is possible to undertake actions to directly enhance θ .

Approach: We use a modified version of the database presented in Frankish et al. (2006) to undertake a two-step analysis of entrepreneurial learning. In the first step we estimate conditional survival models for each of the four six month periods in the first two years after start-up. This provides a simple test of whether θ is enhanced by prior business experience. These models also yield a more sophisticated and robust measure of θ - sales volatility - that can be directly tested for evidence of change over time. The second step of the analysis uses an Ordinary Least Squares (OLS) model to test our chosen measure of θ for compatibility with the theory of entrepreneurial learning.

Results: Our analysis does not provide support for the theory of entrepreneurial learning. The models of business survival indicate a clear set of factors influencing longevity including growth, sales volatility and financial management. However, there is no evidence of a significant positive role for prior business experience. The OLS analysis of our chosen measure of θ indicates a significant improvement after the first six months of trading, but that there is then no further positive change in the remainder of the two year period.

Value: The core value of this paper is twofold. First, an analysis of business survival that reveals a core set of factors consistent with theory. Second, the provision, and testing, of a robust measure of entrepreneurial talent that is not reliant on surveys of owner-managers or the growth performance of firms.

Key words: start-up, survival, learning

1. Introduction

Those familiar with the classic, tightly theorised, text by Casson (1982), will recall that author's efforts to link entrepreneurship theory with the fictional Jack Brash. Casson says:

"Jack Brash starts with very little information. But information is generated continuously as a by-product of his trading activity, and Jack uses this information to the full. He learns from the deals that he makes, and he learns from the deals that fall through. By analysing his experience he is able to turn adversity to advantage", page 386-7.

In his later writing Casson (1999) sees the key role of the entrepreneur as being to process information when that information is both costly and volatile. Casson postulates that the economic environment is continuously disturbed by shocks, which may be either transitory or persistent. The entrepreneur who runs a business has to respond to these shocks by making decisions – whether to invest in new plant and machinery, develop new products or services or shed labour. To make such decisions the entrepreneur is assumed to require information which is costly.

But, not all entrepreneurs choose to collect the same amount of information and, even if they all had the same information, some make better decisions than others. Casson views the former as better entrepreneurs because of their greater skill in processing information. In terms of Jack Brash, if all individuals start with little information, then it is the ability of some to learn faster than others that distinguishes the successful entrepreneur from the less successful.

Despite its beguiling plausibility, and some empirical support that we review in the next section, the case made in this paper is that both the theory and the empirical support for "the learning entrepreneur" remains open to question. Our theoretical case is based primarily upon the key role of chance in influencing entrepreneurial outcomes. So, the extent to which a lottery player can "learn" from past experience to be more successful in the future must be limited.

The prime focus of the paper, however, is an empirical test of "learning". We argue that if learning takes place then an individual's entrepreneurial talent θ would be expected to increase with time in business. Second, we argue that the best indicator of θ is whether that business owner becomes less likely to undertake actions which are clearly linked to endangering the survival of his or her business. Therefore, the test is whether, with increasing business experience, business owners are less likely to undertake "life threatening" actions.

To formulate the test we use a modified version of the dataset employed in Frankish et al. (2006). This is a large bespoke dataset derived from new start-up customers opening with Barclays Bank in the three months March to May 2004. We examine the influence of a wide range of factors on business survival/non-survival in each six month period over the two years after start-up. This analysis shows that variables describing account management – volatility (of sales), exceeding overdraft limits, use of overdraft facilities – are clearly linked to subsequent business closure, while prior business experience has no discernible role. Crucially, we then show that, allowing for the exit of owner-managers with lower entrepreneurial talent there is no evidence that volatility – our chosen measure of θ – shows consistent improvement over time. Our conclusion therefore has to be that this data set does not provide a compelling support for the theory of entrepreneurial learning.

The remainder of the paper is set out as follows. Section 2 reviews and develops the theory of entrepreneurial learning and then assesses the extent to which such theories are supported by empirical evidence. Section 3 summarises some key empirical studies into firm survival. Section 4 presents our hypotheses derived from the literature review. Section 5 sets out the data used to test these hypotheses. Section 6 presents estimated models of conditional firm survival, enabling a simple test of entrepreneurial learning and also using the estimates to derive a more sophisticated measure of θ . Section 7 uses this chosen measure of θ to test for entrepreneurial learning among firms that survive the first two years after start-up. Section 8 summarises the paper and offers some concluding points relating to both theory and small business policy.

2. Theory and Evidence on Entrepreneurial Learning

As Casson (1982) implies, if an individual begins an enterprise with little, or perhaps no, knowledge one simple inference is that those individuals that either begin with more knowledge and/or those that add fastest to their stock of knowledge will have better performing businesses. One measure of performance might be whether or not the business survives.

However, even this simple linkage has been questioned. Jovanovic (1982) argued that the entrepreneurial ability of new entrepreneurs (translating into a profit function) is drawn from a known distribution, but that individual entrepreneurs are unable to discern their own ability prior to entry. Instead they form (and modify) a judgement of their ability based on actual performance. The result of this ongoing evaluation is the expansion of some new firms and the contraction of others, with ultimate closure when an opportunity cost threshold is breached. Although there is a stochastic element, the model results in entrepreneurs with higher ability levels trading for longer periods and the conditional probability of exit declining with time. The crucial element of Jovanovic is that it does not assume that entrepreneurial talent θ improves over time, but only the ability of the individual to assess that talent. The value of that greater accuracy is that the individual is able to make a better informed judgement about whether or not to continue in business – the so called “stay or quit” decision (Taylor, 1999).

A second variant is the ‘active’ learning model put forward by Ericson and Pakes (1989). Here a new entrepreneur is aware of their (and their competitors) level of ability. Unlike the passive learning model, the entrepreneur can influence the likelihood of higher profits in the future by undertaking investment that diminishes current profits, but could improve future ability and hence profits.

The theoretical base provided by the ‘trading as learning’ concept has subsequently been developed in a number of ways. These include the introduction of financial resources and possible credit rationing (Evans and Jovanovic, 1989), and an explicit role for human capital (Cressy, 1996). A recent extension has been the scope for the entrepreneur to choose their market position (Cressy, 2006), defined in terms of selecting an optimal risk/return trade-off based on both their ability and their preferences.

The above work implies that entrepreneurial learning (EL), in some form, both takes place and that it either helps the stay or quit decision, or directly enhances the individual’s entrepreneurial talent. However a plausible case can also be made that entrepreneurs do not learn. The following are the most obvious reasons:

- Entrepreneurship is risky¹ and chance plays a key role². The most valid analogy here is that starting a business can be compared with purchasing tickets to a lottery. The gambler buys tickets for this chance event because he observes that some people win a large sum of money and assumes that he may do likewise. Of course, if the lottery is truly a chance event then either the winners are lucky or they have bought more tickets. It does not imply that those who win have “learnt” how to play the lottery. The empirical question therefore is the extent to which business performance reflects θ and the extent to which it reflects chance³.
- Entrepreneurs are optimists. The clear evidence from De Meza (2002) is that the self employed – entrepreneurs – are considerably more optimistic than employees. He shows that, whilst both groups are optimistic, the ratio of expectations to actual achievement for the self employed is more than 50% higher than for employees. Interestingly, De Meza also finds that these individuals are most optimistic about events over which they have least control. Hence, in the context of the lottery analogy above, it is optimists who

¹ Depending on the measure, between 18% and 33% of new firms in the UK fail to survive for two years. See Charts A and B.

² The justification for this is based on the weak explanatory power of models seeking to explain survival/ non-survival of small firms, and the inconsistency of key explanatory variables. For example see Bruderl et al. (1992) or Cressy (1996). In his work on self employment Henley (2004) says “over half the unexplained variance in the probability of choosing self-employment is accounted for as unobserved heterogeneity, suggesting that idiosyncratic influences have an important part to play in self employment status”.

³ One “explanation” might suggest that entrepreneurs that succeed attribute this to talent, whereas those that do not attribute it to chance.

buy more tickets. Since optimism is clearly equated with entrepreneurship the fact that, in such a chancy environment, individuals continue to buy more tickets – start more businesses – reflects their optimistic personality rather than their ability to learn. It certainly does not provide evidence that the probability of winning increases with each ticket purchased – which is the implication of EL.

- A third reason to be sceptical about EL is that no two business situations are identical. The individual who has been in business for some time may have not experienced, and thus be no more able to deal with, certain business situations than an individual with little experience. The analogy here is with the parenting of children. Given that children of the same parents are extremely variable, and the family context in which they grow up is very different, the notion that a parent with eight children is significantly more knowledgeable in dealing with their ninth child, compared with a 'novice' parent, seems a little fanciful.
- Finally, the empirical evidence of entrepreneurial learning also looks weak. Some is based upon asking entrepreneurs about their learning experiences⁴. Such a methodology seems unlikely to tease out whether learning took place on the grounds that few such individuals would claim to have "learnt nothing and forgotten nothing"⁵. A more formal attempt to test for learning was made by Parker (2006). He shows that the self-employed adjust their behaviour only very marginally in the face of recent evidence. Instead they are much more strongly driven by their 'priors', which in this context we can take as their long-term experience and personality characteristics

So, how can we explain some frequently cited justifications for EL, as defined by some theorists?

- It is frequently observed, particularly with reference the United States that currently highly successful business owners have previously owned a business that failed. The inference is that, because they are now successful, failure must have been 'a learning experience' for them. Unfortunately there are several problems with this 'evidence'. The first is that the outcome is equally well explained by the lottery argument above. Here, even if business success is a chance event, an individual who continues to buy tickets for the lottery will enhance their probability of being successful at some point in time. It does not mean that they have 'learnt to play the lottery'. It merely means they have bought more tickets. The second is that, to demonstrate evidence of "learning" in a business context it is necessary to show, as a minimum⁶, that experienced entrepreneurs – those that have previously owned businesses – have, all else equal, better performing businesses. The UK evidence (Ucbasaran, 2004) is that "after controlling for entrepreneurs' human capital, the environment and other organisational characteristics, failed to detect any performance differences between novice and habitual entrepreneurs"⁷. The evidence from Germany (Metzger, 2006) is that prior business ownership experience does enhance subsequent performance, except where this was associated with business failure. Those individuals that failed have poorer performing businesses if they re-start.
- A second observation is that in the United States there is much higher likelihood than in Europe of individuals, who have previously failed in business, then finding success with a later business. European policymakers have argued that this is because there is a 'stigma of failure' in Europe compared with the United States. They argue that Europe incurs an economic loss as a result of preventing failed entrepreneurs from being able to easily re-start. The fallacy of this argument is again illustrated by reference to the lottery. In essence the reason why individuals in the United States are more prepared to start a business again is because price of the lottery tickets are lower in the United States than in Europe. In European countries there are more restrictions on a bankrupt individual in terms of the minimum time before that individual can re-start and the resources that they can draw upon to fund the re-start. In short, the price of business failure is lower in the United States. So, if the price of lottery tickets is lower, as in the

⁴ See for example Cope (2003).

⁵ Used by Talleyrand to describe the Bourbon restoration in France in 1815.

⁶ The more challenging test would be to demonstrate that the same individual performed better in each successive business, whilst also seeking to control for other factors influencing performance.

⁷ This quotation is taken from Ucbasaran et al. (2006), page 474.

United States, more tickets will be bought and the chance of a win will increase. It does not reflect evidence of greater EL in the US, but rather a different emphasis upon responsibility to creditors.

So what does this mean?

- First, the difficulty of being able to identify persuasive evidence of EL leading to enhanced venture performance is not to be taken to imply that, in any sense, entrepreneurs are incapable. Instead it shifts the emphasis in explaining venture performance towards a much greater focus upon risk.
- Second, it does not imply that business performance is entirely a matter of chance, but merely that there is a very strong chance element in performance.
- Thirdly, it does not imply that no entrepreneurs learn. That seems most unlikely, and it may be that those who do learn obtain a comparative advantage over those that do not. What is clear is that, when EL is tightly defined, the evidence that EL is a generalised phenomenon that can be assumed to take place is far from conclusive.
- Finally using prior business ownership experience as a proxy for EL is limited. As we observed above the likelihood of re-entry varies between countries and is also likely to vary between individuals. In short, re-entrants are unlikely to be a random draw from the population – yet it is only re-entrants that can be the subject of the test of EL. What is needed is a better test of EL which comprises all owner-managers and not simply those who choose to re-enter.

The next two sections set out what we argue is a better test for EL. It is that most new firm founders wish/expect their business to survive at least for two years⁸ after it begins, and would avoid taking actions that they knew would lead to closure. Therefore, the test for EL is whether there is evidence that amongst new firm founders that they became less likely to take actions that endanger survival the longer they are in business. To examine this we have to link EL with work on business survival.

3. Firm Survival: Key Empirical findings

Empirical work on business survival has been undertaken across a number of countries (see Bruderl et al. (1992), Mata and Portugal (1994) and Strotmann (2007) for studies outside of the UK and US). Despite using a range of analytical bases several common elements in business survival have emerged fairly consistently. Survival appears positively related to firm size (whether defined by turnover, assets or employee numbers) and the length of time that a business has been operating. Some studies have also indicated that conditional closure rates take an inverted U-shape, rising up to a peak in the first few years before declining thereafter (Ganguly (1985), Cressy (1996)).

Aside from size and age, studies have differed with regards to the factors influencing survival (or at least their relative importance). Some have indicated that industry-level factors, in the form of minimum efficient scale or the developmental stage of that sector, are relatively important (Audretsch (1991), Audretsch and Mahmood (1995), Agarwal and Audretsch (2001)). Others have found the scale of financial resources available to the firm to be a key element (Evans and Jovanovic, 1989). A third set have put forward individual and collective human capital (measured in a variety of ways) as the most important determining factors (Cressy, 1996; Taylor, 1999).

However our knowledge of the factors influencing new firm survival – at least in the UK are limited to Cressy (1996). It is also limited because most studies have used one of two methods to examine survival rates. The first is by modelling survival over a set period after start-up (e.g. Bates, 1990). The second, and most prevalent, is by estimating a variant of a Cox proportional hazards model (Cox, 1972). This approach estimates a baseline conditional hazard function, with the relevant explanatory factors shifting this profile. While well established, these approaches have a particular limitation in that the estimated marginal effect of an explanatory factor is constant over time. This may provide a misleading indication of the role of a given

⁸ Of course this is not the case for longer established small firms or self employed individual (Taylor, 2003).

factor at a particular point in time. The model presented by Cressy (2006) provides an example of marginal effects varying over time. Frankish et al. (2006) addressed this limitation by estimating closure models for a number of distinct periods after start-up. This approach is the one built upon in this paper.

4. Hypothesis Derivation

From the literature review two issues emerge. Thus far we have argued that the bulk of new firm founders would expect their businesses to survive and so would avoid actions which they knew would lead to closure. However, we also argued that new firm founders with low levels of talent θ might be unable to link their actions to the impact this has upon the business, but that as their survival duration increases this provides them with the experience – the learning – that enables them to make such a link.

The contrasting argument is that learning is not possible for two reasons. The first is that business is a random draw – as in the lottery – from which learning is impossible. The second is that as the business survives it encounters very different circumstances and situations from those that it has previously experienced. In simple terms, in the first six months the skill may be to generate any orders at all; in the next six months it may be to satisfy those orders; in the third six months it may be to invest wisely in staff and equipment to satisfy the expansion of orders. All these may require different skills to overcome new and distinct challenges, with limited value from any learning derived from prior experience.

To address these issues we therefore formulate the following two hypotheses:

H1: The factors associated with business survival do not change in the two years after start-up

H2: There is no entrepreneurial learning among firms surviving the first two years

5. Data

The data used in this paper are drawn from the customer records of Barclays Bank. The size of Barclays customer base means that it offers a large and representative cross-section of those firms in England & Wales using a business current account. The sample base consists of 6,854 non-financial firms opening as start-ups with Barclays in the three months from March to May 2004. These represent approximately 30% of all start-ups with the bank during this period. For each firm in the sample base data are available on a set of variables characterising the business, the owner-manager, trading activity and survival. Many of these variables are representative of the business and human capital variables used in previous research. However, a few provide additional information on trading activity not usually covered. Table 1 provides a summary of these variables. Table 2 sets out headline quantitative data for them. Table 3 shows a correlation matrix for the continuous variables.

The variables defining the business include the legal form of the firm, twelve broad business sectors and the number and type of associated individuals- a very close approximation to the number of owner-managers. For the analysis presented in this paper the latter two variables were structured to consider two aspects – whether the firm has more than the minimum number of individuals for that legal form and whether there is some male involvement in the firm.

Owner-manager variables cover the (mean) age of the associated individuals and data on human capital derived from a set of voluntary questions asked of start-up customers from March 2004 onwards. These questions were designed to supplement Barclays systems which primarily consists of quantitative financial data. The questions cover three aspects of an owner-manager's human capital and past experience – educational attainment, prior business experience (personal and/or family) and the sources of advice/support used.

Variables covering trading activity seek to capture not only standard business information – (debit) turnover and growth – but also provide our key measure of EL that of volatility. Volatility is the ratio of the standard deviation of monthly sales turnover in each six month period to the mean monthly turnover, thereby scaling volatility to the size of the firm. A second measure of

EL is the quality of financial management. This is captured by two variables, both relating to the use of overdraft facilities. The first is the proportion of a six month period that a business spends in excess of its arranged overdraft limit. The second is the mean proportion of any overdraft limit in use across a six month period.

The final set of variables cover conditional survival. That is, survival of a firm over a six month period given that it was present at the start of that period. For Barclays data this raises two difficulties. First, the data source is not a comprehensive view of the business stock as might be found in official data. This means that it is possible for businesses to have switched to another bank. Therefore, firms that exited the customer stock and were (positively) identified as switching were excluded from the dataset⁹. Second, even allowing for switching, business closure is not well defined by looking only at explicit exit from the customer base. It is very likely that businesses will cease to trade some time prior to the closure of their current account(s). Therefore, this paper uses a more narrow measure of survival. This additionally requires firms to have no more than a single (six month) period of zero debit turnover. For firms with two (or more) periods without turnover they are deemed to have closed in the first of these periods. In the case of firms that exit the stock, where departure was preceded by a full period without turnover then that period is taken as the point of closure.

As well as the switching exclusion noted above, a couple of other factors reduced the final dataset to 6,854 firms, only a modest proportion of the 23,000 initial start-up customers. The voluntary nature of the supplementary questions mean that they were fully answered by only 44% of start-ups. In addition, a proportion of firms recorded as start-ups in the three months in 2004 showed no trading activity during that period. For the purpose of this paper they were therefore not considered to have effectively started.

6. Analysis: business survival

This section presents an analysis of hypothesis *H1* on the role of various factors in influencing business survival and whether there is evidence that these change over the first two years after start-up. The analysis also provides a measure of θ that we subsequently use to evaluate the theory of entrepreneurial learning.

As mentioned in section 3, the conventional method for analysing business survival is a conditional hazard model. Conditional hazard models estimate a hazard function for survival where time enters as an explanatory variable in its own right. Other factors then serve to shift this baseline function, but with constant marginal effects over time. However, this approach cannot be used to test hypotheses such as *H1* where the question of changing influence over time is central.

Instead, conditional survival models were estimated for each of the four six month periods in the dataset – described as periods 1 to 4 respectively. The estimation method is binary logistic regression. This approach estimates how the probability of survival is associated with the potentially explanatory variables. For the period 1 model only pre- and at-start data (Storey, 1994) are available. For the subsequent models the variables expand to include the measures of business activity, both levels and changes, outlined in section 5. Table 4 presents the estimates and other model information for each of the four resulting models.

Before considering hypothesis *H1* it is important to note what the estimates say about the relative roles of at-start and post-start data in accounting for business survival. They support the view that observing even a short period of business activity will shed more light on the likelihood of short-term survival than a range of at-start data on human capital and firm characteristics. In the model set the explanatory power for model (1), covering the first six months after start-up and restricted to only at-start variables, is limited compared with those for models (2) to (4) with additional data on business activity. Likelihood ratio tests confirm that the addition of business activity data in (2)-(4) significantly improve the explanatory power of those models. Comparison with log-likelihood scores for models restricted to at-start variables

⁹ Only about 50% of all switching businesses are excluded by this definition.

(not shown) indicate that business activity data provide about 80% of the explanatory power in the full models.

Hypothesis *H1* proposes that the factors associated with business survival are constant across the two years after start-up. This is technically rejected simply by the introduction of additional variables for later periods. However, for the purpose of this paper *H1* will be considered with regards to constancy given data availability. Even with this broad interpretation of *H1* the estimates indicate that it should be rejected. The models indicate that business survival is shaped by a core set of variables supplemented with a changing set of additional factors. However, even with *H1* rejected the estimates provide insight into proposed models of business survival.

The core of the models is provided by five variables – incorporation, growth, volatility, change in volatility and relatively frequent use of unauthorised overdrafts. These are significant (with the same sign) in each period for which they are available. What do these five factors tell us about the processes shaping business survival?

One thing is that the choice of legal form appears to contain significant information about the aims and motivations of the owner-manager(s). By choosing to make their start-up a company the owner-manager has elected to structure their business in a form that involves greater short-term expense, both in terms of time and money. Therefore, the balancing expectation is likely to be of a longer lasting business that offsets these costs and a structure that provides greater flexibility for growth and financing. The result is that the two year survival rate of companies in the dataset is 81%, rather than the 68% for sole traders¹⁰.

The positive roles of growth and lower volatility in increasing the likelihood of business survival support labour market models that present business survival as involving periodic assessments of the relative utility for continued self-employment against that of employment (for example, see Jovanovic (1982), Cressy (2006)). Growth moves the business away from the threshold for ceasing trading, reducing the likelihood of crossing it for any given level of volatility.

Importantly, in terms of our subsequent discussion, lower volatility makes it less likely that the threshold will be breached for any given size of firm. The estimates also indicate that, for volatility, change is as important as the absolute level. A firm that experiences higher/lower volatility than in the previous period has a higher/lower probability of closure. Changes in volatility from any starting point may cause the owner-manager to re-evaluate both their own ability and the nature of the market that they are operating in.

Completing the core set of variables is the high use of unauthorised overdraft. The significance of this factor may indicate the importance of financial management skills and thus the ability of an owner-manager to operate within their financial constraints. An alternative interpretation is that it reflects under-capitalisation and the resulting pressures this brings.

The remainder of the estimates contain factors that exert different influences during different periods and others that appear to exert no significant influence in any period. Notable amongst these are prior business experience and educational attainment. The former is certainly at odds with EL theory, whereas the latter is less surprising given the findings of Taylor (1999).

So, while strictly rejecting *H1*, our results suggest there are core factors associated with continued trading in the first two years. However the simple measure of EL – prior business ownership experience – is not one of these core factors. What the models do not touch on is whether there is change in entrepreneurial ability over time – our second test for EL. The next section turns to this question.

¹⁰ Whilst there is empirical evidence that legal form is clearly linked to small enterprise growth, the prior picture on survival is less clear (Harhoff et al., 1998).

7. Analysis: entrepreneurial learning (EL)

This section presents a test of hypothesis *H2*. As discussed in section 2, the phrase 'entrepreneurial learning' has two subtly different meanings. The first is that owner-managers obtain a better assessment of their own ability over time, but without that ability changing. The other is that the process of running a business actually improves their average ability to some extent. In this section the focus is on an assessment of whether entrepreneurial learning, of either kind, is taking place.

Analysing entrepreneurial learning requires some measure of owner-manager ability. In models of business survival/growth ability can enter in a number of ways, including lowering costs, improving the chances of growth and reducing risk. However it is framed, the implications of these models are that firms with higher ability will survive longer. We therefore seek a measure of entrepreneurial talent θ that is measurable over time and is clearly linked to the performance measure of survival. The evidence from the analysis of *H1* is that volatility fully satisfies these requirements. It was shown that volatility was a core factor in accounting for short-term survival. The negative relationship fits with a view of entrepreneurial ability as reducing trading risk. Volatility is preferable to size/growth as the latter can reflect a wider set of owner-manager preferences for the new firm. In contrast it is possible for volatility to reflect ability across all business sizes.

Hypothesis *H2* requires an assessment of whether and if so, how, volatility changes over time. The most obvious element that needs to be controlled for in this analysis is the change in the composition of the sample over time. That is, the volatility of firms in period 4 maybe lower than that in period 1 as a result of the closure of more volatile (less able) firms in the interim. Chart C shows the distribution of volatility in periods 1 and 4 for the 5,026 firms that were open across the full two years.

An initial inspection of the chart strongly suggests that typical volatility was lower in period 4 than period 1, with a definite shift to the left (lower volatility) in the peak of the distribution. It is also interesting to note the shift of firms to the extremes of the distribution, with 1.1% of the sample located there initially rising to 4.9% in period 4. This polarisation indicates that irregular trading patterns are perhaps more common than might be expected.

However, the data presented is not sufficient to cast doubt on *H2*. The main reason is that while the chart presents volatility for surviving firms, thus avoiding any bias caused by poorer performing firms closing within the two year period, these firms also change over time. This is particularly important for growing firms, with Table 3 showing a significant negative correlation between volatility and turnover in each period. To gain a clearer understanding of volatility and, by implication, entrepreneurial ability we turn to a simple regression model.

In section 6 we used binary logistic models to analysis business survival. In this instance we turn to an Ordinary Least Squares (OLS) approach. The aim is to model volatility as a function of the other data, plus additional dummy variables representing periods 2 to 4. If, having controlled for other firm characteristics, these latter variables are significant, then it would indicate that there is a distinct time component to volatility and thus some measure of entrepreneurial learning.

For the OLS model the data was restructured such that each firm-period combination was a distinct observation, i.e. each surviving firm appears four times, one for each period. This provided 20,104 observations in total. Other data was also reconfigured as appropriate, e.g. a series of dummy variables representing legal form, sector and items such as educational attainment. Finally, a model was also estimated excluding extreme volatility values¹¹ in order to check the robustness of the initial results. Table 5 sets out the estimates and summary data for both models. Therefore, our test of Hypothesis *H2* is that the presence of EL would be reflected in lower volatility in later than in earlier periods. A compelling case for EL would be if volatility were to be significantly lower in each successive six month period.

¹¹ A value of zero or 2.236 (the maximum value) for the *vol* variable.

Table 5 shows that volatility is significantly lower in periods 2 to 4 than in period 1. However, the estimates do not provide a clear picture of the relative change in volatility between these latter periods. While the coefficients indicate that adjusted volatility falls between periods 2 and 3, it then rises between periods 3 and 4, with only the latter difference being significant¹². What should be drawn from these results with regard to $H2$?

One possibility is that the estimates reflect the inherent volatility of the period immediately after start-up. The push to establish the business – building contacts and sales – produces unavoidably erratic trading. When the first six months is over the business has been put on a more regular footing reflected in commensurately lower volatility. On this interpretation the estimates do not indicate the presence of entrepreneurial learning, rather they say something about the nature of the start-up process.

An alternative interpretation is that the improvement after the first period does reflect entrepreneurial learning. That is, moving from a nascent to an established business is inevitably a learning process. However, the estimates may indicate that the concept of entrepreneurial ability is divisible, rather than the single factor usually specified by theory. Rather than showing a step-by-step improvement in volatility, the results suggest that there is some slipping back at the end of the two year period¹³. This may mean that any enhanced ability gained from surviving the start-up phase maybe of more limited or reduced benefit when facing the challenges of a more established business.

Thus far we have focused our attention upon volatility as a measure of EL, but Table 4 also shows that overdraft usage – and particularly unauthorised usage – is also associated with subsequent closure. The coefficients on this variable (xs) point in a very similar direction to the volatility measure – being higher in period 1 than in subsequent periods, but showing no consistent trend in periods 2 to 4.

Overall, the estimates are not sufficiently definitive to be able to reject $H2$. Extending the analysis to additional periods might permit a more robust conclusion, but for now the case for entrepreneurial learning remains to be demonstrated.

8. Conclusion

This paper has examined the issue of entrepreneurial learning (EL). We have reviewed the theory, both in support of, and in conflict with EL and concluded that on theoretical grounds EL could neither be accepted nor rejected.

The paper then turned to undertake empirical testing of EL which it was argued was more valid than prior tests which examined either the responses of entrepreneurs themselves, or relied solely on examining the performance of firms owned by individuals with and without prior business ownership experience. Our test used business survival as the key performance measure and argued that evidence in support for EL could be in two forms. The first was whether, all else equal, new businesses founded by individuals with prior business ownership had lower survival rates than those which did not. Our second test was more sophisticated. It argued that evidence in support of EL would be if the owner-manager was more likely to take actions that lowered the likelihood of closure as the time from start-up increases. We showed that sales volatility was clearly linked to subsequent closure. Therefore, this evidence was sought on whether volatility changed as the business aged. A key requirement was to have a sample large enough to take explicit account of sample attrition.

We showed that the factors influencing business survival in each six month period over two years do vary. However, there are also a set of core factors shaping the likelihood of continued trading – incorporation, growth, lower volatility and limited use of unauthorised overdraft. One factor that never appears as significant, however, is prior business ownership.

¹² There is no significant difference between the coefficients for periods 2 and 4.

¹³ Although the reduction in volatility compared to period 1 remains significant.

This suggests that using this simple and "standard" test the case for EL is not supported. Furthermore, the weak overall explanatory power of our models suggests that there is a powerful role for chance in explaining new firm survival which is also compatible with weak evidence for EL.

Our second test for EL was whether volatility becomes lower over time amongst surviving firms. The estimates indicate that there is a clear reduction in volatility between period 1 and the next 18 months. However, the absence of a clear pattern to the change in volatility in periods 2 to 4 poses an important question mark over EL. One possible explanation is that entrepreneurial ability is not a uniform concept and that moving from start-up to established business does not necessarily provide benefits for future trading, although further analysis (and data) would be required to explore this in more detail.

Although the analyses presented in this paper do not directly address issues of small business public policy, any research in the areas of business survival and entrepreneurial ability will offer some insight into policy questions. What can be drawn from this paper?

The estimates relating to business survival do not indicate a clear benefit from most areas of direct advice/support that are within the scope of small business policy. The exception is possibly in the combination of financial management and start-up resources represented by unauthorised overdraft use. Nor do the estimates reveal a positive role for the two aspects of human capital – educational attainment and prior business experience – that sit within a wider range of policy options. However, a full assessment of the link between policy and survival is restricted by the limited nature of some of the variables used.

The public policy outlook is tempered a little by the analysis of EL. This showed that volatility was significantly lower when owner-managers had sought advice/support from accountants and enterprise agencies/business links, prior to starting the business. The link between lower volatility and improved survival chances suggests an indirect role for policy in these areas, albeit with a caveat about whether the results reflect risk preferences, e.g. owner-managers going to accountants maybe relatively risk averse.

A more subtle issue for policy is raised by the nature of entrepreneurial ability. If it is the case that the qualities that allow an owner-manager to start-up and survive are of less value in meeting the challenges faced by an established business, then this would suggest the need to reassess the nature and provision of advice/support. At present this tends to be disproportionately focused on the pre-start and immediate post-start period. The results suggest that a greater emphasis on firms that have survived a short period (e.g. 6-12 months) may have value, although this would probably involve a more needs based approach in provision, bringing its own difficulties in terms of cost and effectiveness.

In conclusion, this paper has presented a large scale analysis of business survival and entrepreneurial learning. The results show that while a variety of changing factors shape business survival in the two years after start-up, within this there is a clear core covering growth, volatility, financial management and ambition. The significance of these variables provides strong support to models of business survival that characterise continued trading as an ongoing choice set against alternative occupations. The results also show that there is a significant drop in volatility for firms after the first six months. However, the absence of a clear pattern for changes in subsequent periods means that it is not possible to conclude that entrepreneurial learning is present. Overall, this paper has provided a clear analysis of the factors shaping business survival. If and how business survival shapes the owner-manager remains to be fully discerned.

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Table 1: Variable definitions

Dependent	
<i>op_1</i>	= 1 if firm open at end period 1 (6 months after start-up)
<i>op_2</i>	= 1 if firm open at end period 2 (12 months)
<i>op_3</i>	= 1 if firm open at end period 3 (18 months)
<i>op_4</i>	= 1 if firm open at end period 4 (24 months)
NB these variables are conditional on the firm being open at start of period x	
Explanatory	
Firm	
<i>legal</i>	legal form of firm at start - company (comp), partnership (part) or sole trader (sole)
<i>sic</i>	business sector of firm at start - agriculture (agr), manufacturing (man), construction (con), motor trades (motor), wholesale (who), retail (ret), hotels & catering (hot), transport (tra), property services (prop), business services (bus), health, education & social work (hesw) and personal & leisure services (per)
<i>involve_xs</i>	= 1 if more than minimum number of people associated with firm (owner of, director of, or partner of) - 2+ if company, 3+ if partnership
<i>involve_male</i>	= 1 if at least one male associated with the firm
<i>turn_ln</i>	log debit turnover for previous period
<i>turn_ln_c</i>	change in <i>turn_ln</i> for previous period
<i>vol</i>	ratio of standard deviation of monthly debit turnover to mean monthly turnover in previous period
<i>vol_c</i>	change in <i>vol</i> for previous period
<i>xs</i>	proportion of previous period in excess of authorised overdraft limit
<i>xs_c</i>	change in <i>xs</i> for previous period
<i>limuse</i>	mean proportion of authorised overdraft limit used during previous period
<i>limuse_c</i>	change in <i>limuse</i> for previous period
Individual	
<i>age</i>	(mean) age of associated individuals at start
<i>age_sq</i>	square of <i>age</i>
<i>educate</i>	highest educational attainment of respondent(s) - none, nvq2, nvq3, nvq4 or higher
<i>bus_exp</i>	previous business experience of respondent(s) - none, family (fam), self, self & family (self_fam)
<i>advice</i>	advice/support sought prior to start from - enterprise agency/business link (entbl), accountant (acc), solicitor (sol), college (coll), (Barclays) start right seminar (srs), the princes trust (pybt), family (fam), other (oth)

Table 2: Variable means

Dependent					
<i>op_1</i>		.961			
<i>op_2</i>		.907			
<i>op_3</i>		.896			
<i>op_4</i>		.939			
Explanatory					
Firm					
<i>legal</i>	comp	.382	<i>turn_1</i>	50.956	Individual
	part	.131	<i>turn_2</i>	58.908	<i>age</i>
	sole	.487	<i>turn_3</i>	65.650	<i>educate</i>
<i>sic</i>	agr	.010	<i>turn_4</i>	68.049	none
	bus	.264	<i>vol_1</i>	.757	nvq2
	con	.145	<i>vol_2</i>	.679	nvq3
	hesw	.024	<i>vol_3</i>	.644	nvq4
	hot	.088	<i>vol_4</i>	.658	<i>bus_exp</i>
	man	.051	<i>xs_1</i>	.042	none
	motor	.035	<i>xs_2</i>	.056	fam
	per	.167	<i>xs_3</i>	.063	self
	prop	.039	<i>xs_4</i>	.069	self_fam
	ret	.116	<i>limuse_1</i>	.011	<i>advice_entbl</i>
	tran	.036	<i>limuse_2</i>	.040	<i>advice_acc</i>
	who	.024	<i>limuse_3</i>	.071	<i>advice_sol</i>
<i>involve_xs</i>		.163	<i>limuse_4</i>	.137	<i>advice_coll</i>
<i>involve_male</i>		.813			<i>advice_srs</i>
					<i>advice_pybt</i>
					<i>advice_fam</i>
					<i>advice_oth</i>

Table 3: Correlation matrix

Pearson Correlation	turn_in_1	turn_in_2	turn_in_3	turn_in_4	vol_1	vol_2	vol_3	vol_4	xs_1	xs_2	xs_3	xs_4	limuse_1	limuse_2	limuse_3	limuse_4
turn_in_1	1.000															
turn_in_2	.748**	1.000														
turn_in_3	.650**	.764**	1.000													
turn_in_4	.588**	.701**	.769**	1.000												
vol_1	-.392**	-.410**	-.347**	-.279**	1.000											
vol_2	-.372**	-.430**	-.481**	-.406**	.436**	1.000										
vol_3	-.326**	-.453**	-.416**	-.464**	.359**	.481**	1.000									
vol_4	-.263**	-.337**	-.431**	-.410**	.305**	.459**	.487**	1.000								
xs_1	-.180**	-.103**	-.057**	-.040**	.124**	.075**	0.023	-0.022	1.000							
xs_2	-.091**	-.167**	-.116**	-.128**	.038**	.143**	.059**	0.012	.491**	1.000						
xs_3	-.042**	-.075**	-.150**	-.175**	-0.001	.042**	.109**	0.018	.298**	.566**	1.000					
xs_4	-.039**	-.063**	-.099**	-.194**	0.003	.042**	.040**	.070**	.182**	.372**	.518**	1.000				
limuse_1	.096**	.065**	.044**	.061**	-.066**	-.055**	-.053**	-.057**	.082**	.038**	.056**	0.004	1.000			
limuse_2	.091**	.077**	.038**	.079**	-.060**	-.061**	-.024	-.081**	.036**	.092**	.124**	.092**	.338**	1.000		
limuse_3	.137**	.145**	.116**	.074**	-.095**	-.107**	-.077**	-.069**	.048**	.063**	.189**	.140**	.281**	.342**	1.000	
limuse_4	.036**	.037**	0.025	-.055**	-0.012	-0.015	0.007	-0.023	-0.001	0.005	.030*	.094**	0.010	.050**	.060**	1.000

** . Correlation is significant at the 0.01 level (2-tailed).
 * . Correlation is significant at the 0.05 level (2-tailed).

Table 4: Conditional survival models

model	periods			
	(1)	(2)	(3)	(4)
<i>legal</i> [sole]				
comp	.598***	.317**	.236*	.511***
part	.045	-.154	-.235	-.238
<i>sic</i> [who]				
agr	1.385	1.500**	.407	.649
bus	.012	.528*	-.520	.710*
con	.254	.766**	-.703	.594
hesw	-.191	.735*	.270	.413
hot	-.121	.104	-.845*	.239
man	.314	.634*	-.683	.874
motor	.084	-.112	-.21	.685
per	.073	.564*	-.672	.856**
prop	.598	1.005***	.285	1.26**
ret	-.196	.513*	-.747*	.202
tran	.138	.136	-.598	.033
<i>involve_xs</i>	.107***	.037	.034	-.041
<i>involve_male</i>	-.001**	.000	.000	.001
<i>age</i>	.102	.469**	.102	.226
<i>age_sq</i>	-.424**	.322***	.174	-.362*
<i>bus_exp</i> [none]				
fam	-.183	.333*	.107	.235
self	-.154	-.040	-.052	-.446*
self_fam	-.194	.210	-.060	-.201
<i>educate</i> [none]				
nvq2	.041	.018	.203	-.105
nvq3	.186	.080	.102	.375
nvq4	.515**	.217	.158	-.324
<i>advice_entbl</i>	-.255	.417**	-.146	-.171
<i>advice_acc</i>	-.082	-.022	-.067	.082
<i>advice_sol</i>	.108	.456*	.069	-.496*
<i>advice_coll</i>	.347	-.032	-.065	-.266
<i>advice_srs</i>	-.877*	-.120	.133	2.373**
<i>advice_pybt</i>	-.177	-.666**	-.562	.692
<i>advice_fam</i>	-.325**	-.095	-.033	.106
<i>advice_oth</i>	-.507**	-.102	-.191	-.037
<i>turn_in</i>		.139***	.044	.219***
<i>turn_in_c</i>			.179***	.076**
<i>vol</i>		-1.242***	-.819***	-1.624***
<i>vol_c</i>			-.511***	-.566***
<i>xs</i>		-3.46***	-2.951***	-2.861***
<i>xs_c</i>			-.505	.650
<i>limuse</i>		.803	.343	-1.208***
<i>limuse_c</i>			-.468	1.012*
constant	.980	1.313*	2.567***	4.926***
Number of observations	6,854	6,587	5,974	5,351
-2 Log likelihood	2155.290	3334.071	3168.527	1575.096
χ^2	101.182***	744.148***	826.859***	875.416***

significant at ***1% level, **5% level, *10% level

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