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Selection and Serial Entrepreneurs

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This paper develops and tests a model that explains entry into serial entrepreneurship and the performance of serial entrepreneurs as the result of selection on innate ability. The model supposes that agents establish businesses with imperfect information about their entrepreneurial ability and the profitability of business ideas. Agents continually observe signals with which they update their beliefs, and this process eventually determines their next business choice. Selection on ability induces a positive correlation between entrepreneurial experience (measured by previous business earnings and founding experience) and serial business formation, as well as its subsequent performance. The predictions in the model are tested using panel data from the *NLSY79*. The analysis permits a distinction to be made between selection on innate ability and learning by doing.

JEL Classification Codes: J21, J24, J62, M13.

Keywords: Serial entrepreneurs, selection, ability, entrepreneurial experience, learning by doing.

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1. Introduction

What motivates some individuals to become serial entrepreneurs, and how does this influence their performance? Is serial entrepreneurship driven by taste or personal accidents of history, or are there more systematic predictors? Do agents become serial entrepreneurs because their prior business failed, or because their prior business was a success? Despite an emerging literature on serial entrepreneurship we continue to have little confidence in our answers to these questions.

Early work, largely based on small-sample interviews with serial entrepreneurs, suggest they are motivated by a variety of factors. Wright, Robbie, and Ennew (1997), for example, identify half a dozen disparate motivations. Prominent among them, some start a new venture because they want to explore new business opportunities, while others are attempting to rebuild a failed business. Williams (2000) also identified disparate motivations. While some interviewees were motivated by a desire to seize timely opportunities, Williams also documents instances in which serial entrepreneurs enjoy starting businesses because they can relate the products to their personal experiences.[1]

More recent work has exploited larger samples, focused on more objectively measurable attributes of serial entrepreneurs, and provided performance comparisons with first-time entrepreneurs [cf. Eesley and Roberts (2006a), Stam et al. 2006, Gompers *et al.* 2006). These studies have yielded the following evidence:

- Serial entrepreneurs are more likely to have successfully sold their prior ventures before starting a new business (Eesley et al. 2006b, Stam et al. 2006).
- The current firm has a higher chance of going public if the entrepreneur's previous venture was acquired (Eesley et al. 2006a).
- Entrepreneurs whose business performs poorly are less likely to create a new business (Stam et al. 2006).
- Entrepreneurs who succeeded in prior business have a much higher chance of succeeding in the current business, compared to first-time entrepreneurs and entrepreneurs who previously failed (Gompers *et al.* 2006).

[1] Jeff Jacober, for example, started his first business when he was still in college, selling sportswear to fraternities and sororities. After his brother was diagnosed with chronic kidney failure, Jacober found Ocean Diagnostic Inc. which produced a home health test that helped people to self-diagnose various diseases.

These findings are consistent with at least two distinct interpretations. Eesley and Roberts (2006a), and Stam et al. (2006) interpret their results as evidence that learning from prior founding experience has a positive impact on serial entrepreneurial performance. In contrast, Gompers *et al.* (2006) conclude that self-selection based on innate entrepreneurial skill, rather than learning by doing matters most for serial business formation and performance.

There is, of course, an extensive theoretical literature on learning by doing (see Thompson, 2008a, for an extensive review), and many of the insights in this literature is readily adaptable to entrepreneurship. Indeed, there is already an emerging literature that focuses on issues such as how serial entrepreneurs learn from their successful or unsuccessful prior experiences (Minniti and Bygrave 2001), or how experiential learning positively or negatively affects their entrepreneurial performance (Politis 2005, Corbett 2005, Pástor, Taylor, and Veronesi 2009, *etc.*).

In contrast, there has been little theoretical work on the role of innate ability among serial entrepreneurs. Among the very few contributions, Holmes and Schmitz' (1990) seminal theory of business transfer focuses on serial entrepreneurs who have a comparative advantage in developing new businesses. In their theory, people differ in their ability to respond to business opportunities. Thus, high-ability people become entrepreneurs, specializing in forming new businesses, the low-ability concentrate on managing existing businesses, and those in the middle are "jacks-of-all-trades". To pursue new business opportunities, entrepreneurs need to free up their resources, such as time, through discontinuing or selling their previously developed businesses to their low- or middle-ability counterparts. In their model, an essential assumption is that individuals can perfectly observe their abilities. Then, serial entrepreneurship serves as a natural avenue for them to allocate their talents to the best use.

The present paper also develops a framework that formalizes serial entrepreneurial behavior based on selection on ability. I follow Holmes and Schmitz (1990) by assuming that business performance is jointly determined by an entrepreneur's time-invariant ability and the quality of his business idea. I also assume these two determinants of performance are statistically independent. However, in the spirit of Jovanovic (1979, 1982), the entrepreneur does not perfectly observe his ability and the quality of the business idea ex ante, but only has some prior beliefs about them. Every period, he observes the earnings of his business, as well as the average earnings of the same kind of businesses in the market. The latter is a signal of the value of his business idea. By comparing the performance of his business with other similar

ventures, the entrepreneur gradually updates his belief about his entrepreneurial ability. Based on this belief, he makes a choice between keeping the current business and leaving the business to explore a new idea.

Although misleading signals may induce mistakes on the part of entrepreneurs, the model predicts that high ability entrepreneurs are more likely to form a serial business. This result has two further implications. First, entrepreneurs with a successful experience in the last business have a higher probability of starting a new venture, as ability is positively related to business earnings. Second, the ability of serial entrepreneurs is stochastically higher than that of first-time entrepreneurs. This in turn indicates that the more founding experience an entrepreneur has, the higher is the probability of him forming a new business, and the better is the performance of his new venture.

These implications bring out the essential insight of the model, that selection on ability is sufficient to induce a positive correlation between entrepreneurial experience (measured by previous business earnings and founding experience) and serial business formation as well as its subsequent performance. As previously mentioned, there has been a debate in the empirical literature on whether the impact of prior experience on current entrepreneurial performance can be explained by learning by doing (Eesley and Roberts 2006a) or should be attributed to entrepreneurial skills (Gompers *et al.* 2006). This paper provides a theoretical basis for the hypothesis of selection on ability.

Learning about one's ability and learning about how to do a business are of course not mutually exclusive phenomena, and we would like to understand more about their relative importance. From the empirical standpoint, it has always been a challenge to separate these two types of learning. Thompson (2008a) develops a simple framework incorporating both types of learning, and highlights the difficulty in distinguishing them in empirical analysis. So far, two studies on learning by doing have attempted to do so: one is by Farber (1994), who focuses on differences in the hazards of job separation implied by the two models; the other is by Nagypál (2007), who looked at firm-specific price shocks and their distinctive impacts on employee turnover in the two learning models [See Thompson (2008) for a more detailed discussion]. In this paper, I take alternative approaches of fixed effects and IV estimations to test the predictions of the selection-based model, and to distinguish selection from learning by doing.

The data come from the *NLSY79*. The distinctive feature of the *NLSY79*, which makes it an ideal data source for this study, is its focus on a young cohort that was first interviewed between the ages of 14 and 22. This allows me to trace these individuals' employment history from their first job after graduation, thereby avoiding potential left-censoring problems. Starting in 1979, the survey was conducted annually through 1994 and biennially afterwards. As information from the previous year is often needed in the present analysis, I focus on the period from 1980 to 1993. The sample includes 1,830 individuals who were on average interviewed for 5.8 survey rounds and had been self-employed at least once during these years. In each year, serial entrepreneurs are identified from the respondents' self-employment records. Nearly 30 percent of them reported ever forming a serial business. Their entrepreneurial experience is characterized by two variables. One is previous business performance, measured by their earnings on the last business. The other is their founding experience, indicated by the number of businesses they had previously formed.

A simple examination of the likelihood that a former entrepreneur currently started a new business consistently demonstrates its positive correlation with entrepreneurial experience. That is, entrepreneurs with higher earnings on the last business or with more founding experience are more likely to form a serial business. Clearly, this result can be explained by either selection on ability, or learning by doing, or even both. To explicitly separate these two effects, I first run a fixed-effects model to control for time-invariant ability, an essential element in the theoretical model. By fixing entrepreneurial ability, the two variables, previous business earnings and the number of previously-owned businesses, would only be proxies for learning by doing. Surprisingly, neither of these two variables has a positive effect on the likelihood of new business formation. This suggests that learning by doing is not the cause of the positive effect that entrepreneurial experience has on new business formation.

A perhaps better way to investigate how selection on ability affects serial business formation and its performance is to find instrumental variables that are closely related to the two measures of business experience (*i.e.*, previous business earnings and the number of previously-owned businesses), but that are not subject to learning by doing. I construct two variables, which record an entrepreneur's earnings in his first business and his earnings on his first job, respectively. As mentioned above, the structure of the *NLSY79* survey allows me to precisely identify most respondents' first jobs and especially their first businesses. As there was no previous working

experience for learning to occur, both earnings variables are only related to a person's ability, which, as predicted in the model, positively affects his earnings in subsequent businesses and the number of ventures he would ever form. Consistent with the results from the regular logit regressions, the IV estimations show that, not only do high-ability entrepreneurs (proxied by previous business earnings and the number of previously-owned businesses) have a higher chance of starting a new business, they are also likely to earn more in the new venture.

The contributions of this paper are threefold. First, to my knowledge, this is the first paper that applies the notion of selection on ability to explaining the origin of serial entrepreneurship, although similar ideas have long been formalized to model firm dynamics (Jovanovic 1982). Selection yields some implications for serial entrepreneurship that can easily be misconstrued as the result of learning by doing, and therefore raises doubts about whether we have correctly understood some of the existing empirical evidence. Second, the paper offers a plausible way to empirically examine the mechanism through which entrepreneurial experience affects the likelihood that an entrepreneur starts a new business and his entrepreneurial performance. The results shed light on some long-debated questions, such as what exactly (serial) entrepreneurs learned from their experience, and whether learning really improves their entrepreneurial performance. Third, this paper focuses on a broad definition of entrepreneurs, *i.e.*, self-employed workers. The model applies not only to serial entrepreneurs clustered in high-tech industries and likely to obtain venture capital funding, but also to those who were self-employed in various small businesses. Compared to previous empirical studies which usually use hand-collected data from a relatively small survey sample, the empirical findings in this paper relate to a much more representative group of young workers in the US. Thus, the results provide us with a better understanding of serial entrepreneurship from the perspective of individual occupational choice.

The paper is organized as follows. Section 2 presents the model in which entrepreneurs make a business choice based on the evolution of beliefs about their time-invariant abilities. In section 3, several implications in the model are tested using data from the *NLSY79*. Section 4 concludes.

2. The Model

(1) Technology

Agents start in the business sector as entrepreneurs, and their lifetime is infinite. An entrepreneur's business earnings, q, are given by,

$$q = ae^b \tag{1}$$

where a is his entrepreneurial ability, and b is the quality of his business idea. Neither a nor b is perfectly observable to the entrepreneur. Let $F_0(b)$ denote a common prior belief about b, which is normal with mean $\bar{b}$ and variance σ_b^2. The prior belief about a, $F_0(a)$, is assumed to be diffuse.

Each period, an active entrepreneur observes q, which does not change over time. He also observes a signal of b, for example, from the average performance of this business idea in the market. The signal, s, is normally distributed with mean b and variance σ_s^2. Using Bayesian updating, the entrepreneur's posterior belief about b in period t, $F_t(b)$, is normal with mean $\tilde{b}_t$ and variance $\tilde{\sigma}_{b,t}^2$, where $\tilde{b}_t = (\sigma_s^2\bar{b} + t\bar{s}\sigma_b^2)/(\sigma_s^2 + t\sigma_b^2)$, $\tilde{\sigma}_{b,t}^2 = \sigma_s^2\sigma_b^2/(\sigma_s^2 + t\sigma_b^2)$, and $\bar{s} = (\sum_{i=0}^{t} s_i)/t$. The expectation of his ability at t, $E_t(a)$, is therefore given by

$$E_t(a) = q\int_{-\infty}^{\infty} e^{-b} dF_t(b) \tag{2}$$

(2) The entrepreneur's decision

The entrepreneur faces two choices each period. He can choose to stay with the current business, or he can sell this business and start a new one with a different idea. Assume the market price of a business in period t is given, and only depends on the average market performance of this business idea up to t, *i.e.*, $P = P(\bar{s}_t)$. In addition, assume a sunk cost, c, is incurred if the entrepreneur forms a new business.

Let $V(F_t(b),t;\ q)$ be the value to the entrepreneur of having a business that generates earnings q at time t when his belief about the business idea, b, is $F_t(b)$. Let γ denote the discount factor. Suppose, for simplicity, that the entrepreneur expects to form at most one serial business. Then the Bellman equation can be written as

$$V(F_t(b), t; q) = \max\left\{q + \gamma \int_{-\infty}^{\infty} V(F_{t+1}(b), t; q) dF_t(b), -c + E_t(a)\bar{b}/(1-\gamma) + P(\bar{s}_t)\right\} \qquad (3)$$

The first component in the bracket is the sum of the immediate earnings generated by the current business at time t and the value of continuation. The second component represents the discounted present value of forming a new business at time t. As the new business idea is unknown ex ante, the expected quality of his new idea takes the value of the prior mean, $\bar{b}$; because the entrepreneur expects to form only one serial business, the present value of this business is simply $E_t(a)\bar{b}/(1-\gamma)$.

The question of particular interest is how the evolution of an entrepreneur's belief about his ability and the quality of his business idea affects his decision. To address this question, I follow the approach developed by Thompson and Chen (2009) and redefine the dynamic problem in equation (3) in terms of beliefs about b. Then, equation (3) can be rewritten as

$$V(\tilde{b}, t; q) = max\{q + \gamma \int_{-\infty}^{\infty} V(\tilde{b'}, t+1; q) dG_{t+1}(\tilde{b'}|\tilde{b}), -c + E_t(a)\bar{b}/(1-\gamma) + P(\bar{s}_t)\} \qquad (4)$$

where $\tilde{b}$ is the mean of the posterior belief about b at time t, as previously defined. $G_{t+1}(\tilde{b'}|\tilde{b})$ is the conditional distribution of the posterior mean, $\tilde{b}$. Thus, it is normal with mean $\widetilde{b_t}$ and variance $\sigma_b^2\tilde{\sigma}_{b,t+1}^2/(\sigma_s^2 + (t+1)\sigma_b^2)$.

Let $\tilde{b}^*$ be the critical value of the posterior mean. Forming a new business is preferred if an entrepreneur's posterior expectation of b falls below $\tilde{b}_t^*(\bar{s}_t)$. There is no explicit solution for the critical value because it fluctuates over time in complicated ways. First, it is a function of the average of the signals received about business quality, so the critical value is state dependent. Second, the function itself changes over time because of the evolution in the posterior variance.[2] In order to continue with analytical rather than computational analysis, and especially to derive an expression for the hazard of new business formation as a function of time, I impose a form of myopia where the entrepreneur ignores the option value of remaining one more period with the current business. This approximation has been employed in

[2] The posterior variance declines monotonically, but this has two competing effects on the value function. On the one hand, the option value of staying with the current business is increasing in the conditional variance of $\tilde{b}'$. This induces $\tilde{b}^*$ to rise over time. On the other hand, an entrepreneur's expectation of his ability is increasing in the variance of this posterior belief about b. This causes $\tilde{b}^*$ to fall over time as the expected value of developing a new business idea declines.

similar problems by Jovanovic (1979), Thompson (2008b), and Thompson and Chen (2009). This implies the entrepreneur will form a new business at time t if

$$\frac{q}{1-\gamma} < -c + \frac{E_t(a)\bar{b}}{1-\gamma} + P(\bar{s}_t) \tag{5}$$

which yields the approximate critical value

$$\tilde{b}_t^* = \frac{1}{2}\tilde{\sigma}_{b,t}^2 + \ln\left[\frac{\bar{b}q}{q+(1-\gamma)(c-P(\bar{s}_t))}\right] \tag{6}$$

As $\tilde{\sigma}_{b,t}^2 = \sigma_s^2\sigma_b^2/(\sigma_s^2 + t\sigma_b^2)$, reorganizing equation (6) yields

$$\tilde{b}_t^* = \frac{\sigma_s^2\sigma_b^2}{2(\sigma_s^2+t\sigma_b^2)} + ln\left(\frac{\bar{b}q}{q+(1-\gamma)(c-P(\bar{s}_t))}\right) \tag{7}$$

Clearly, the critical value, $\tilde{b}_t^*$, is decreasing in the cost, c, of forming a new business, but increasing with noisy signals (σ_s^2) and imprecise priors (σ_b^2). It is also positively related to business earnings, q, the market price of an entrepreneur's business idea, $P(\bar{s}_t)$, and his discount factor, γ.

(3) A first-passage problem

The event that an entrepreneur first forms a serial business can be analyzed as a first-passage problem. Let T be a Markov time that satisfies

$$T = \min_t\{t: \tilde{b}_t \le \tilde{b}_t^*\} \tag{8}$$

As $\tilde{b}_t$ is normally distributed with mean $\left(\sigma_s^2\bar{b} + t\bar{s}_t\sigma_b^2\right)/(\sigma_s^2 + t\sigma_b^2)$ and variance $t\sigma_b^4\sigma_s^2/(\sigma_s^2 + t\sigma_b^2)^2$, I construct a variable, ω_t, such that

$$\omega_t = \frac{\sigma_s^2+t\sigma_b^2}{\sigma_s\sigma_b^2}\tilde{b}_t - \frac{\sigma_s^2\bar{b}+tb\sigma_b^2}{\sigma_b^2\sigma_s}, \tag{9}$$

which is a random walk with mean zero and variance t. When $\tilde{b}_t \le \tilde{b}_t^*$,

$$\omega_t \le \frac{\sigma_s^2+t\sigma_b^2}{\sigma_s\sigma_b^2}\tilde{b}_t^* - \frac{\sigma_s^2\bar{b}+tb\sigma_b^2}{\sigma_b^2\sigma_s} \tag{10}$$

Let $\omega(t)$ denote the continuous-time counterpart to ω_t. Then, I can rewrite equation (8) in terms of $\omega(t)$, *i.e.*,

$$T = \min_t\{t: \omega(t) \le \lambda_1 + \lambda_2 t\} \tag{11}$$

where

$$\lambda_1 = \frac{1}{2}\sigma_s + \frac{\sigma_s}{\sigma_b^2}\left[ln\left(\frac{\bar{b}q}{q+(1-\gamma)(c-P(\bar{s}_t))}\right) - \bar{b}\right] \tag{12}$$

and

$$\lambda_2 = \frac{1}{\sigma_s}\left[ln\left(\frac{\bar{b}q}{q+(1-\gamma)(c-P(\bar{s}_t))}\right) - b\right] \tag{13}$$

Equations (11)-(13) define a stochastic process that may reach a linear absorbing barrier located below where the random walk starts. In a symmetric problem where the linear barrier is located above the origin, the distribution of first passage times can be easily derived using the Bachelier-Lévy formula (Cox and Miller 1965 pp221). For this purpose, I make a transformation of equation (11) to obtain the upcrossing time

$$T = \min_t\{t: \omega(t) \geq \zeta_1 + \zeta_2 t\} \tag{14}$$

where $\zeta_1 = -\lambda_1$, and $\zeta_2 = -\lambda_2$.

Equations (11) and (14) describe two symmetric stochastic processes that generate identical results for the first passage time.

Two issues regarding the absorbing barrier merit discussion. First, to ensure the present problem is valid, we need the process, ω_t, to start below the absorbing barrier. This requires $\zeta_1 > 0$. Second, the sign of the slope of the barrier, ζ_2, has some implications on whether an entrepreneur will ever form a serial business. If $\zeta_2 < 0$, the barrier is downward sloping. Thus, no matter in what direction ω_t moves, it will eventually reach the barrier. This indicates that the probability of an entrepreneur ever forming a serial business is one in this case, and new business formation is only a matter of time. If $\zeta_2 > 0$, the absorbing barrier has a positive slope. In this case, whether ω_t will ever reach the barrier is uncertain, depending on the specific sample path. Both results can be easily derived in the following analysis of the probability of serial business formation.

(4) The probability of serial business formation

The probability distribution of the first passage times T is given by the Bachelier-Lévy formula,

$$P(T,\zeta_1,\zeta_2) = \Phi\left(-\frac{\zeta_1+\zeta_2 T}{\sqrt{T}}\right) + e^{-2\zeta_1\zeta_2}\Phi\left(-\frac{\zeta_1-\zeta_2 T}{\sqrt{T}}\right) \tag{15}$$

where $\Phi(.)$ is a standard normal integral.

Let $T \to \infty$. Equation (15) generates some intuitive results about the probability that an entrepreneur ever forms a new business,

$$\lim_{T\to\infty} P\,(T,\zeta_1,\zeta_2) = \begin{cases} 1 & if \;\; b \le W \\ e^{-2\zeta_1\zeta_2} < 1 & if \;\; b > W \end{cases} \tag{16}$$

where $W = ln\left(\frac{\bar{b}q}{q+(1-\gamma)(c-P(\bar{s}_t))}\right)$.

When $T \to \infty$, an entrepreneur has perfectly learned about the true value of his current business idea, b. Meanwhile, equation (6) indicates that the critical value of forming a new business, $\tilde{b}_t^*$, equals W, as $t \to \infty$ and the posterior variance, $\tilde{\sigma}_{b,t}^2$, becomes zero. Thus, consistent with the previous intuition, an entrepreneur will eventually get rid of a low-value business idea and form a new business if $b \le W$. On the contrary, if the current business idea is profitable, there is only a certain possibility that an entrepreneur may unwisely give up this business in order to pursue a different one. The probability of mistakenly starting a new business increases if the cost, c, of forming a new business is low, the market price of the current business, $P(\bar{s}_t)$, is high, or the entrepreneur's discount factor, γ, is large. Also notice the precision of public signals, $1/\sigma_s^2$, does not affect an entrepreneur's decision.

As far as empiricists are concerned, the only element that is observable in the present model is business earnings, which is a common variable recorded in almost all survey data. Thus, it would be interesting to question how business performance affects the likelihood that an entrepreneur decides to form a new venture. Figure 1 presents plots of the probability distribution (16) against business earnings, q. Holding the quality of business idea, b, constant, the graph shows that the probability of an entrepreneur forming a new business is monotonically increasing in business earnings, although at a decreasing rate. At any level of business earnings, the probability of new business formation is higher if the entrepreneur has a lower-value business idea. This result yields the first testable proposition in the model.

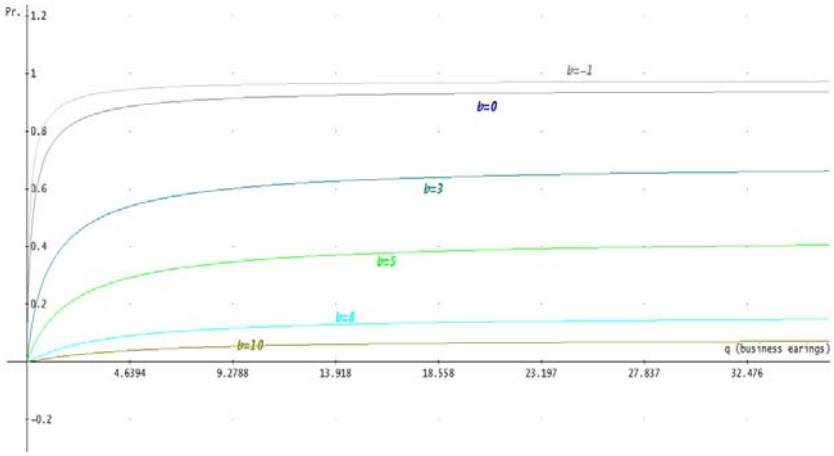

Figure 1. Probabilities of forming a new business as business earnings change
(Parameter values: $c = 50$, $P(\bar{s}_t)= 0$, $\bar{b} = 20$, $\sigma_s^2 = \sigma_b^2 = 25$, $T = 5$, $\gamma = 0.9$.)

P1*. For any given business quality, the probability of selling the current business and forming a new business is increasing in current business earnings.*

In Figure 2, the probability of new business formation varies with the value of the business idea, b, when business earnings, q, are held constant. For five possible values of q, we consistently observe the pattern that the probability of new business formation starts from nearly one when b is very small, decreases at an increasing rate as business quality rises, and eventually declines asymptotically to zero as b becomes sufficiently large. Moreover, as I gradually increase business earnings from 0.1 to 500, the probability curve is also moving upwards. Because ability and quality of business idea are independent in the model, but complementary to each other in the production technology, entrepreneurs who achieved greater earnings must have higher ability relative to people in the same or similar line of business. Thus the model also predicts that higher-ability entrepreneurs are more likely to form a serial business. The above results are summarized in the following two propositions.

P2. *The likelihood of an entrepreneur forming a serial business is decreasing in the quality of his current business idea.*

P3. *Serial business formation is more likely to happen if an entrepreneur has higher ability.*

The present model focuses on first-time entrepreneurs and their decision to form a second business. This framework can be easily extended to characterize their subsequent behavior of starting a third or even more serial ventures. This time I focus on entrepreneurs who are in their second businesses, and relax the assumption that entrepreneurs can only start one serial venture. These second-round entrepreneurs then face the same business choice as they did the first time, and the whole decision-making process starts again. Recall from Proposition 1, entrepreneurs who started a second venture are those who had higher earnings from the first business. Moreover, given the quality level of business idea, higher earnings correspond to higher entrepreneurial abilities. Because business idea is a random draw and has no correlation with ability, ability in the population of second-round entrepreneurs is stochastically greater than ability among first-round entrepreneurs. This result has two further implications.

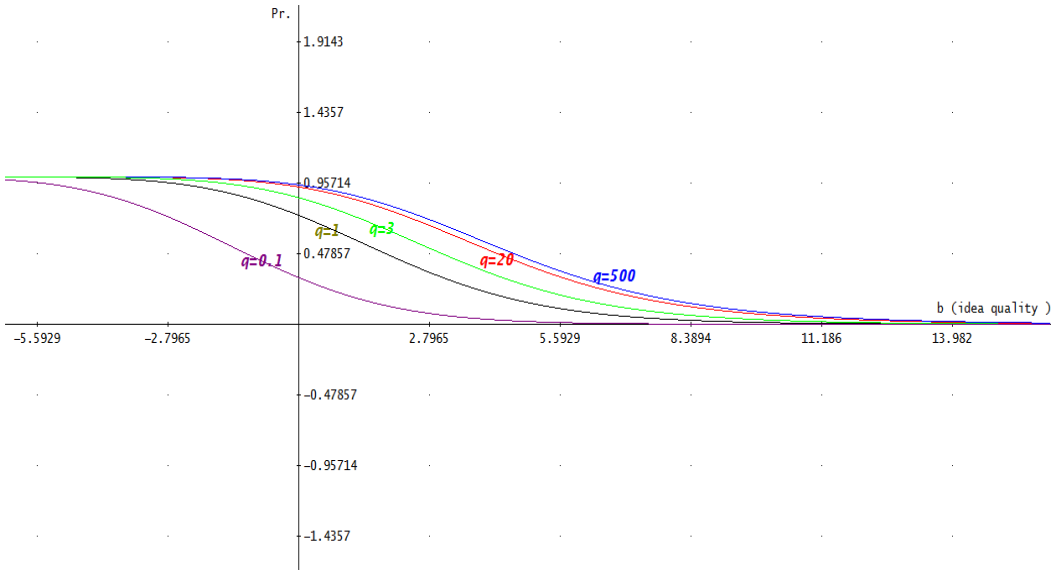

Figure 2. Probabilities of forming a new business as the quality of business idea changes
(Parameter values: $c = 50$, $P(\bar{s}_t) = 0$, $\bar{b} = 20$, $\sigma_s^2 = \sigma_b^2 = 25$, $T = 5$, $\gamma = 0.9$.)

First, as Proposition 3 suggests, higher-ability entrepreneurs have a higher likelihood of forming a new business. Thus, second-round entrepreneurs have a higher probability of forming another new business than do first-time entrepreneurs. More generally, the model predicts that the more businesses an entrepreneur previously owned, the more likely he is to form another serial business. This prediction is consistent with the empirical evidence presented by Stam, Audretsch and Meijaard (2005). Their study, based on 240 ex-entrepreneurs in a longitudinal data set of Dutch firm founders, shows that entrepreneurs who exited from their previous businesses reveal a higher preference for re-entering the business sector if they had previously formed more than one firm.

P4. *The probability of new business formation is increasing in the number of ventures an entrepreneur previously founded.*

Second, as ability is positively related to business performance, but independent of the quality of the business idea, second-round entrepreneurs are also expected to have better performance in the current business than nascent entrepreneurs. Regarding this implication, one thing is worth emphasizing. Gompers *et al.* (2006) found a positive effect of entrepreneurial experience on current business performance (measured by the likelihood of success) among venture-capital backed entrepreneurs, but they also demonstrate that adding the success of previous experience as an indication of entrepreneurial skills eliminates this effect. Eesley and Roberts (2006a) also have found a positive correlation between firm revenues and entrepreneurial experience in their survey of MIT alumni, and considered it the result of learning by doing. The present model generates this similar relationship purely based on selection on ability, consistent with the insight of Gompers *et al.* (2006). It suggests that not only do higher business earnings increase the likelihood of serial business formation (Proposition 1), but more serial businesses and better performance in previous businesses predict higher performance in the future.

P5. *A greater number of serial businesses is an indicator of higher entrepreneurial ability, which in turn predicts better entrepreneurial performance.*

P6. *Better performance in previous businesses is an indicator of higher entrepreneurial ability, which in turn predicts better performance in serial businesses.*

(5) The hazard of new business formation

The hazard of forming a new business, $h(T, \zeta_1, \zeta_2)$, is given by

$$h(T, \zeta_1, \zeta_2) = \frac{P'(T, \zeta_1, \zeta_2)}{1 - P(T, \zeta_1, \zeta_2)} \tag{17}$$

Figure 3 plots the hazards for two distinct cases. In the first case, the true value of the business idea, b, is smaller than W. As indicated in expression (16), the probability that an entrepreneur ever forms a new business equals one in this case. Consistent with this result, we can see from the graph that the hazard of new business formation rapidly increases in the early period and gradually falls to a strictly positive asymptotic bound. In the second case, the entrepreneur has a better idea and the value of b exceeds W. Thus, switching to a new business is a mistake. Unsurprisingly, the hazard of new business formation is much lower in this. It also reaches its peak faster as mistakes tend to happen early. The longer an entrepreneur waits, the more he learns about his ability and business idea, and the less likely he will leave a good business. As the graph shows, the hazard of new business formation eventually declines to zero in the second case.

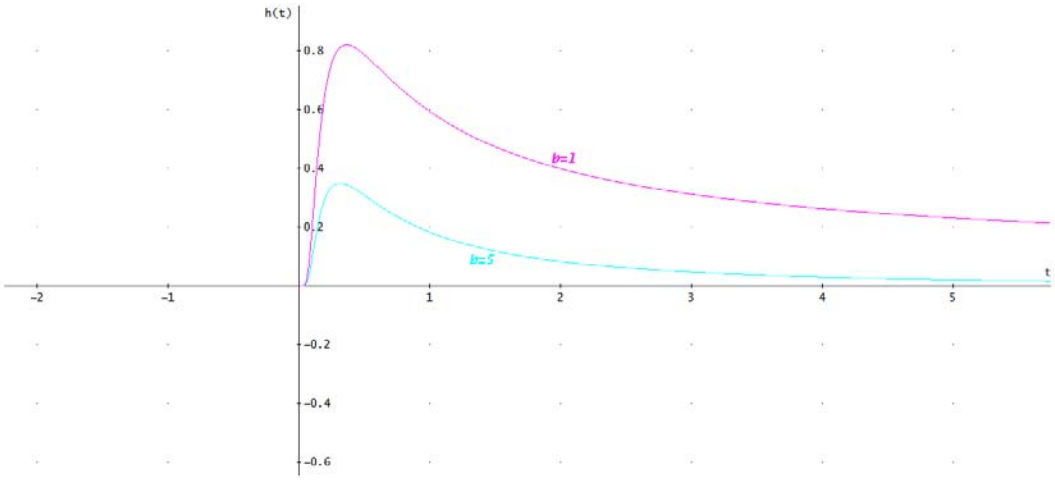

Figure 3. Hazards of new business formation
(Parameter values: $c = 50$, $P(\bar{s}_t) = 0$, $\bar{b} = 20$, $\sigma_s^2 = \sigma_b^2 = 25$, $\gamma = 0.9$, $q = 20$, $W = 2.8$.)

P7. *The hazard of new business formation increases rapidly to a unique peak, and then declines gradually. It moves towards a positive lower bound if an entrepreneur has a bad business idea, and to zero if his business idea is sufficiently good.*

3. Empirical Analysis

This section tests the relationships summarized in Propositions 1, 4, and 5 between previous entrepreneurial earnings, the likelihood of serial business formation, and new business performance. I also examine whether the results should be explained by selection on ability as perceived in the present model, or be attributed to learning by doing as demonstrated in previous studies (Eesley *et al.* (2006a, b)).

(1) The data

The data come from the *NLSY79*. Fairlie (2005) has pointed out a number of features of the *NLSY79* that make it a rich data source to study self-employment. For the present analysis of serial entrepreneurs, what is most important is that the *NLSY79* cohort was at the age of 14-22 when they were first surveyed in 1979. This allows me to track the respondents' employment history almost since the first time they entered the labor market. This property of the *NLSY79* largely alleviates potential left-censoring problems in the present analysis, although right-censoring still exists.

In order to identify serial businesses and create historical variables, I impose two restrictions on the selection of the sample. First, respondents included in each yearly subsample must have participated in all the survey rounds prior to the current year. In doing so, I can keep a complete record of each individual's employment history for the sample periods, so that any serial entrepreneur would be identified. Most important, all individuals included in the sample must have been self-employed at least once in previous years in order for them to have a risk of starting a serial business in the current year. Second, the sampling periods are limited to the years 1980 through 1993. The reason is that the *NLSY79* surveys only report income from

the previous year. This raises an issue after 1993 when the survey is conducted biennially. For example, if I want to collect income data for 1994, I should look at the numbers reported in 1995 survey. However, there was no survey conducted in that year. The next survey was in 1996 and only income in 1995 was reported. As income is an important variable for the analysis, I have to restrict the sample to the periods prior to 1994, even though it means I would not be able to capture all the observations on self-employment in the following seven survey rounds (from 1994 to 2006)

The final sample consists of 25,620 observations on 1,830 individuals, who were on average interviewed for 5.8 years from 1980 to 1993. Fifty-six percent of the sample was male, and 30 percent had a college degree. Because of the previous restriction on the observation periods, individuals in this sample appear to be very young. At the last interview date (1993), the average age was 32, and the oldest was 36. This age pattern reveals one drawback of the sample. As Fairlie (2005) shows, the self-employment rate in the *NLSY79* data steadily increases as the cohort became older. By the age of 42, the self-employment rate for men nearly doubled the rate at the age of 22. Given the current sample period, it is possible that the present analysis only captures a relatively small portion of entrepreneurs and their businesses in the *NLSY79* data. However, for people who started businesses at the early age, the observation period is long enough to generate results that shed lights on serial business formation, entrepreneurial performance, and their relationship with selection on ability.

(2) **Descriptive statistics**

The four key variables created in the data set are: (1) a dummy variable, *serial*, that identifies whether a respondent started a serial business in the current year; (2) a variable, *npb*, that records the number of businesses a respondent ever founded prior to the current survey; (3) a variable, *pearn*, that records a respondent's earnings on his last business; and (4) a variable, *span*, that measures the time period between the current survey year and the last time a respondent was self-employed. Below, I provide additional information on how these variables are constructed, followed by some descriptive results.

Serial Business Formation (*serial=1*). In each survey year, serial business owners are defined as former entrepreneurs who started a new business in the current year. This

definition applies to two cases. In the first case, I look at business owners who switched to wage-employment but currently returned to the business sector. In the second case, I focus on self-employed people who were running a business different from the one they had a year before.

In the sample, there are 10,659 observations on serial business formation over 1,827 individuals. Seven percent of these observations correspond to years in which the individual had formed a new serial business, while thirty percent of respondents had formed a serial business at some point during the observation window. Conditional on a respondent ever forming a serial business, seventeen percent of his observations are associated with a new venture.

Table 1
Frequency of Serial Entrepreneurs by Year

	Serial Entrepreneurs	Total Entrepreneurs	Fraction Serial
1980	1	10	0.10
1981	7	31	0.23
1982	18	64	0.28
1983	24	106	0.23
1984	39	134	0.29
1985	49	177	0.28
1986	47	210	0.22
1987	71	263	0.27
1988	85	292	0.29
1989	96	390	0.25
1990	71	368	0.19
1991	80	352	0.23
1992	84	365	0.23
1993	73	378	0.19

Following Gompers *et al.* (2006), I provide in Table 1 the number of serial entrepreneurs observed in each period. Consistent with Fairlie's (2005) finding, the

total number of entrepreneurs reported in each year is strictly increasing as the *NLSY79* cohort aged, except for a slight drop in the last four periods. The frequency of serial entrepreneurs exhibits a similar pattern. Among total entrepreneurs, the percentage of serial entrepreneurs stays in the range between 0.2 and 0.3 throughout the fourteen periods. Compared to the maximum number of 13% Gompers *et al.* (2006) observe in their sample of venture capital-backed firms, the fraction of serial entrepreneurs counted in this sample is quite large.

The distribution of serial businesses across twelve industries is presented in Table 2. Although self-employment is common in most industries, serial entrepreneurship is mostly related to construction, trade, and business services.

Table 2
Frequency of Serial Entrepreneurs by Industry

	Serial Entrepreneurs	Total Entrepreneurs	Fraction Serial
Agriculture, Forestry and Fisheries	70	379	0.18
Mining	3	11	0.27
Construction	133	525	0.25
Manufacturing	39	155	0.25
Transportation, Communication, Public Utilities	32	92	0.35
Wholesale and Retail Trade	96	433	0.22
Finance, Insurance and Real Estate	19	50	0.38
Business and Repair Services	105	457	0.23
Personal Services	164	681	0.24
Entertainment and Recreation Services	38	105	0.36
Professional and Related Services	46	246	0.19
Public Administration	0	1	0.00

Number of Previous Businesses (*npb*). Based on the information of serial business owners, I construct the variable, *npb*, to record how many different businesses a person had ever owned prior to the current survey. This variable is a measure of

entrepreneurs' founding experience. In the overall sample, the average number of reported previous businesses is one, with the maximum equal to five.

Previous Business Earnings (*pearn*). In each round of the survey, respondents were asked about their income in the past calendar year from three main sources: military, wage and salaries, and business. Fairlie (2005) suggests that self-employment earnings should be measured by the total income from these three sources because most self-employed workers in the *NLSY79* reported their earnings under wages and salary, instead of business income. Three reasons are presented by Fairlie (2005) to explain why this happened. First, incorporating business owners often account their income as wages; second, due to the ordering of the questions, it is possible that respondents already reported their business income when being asked about wages, and did not make any revision on the answer afterwards; Third, some self-employed workers only reported their labor income from the business under wages and salary.

To create a variable that captures a respondent's earnings from his last business, I first construct a yearly variable, *rinc*, which is the sum of a respondent's wage and business income in the previous calendar year. The variable previous (last) business earnings, *pearn*, is created in the following way. Let the 1982 data set be an example. If a person was self-employed in 1981, the variable, *pearn_82*, takes the value of *rinc*_82 as it records his self-employment earnings in 1981. If the person was not self-employed in 1981, but had a business in 1980, the variable, *pearn_82*, takes the value of *rinc_81*, which captures his business earnings in 1980, and so on. Each year, the respondents' previous business earnings are inflated to 2000 dollars. As noted here, military income does not play a part in this variable. The reason is that, compared to wages and salary, it is much less likely that a self-employed worker would report his business earnings under this category.

In the sample, average business earnings are \$18,617, with \$25,599 for men and \$9,593 for women. Table 3 compares the distributions of previous business earnings for those who started a new business and those who did not. Results from the raw data shows that people who started a new business had higher previous business earnings at all five percentiles listed in Table 3, though the difference starts to fade at the 99th percentile. This pattern is consistent with what is observed from the residual earnings, obtained after partialing out the contributions of age, sex, education, industry and year. Figures 4 and 5 provide a better illustration. Both figures show that serial entrepreneurs are more likely to be associated with higher

earnings in previous businesses, although little difference between the two groups is observed at the very top end.

Table 3
Distribution of Previous Business Earnings

	Total Earnings		Residual Earnings*	
	Non-Serial	Serial	Non-Serial	Serial
Mean	18,400	22,272	-136	2,307
Std. Dev	27,860	27,742	26,605	25,660
25th percentile	1,364	3,112	-13,562	-12,646
50th percentile	9,780	13,887	-5,318	-3,562
75th percentile	24,547	28,885	5,408	8,701
95th percentile	63,037	85,354	42,961	57,077
99th percentile	121,241	129,150	106,209	103,578
Observations	9,914	745	8,994	671

* Summary statistics for residual earnings from a regression of previous business earnings on observables (age, gender, highest grade completed, and industry and year dummies)

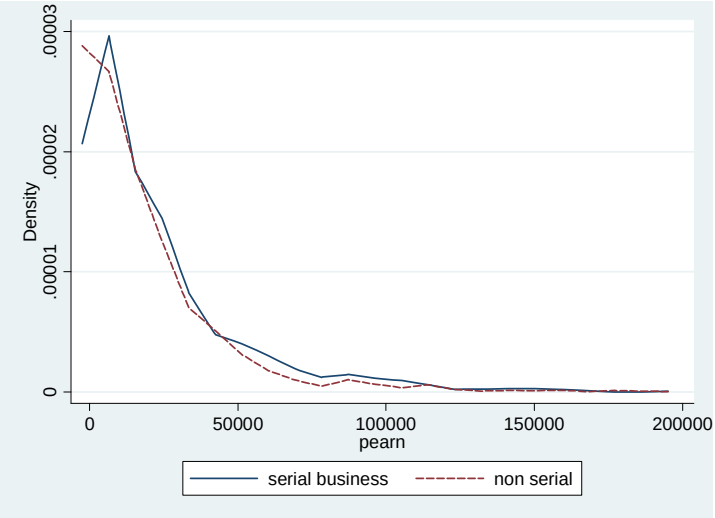

Figure 4. Distributions of previous business earnings

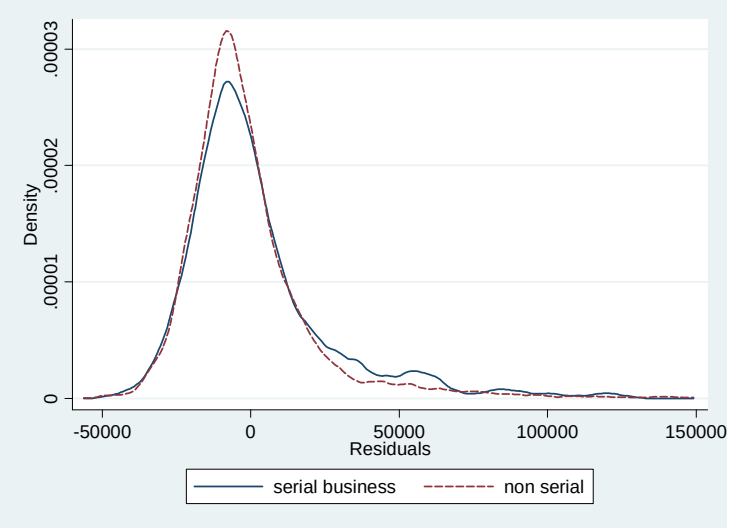

Figure 5. Distributions of residual business earnings

Time Span. This variable is created in each survey round to record how many years had passed since the last time a respondent reported being self-employed. Time span can have two effects on the probability that an ex-entrepreneur re-enters the business sector. On the one hand, a longer waiting period helps a former entrepreneur overcome financial constraints as more capital is accumulated. On the other hand, the longer a person waits, the less likely he is to switch back to self-employment, as implied by Bayesian learning.

In this sample, the average waiting period for an individual to start a new business is three years. The waiting period is slightly longer for people who reported zero earnings on their last businesses (3.3 years on average), and considerably shorter (1.8 years) for those whose earnings from the last business fell into the top one percentile. Wealth constraints may explain these differences.

(3) Results

Before reporting the results, a brief discussion on the regression models I choose is in order. It is common practice to conduct earnings and employment choice regressions using fixed effects. However, the fixed-effects model removes individuals' time-invariant entrepreneurial ability from the estimation process. Thus, it is not a right model for testing any prediction that is based on selection on ability. For this reason, the baseline regressions in this section are carried out without fixed effects. I will then compare the results from these regressions with those generated using instrumental variables and fixed effects (conditional) logits[3], and OLS. The IV estimates are intended to eliminate the contribution of learning by doing, while the fixed effects models eliminate innate ability effects.

A. The Likelihood of serial business formation

The first round of the analysis examines predictions (1) and (4) of the model. That is, the likelihood that an entrepreneur starts a new business is higher if his previous earnings were higher or he had formed more ventures before. My initial approach is to estimate a set of logit regressions where the dependent variable, *serial*, equals one if a person opened a serial business in the current year. Columns (1) and (2) in Table 4 report how this outcome responds to entrepreneurs' previous business earnings (*pearn*) and their prior founding experience (*npb*), respectively, while controlling for age, gender, education, time span, and industries. I do not control for year because there is only limited number of serial entrepreneurs observed each period. Adding this control, we are probably demanding too much from the regressions. Nevertheless, in an unreported analysis, I repeat all the estimations presented in this section with extra controls for years, and find no qualitative changes in the results.

The results reported in columns (1) and (2) demonstrate a positive and significant effect of the two variables, *pearn* and *npb*, on new business formation, as predicted in the model, although the coefficient of previous business earnings is quite small. Column (3) further shows that adding both variables to the regression does not change the previous results. However, even though the results are consistent with

[3] Katz (2001) and Coupé (2005) suggest that when the observing period is less than 16, conditional fixed-effect logit models are preferred to unconditional models because the former produces estimators that have less bias. Respondents in the current sample were on average observed for less than six years.

what is implied by the notion of selection on ability, they could also reflect learning by doing in entrepreneurship. Thus, the real challenge is to show what is actually being captured in the data by the two variables, *pearn*, and *npb*.

Table 4
The Determinants of Serial Business Formation

	Dep Var: Serial=1 if a new business was formed in the current period			
	Logit Regressions			Conditional Logit
	(1)	(2)	(3)	(4)
Previous business earnings ($1,000s)	0.003***		0.003**	0.001
	(2.45)		(2.18)	(0.51)
Number of previously-owned businesses		0.19***	0.18***	-3.73***
		(2.75)	(2.52)	(-15.44)
Span	0.01	0.01	0.02	0.22***
	(0.38)	(0.56)	(0.93)	(3.62)
Highest grade completed	0.02	0.03	0.02	0.04
	(0.94)	(1.56)	(1.15)	(0.53)
Male(=1)	0.13	0.17*	0.12	---
	(1.34)	(1.80)	(1.27)	---
Age	0.35***	0.35***	0.35***	0.93***
	(2.38)	(2.43)	(2.41)	(3.64)
(Age)2	-0.01***	-0.01***	-0.01***	-0.01
	(-2.41)	(-2.49)	(-2.49)	(-1.35)
AV. Log Likelihood	-0.25	-0.25	-0.25	-0.20
No. of Obs	9665	9665	9665	3601

Z-scores are in parentheses. Significance levels: ***0.01, **0.5, *0.1. Additional controls include 11 industry dummies.

I take two approaches to distinguish the effect of selection on ability from the effect of learning by doing on serial business formation. The first approach is to repeat the

analysis in column (3) using the conditional logit model. As the conditional logit regression removes the effect of innate entrepreneurial ability, any surviving effects of *pearn*, and *npb* are likely due to learning by doing. The results reported in column (4) are markedly different from those reported in the previous columns. Not only do previous business earnings no longer matter for serial business formation, but prior founding experience has a strong negative effect on the probability that a person forms a serial business. This sharp contrast suggests that learning by doing may not be an adequate explanation for the results generated by the logit regressions.

In the second approach, I apply IV estimation. Two additional variables are constructed, earnings on one's first job (*fincome*) and earnings from the first-year of one's first business (*fearn*). Both variables are positively related to an entrepreneur's ability, but have little to do with learning by doing from previous experience. Moreover, they are both closely related to entrepreneurs' previous business earnings and even their founding experience through entrepreneurial ability. For this reason, I use these two earnings variables as instruments for previous business earnings and the number of previously-formed businesses.

First, I repeat the analysis in columns (1) through (3) of Table 4, substituting the linear probability model for the logit. The results, shown in columns (1), (3) and (5) of Table 5, are consistent with those from the logit regressions. Next, three IV estimations are implemented with both instruments. The results are reported in columns (2), (4) and (6) of Table 5, which all, again, have the predicted signs and are statistically significant. It is interesting to note that, contrary to expectations, the IV estimations generate larger coefficients for both variables of interest. As the results from IV estimations are solely driven by selection on ability, they provide support for propositions 1 and 4 in the model.

B. Earnings from the Current Business

The second task in the analysis is to examine propositions (5) and (6) which predict a positive effect of the number of ventures an entrepreneur has founded and performance in prior business on earnings in the current business.

Column (1) of Table 6 reports the results of the OLS regression, which confounds selection and learning effects. The regression shows a positive effect of previous business earnings on current earnings, but no effect of the number of businesses

Table 5
Linear probability models – OLS and IV

	Dep Var: Serial=1 if a new business was formed in the current period					
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Previous business earnings						
($1,000s)	2.5E-04***	3.9E-04***			2.3E-04**	5.3E-04***
	(2.55)	(2.41)			(2.32)	(3.03)
Number of previously-						
owned businesses			0.01***	0.12***	0.01***	0.15***
			(2.83)	(2.50)	(2.62)	(3.14)
Span	0.000	0.001	0.001	0.006**	0.001	0.010***
	(0.41)	(0.66)	(0.58)	(2.26)	(0.98)	(3.14)
Highest grade completed	0.001	0.001	0.002	0.003***	0.001	0.002*
	(0.87)	(0.59)	(1.54)	(2.37)	(1.06)	(1.80)
Male(=1)	0.01	0.01	0.01*	0.00	0.01	-0.01
	(1.26)	(0.88)	(1.79)	(0.74)	(1.19)	(-0.67)
Age	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
	(2.36)	(2.34)	(2.41)	(2.53)	(2.38)	(2.48)
(Age)2	-3.6E-04***	-3.6E-04***	-3.8E-04***	-4.9E-04***	-3.8E-04***	-5.4E-04***
	(-2.38)	(-2.38)	(-2.48)	(-3.01)	(-2.47)	(-3.20)
Adj R-squared	0.01	0.01	0.01	---	0.01	---
No. of Obs	9665	9665	9665	9665	9665	9665

t-statistics are in parentheses. Significance levels: ***0.01, **0.5, *0.1. Additional controls include 11 industry dummies. In all regressions, instruments are *fincome* and *fearn*.

previously owned. Column (2) reports IV regressions, using the same instruments as previously, and intended again to isolate the effects of selection on earnings. The IV estimation returns a large positive point estimate for the effect founding experience, although this is very imprecisely estimated and statistically insignificant. The effect of previous business earnings on current earnings is more precisely estimated, and plausibly indicates that current business earnings increase by $720 with each $1,000

increase in previous business earnings. Finally, column (3) of Table 6 reports the results of fixed effects estimation. The positive effect of previous business earnings is eliminated. The point estimate of the effect of previous business ownership remains large and positive, and is now significant at the ten percent level.

Table 6
Current Business Earnings and Previous Business Experience

	Dep Var: Current business earnings, $1,000s		
	OLS	IV	fixed-effects OLS
	(1)	(2)	(3)
Number of previously-owned businesses	-0.05	9.33	8.08*
	(-0.03)	(0.47)	(1.79)
Previous business earnings ($1,000s)	0.62***	0.72***	-0.07
	(13.01)	(9.49)	(-0.81)
Span	-0.23	0.61	0.88
	(-0.37)	(0.43)	(0.71)
Highest grade completed	1.72***	1.65**	-1.5
	(3.28)	(2.28)	(-0.38)
Age	3.88	2.48	2.4
	(0.9)	(0.53)	(0.36)
(Age)2	-0.07	-0.06	-0.06
	(-0.91)	(-0.72)	(-0.54)
Male(=1)	8.37***	6.69**	---
	(2.98)	(2.21)	---
F-statistic	19.28	14.45	1.41
No. of Obs	636	636	636

These results suggest that selection on ability and learning by doing both have a role to play in determining current business earnings. First, the persistence of the effect of

prior business earnings as we move from OLS to IV, and its elimination in the fixed effects model, indicate that that the correlation between previous and current business earnings is entirely due to selection effects; Second, the significance of the number of previously-owned businesses in the fixed effects model, suggests that learning by doing plays a role in linking prior founding experience to current earnings.

As the contribution of entrepreneurial ability is eliminated from the fixed effects regression, the results suggest that entrepreneurs learn from past experience without regard to their performance in previous businesses. This finding is in contrast to Gompers *et al.*'s (2006) study of venture capital-backed firms, where it was suggested that only successful past experiences engender future success. In their study, business performance is measured by a binary indicator of success or failure. They find that serial entrepreneurs with successful prior businesses have a higher rate of success than first-time entrepreneurs or entrepreneurs who failed before. Founding experience, however, does not matter once prior success is considered.[4] Gompers *et al.* favor an interpretation of selection on ability over selective learning by doing. However, using prior success as a proxy for entrepreneurial skills may raise a potential issue as this variable also captures heterogeneous learning by entrepreneurs. Gompers *et al.*'s (2006) result, therefore, could be driven by different forces other than entrepreneurial skills. For example, it could arise because learning from successful experience is more valuable, or because high-ability entrepreneurs learn faster from prior experience.

4. Conclusions

This paper explores the idea that serial entrepreneurial behavior could be a reflection of selection on ability. It develops a framework where entrepreneurs do not perfectly observe their abilities, and their business ideas come as a random draw. Without learning by doing, the model predicts that entrepreneurs from successful ventures are exposed to a higher incentive to pursue a new business idea if the current idea does not appear to be particularly attractive. It also predicts a positive correlation

[4] Indeed, they observe little difference between the predicted success rate of serial entrepreneurs who had failed in the previous business (22.1%) and that of entrepreneurs who had founded only one business (20.9%).

between prior entrepreneurial experience and the likelihood of new business formation and the performance of current venture.

While the model focuses on the role of selection in serial entrepreneurship, I do not intend to discount the notion that learning by doing in prior experience could also encourage entrepreneurs to explore new business opportunities and further improve their performance in new ventures. In fact, the empirical analysis provides evidence of both types of learning among serial entrepreneurs. On the one hand, the results show that, after reducing their correlation with entrepreneurial learning by means of IV regressions, both higher previous business earnings and more founding experience predict a higher probability that entrepreneurs start a new business and better performance in these businesses. These findings support the theory of selection on ability. On the other hand, after eliminating the contribution of entrepreneurial ability by means of fixed effects regressions, I find that learning from prior experience has a significant impact on entrepreneurs' current business performance. This result is consistent with the story of learning by doing in entrepreneurship.

This paper is closely related to Eesley and Roberts' (2006a) study on entrepreneurial learning from founding experience and Gompers *et al.*'s (2006) work that emphasizes entrepreneurial skills rather than learning from prior experience. The present paper suggests that the empirical evidence presented in both studies does not contradict, but rather complement each other. Thus, the paper sheds some light on a controversial issue raised by Gompers *et al.*'s (2006) finding that almost no learning would happen in an unsuccessful venture.[5]

The present paper argues that entrepreneurial experience is an important indicator of entrepreneurial ability. Serial entrepreneurs with successful business backgrounds are more likely to be associated with superior ability, such as discovering a promising business opportunity, or choosing the right management team. Thus, it would not be surprising if they continue to be successful in a new venture. Learning by doing, on the other hand, could help entrepreneurs overcome their initial inexperience in some specific cases, and improve their performance later. But if selection on ability dominates entrepreneurial learning, previously-successful entrepreneurs on average would be expected to have a better performance in a new business than those who

[5] Their finding is also at odds with numerous entrepreneurial legends who suffered several failures before great success eventually came. As Gordon Moore, a co-founder of Intel, put it, "[y]ou're more valuable because of the experiences you've been through under failures" (Berlin, 2009).

failed before, especially if we consider the possibility that high-ability entrepreneurs often learn faster from their previous experience than their low-ability counterparts.

In this paper, I adopt a simplified production technology in order to derive some basic insights for the mechanism of selection. For future research, this model can be extended in several directions. First, some random noise could be added to the production function so that the omitted factors, such as technology shocks or a sudden change in management team, would also have an influence on output. Second, instead of assuming independence of ability and business quality, complementarity between these two variables can be introduced to the model. In this case, high-ability entrepreneurs are more likely to be associated with a good business idea, and also to have a better chance of discovering a promising new business opportunity. It would be interesting to see how differently entrepreneurs behave in this new context. Third, it is also worthwhile to estimate from the model the maximum time it will take an entrepreneur to learn precisely his ability. Lastly, given the widely-accepted view that entrepreneurs are overconfident, adding this element to the model would allow us to explore whether overconfidence accelerates entrepreneurial learning, and whether this would in turn reduce serial entrepreneurial activities.

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