

SELF-EMPLOYMENT DYNAMICS AND THE RETURNS TO ENTREPRENEURSHIP*

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Abstract

In a cross-section of workers, the median entrepreneur earns less than the median wage worker. However, unsuccessful entrepreneurs have the option to transition back to the paid sector. This option value increases the lifetime expected value of entering entrepreneurship relative to the expected pay in a single year. This paper estimates the expected returns to entering entrepreneurship within a dynamic lifecycle model allowing for non-random selection in and out of entrepreneurship and gradual learning about entrepreneurial ability. The option value of entrepreneurship substantially decreases the inferred non-pecuniary benefits of entrepreneurship necessary to reconcile observed earnings and workers' labor choices.

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1 Introduction

The median entrepreneur earns less than the median wage worker (Evans and Leighton 1989, Hamilton 2000).¹ In equilibrium, the marginal individual must be indifferent between wage work and self-employment, so the existence of this earnings gap is a puzzle. Several candidate explanations have been advanced to explain the gap, including non-pecuniary benefits from control, mismeasured earnings due to tax evasion motives, and improper accounting for nonrandom selection. One limitation of most analyses is that returns to self-employment are calculated in a static context: individuals are either entrepreneurs or wage workers. In fact, most spells of entrepreneurship last only a few years, after which individuals return to paid employment. Many of those individuals who enter self-employment may not know their exact ability as entrepreneurs and must learn about it through experience. The option to return to paid work increases the lifetime value of entrepreneurship relative to an estimate from the cross-section because successful entrepreneurs can continue in self-employment while unsuccessful entrepreneurs can return to the wage-paying labor market. This paper analyzes a model of experimentation to explain the career dynamics, cross-sectional earnings distributions, and sectoral choices of entrepreneurs and paid workers.

To illustrate why the option to change sectors affects inference about entrepreneurial earnings, consider a simple sectoral decision problem for a risk neutral individual who lives 1 period. His earnings in entrepreneurship equal his entrepreneurial ability, η_E , and the ex-ante distribution of his entrepreneurial ability is normal with mean \$1000 and standard deviation \$500. If he works in the wage sector he earns \$1200 with certainty. In this static decision problem he only chooses entrepreneurship if the non-measured benefit from entrepreneurship, denoted B , is at least \$200.

In a 2 period model in which the individual maximizes the expected sum of ex-ante utility, the non-measured benefit necessary for the individual to choose entrepreneurship declines dramatically. With no discounting, if the individual learns his entrepreneurial ability after 1 period, his expected lifetime earnings from choosing entrepreneurship in period 1 equals $\eta_E + B + \max(\eta_E + B, \$1200)$. The second term captures the option value to switch from entrepreneurship back

¹Other studies also show that returns to holding private businesses are no higher than investments in publicly traded stocks, despite their higher risk (Moskowitz and Vissing-Jorgenson 2002, Hall and Woodward 2010).

into the paid sector, and the individual switches to wage work if second-period earnings in entrepreneurship do not justify continuation.

How big must the non-measured benefit be for the individual to select entrepreneurship in period 1? The critical value solves

$$\eta_E + B + \max(\eta_E + B, \$1200) \geq \$2400,$$

and a non-measured benefit, B , greater than \$62 is sufficient to induce the selection of entrepreneurship in the first period.² This is less than half of the required non-measured benefit in the static model. On average, a worker must still receive a non-measured benefit of at least \$200 to remain in entrepreneurship again in the second period. In expectation, therefore, an individual with a non-measured benefit to entrepreneurship of less than \$200 has a greater than 50% chance of switching out of entrepreneurship in the second period.

With this intuition in mind, it is possible to identify non-measured benefits from entrepreneurship and the option value of experimenting using panel data on entrepreneurial earnings, expected wages in the paid sector, and the duration of entrepreneurial spells.³ Stylized facts from the Panel Study of Income Dynamics underscore the importance of experimentation for explaining entrepreneurial choice. First, many workers in the PSID experiment with entrepreneurship, which we define as self-employment, but few stick-it-out. Nearly a quarter of the individuals in the PSID experiment with entrepreneurship at some point in their careers, but in each year only about 10% of those in the sample are entrepreneurs. Second, the least successful entrepreneurs exit back into the paid labor force rather quickly, while those who survive in entrepreneurship earn more in entrepreneurship than paid work.

These results have implications for policy and an understanding of entrepreneurial earnings. Earlier studies (Evans and Leighton 1989, Hamilton 2000, Moskowitz and Vissing-Jorgenson 2002, Hall and Woodward 2010) have proposed several reasons why the return to entrepreneurship might be small or negative, including large nonpecuniary benefits from being one's own boss or adverse selec-

²Solving for the level of B set $1000 + B + \left\{ 1000 + B + 500 \frac{\phi(c)}{1 - \Phi(c)} \right\} 1 - \Phi(c) + 1200\Phi(c) = \2400 where $c = (1200 - B - 1000) / 500$. Solving this for the critical value of B in the first period yields a cutoff of \$62.

³Separating non-pecuniary benefits that flow from being one's own boss from systematic misreporting of earnings is difficult to distinguish empirically without consumption data over the lifecycle. Instead, the focus here is on whether measured lifecycle earnings profiles in survey data can explain entrepreneurial choice, while all non-measured benefits, either non-pecuniary or due to misreported earnings, are lumped together as a residual.

tion. Hamilton (2000), Evans and Leighton (1989), and Bruce and Schuetze (2004) provide some evidence on the return to self-employment experience in wage work. Caliendo and Uhlendorff (2008), Caliendo, Fossen, and Kritikos (2010), Levine and Rubinstein (2013), and Hurst and Pugsley (2011) discuss the heterogeneity of self-employed workers and the reasons they select into self-employment. Vereshchagina and Hopenhayn (2009) discuss the role of entrepreneurial selection in a dynamic model, and Manso (2014) suggests that cross-sectional estimates of entrepreneurial earnings are biased because of dynamic concerns. This paper builds on this work by structurally estimating the return to entrepreneurship within a lifecycle model. The model is used to assess the relative importance of different explanations for the observed earnings differential between entrepreneurship and paid work. A dynamic lifecycle model of entrepreneurial choice fits the data substantially better than a static model.

The next section describes our data and presents stylized facts that suggest the importance of considering returns to entrepreneurship in a dynamic context. Section 3 presents our model and Section 4 outlines our plan for estimating it.

2 Data and Summary Statistics

2.1 The Sample

We use data from the 1976-2011 waves of the Panel Study of Income Dynamics (PSID).⁴ The PSID interviewed respondents annually until 1997 and bi-annually from 1999 onwards. The long panel structure of the PSID allows us to observe workers before, during, and sometimes after spells of entrepreneurship. The original PSID sample includes a representative group of American households in 1968 and an oversample of low-income households. The PSID has continued to interview members of these households, their offspring, and individuals who marry into these families. In 1990 and 1997 the PSID refreshed the sample with a set of Latino families (dropped in 1996) and then a set of families representative of US immigrants since 1968 to better reflect the current mix of US households. We include both original samples and the immigrant samples in our analyses, using PSID-constructed weights to adjust for probability of inclusion in the survey. These changes in the sample, along with young workers entering the workforce, old workers aging out, and occasional non-response,

⁴1976 is the first year in which the PSID asked about respondents' tenure in their current job, which we use to construct our measure of work experience in each sector.

creates an unbalanced panel.

Our sample is constrained by the need to keep track of accumulated work experience in each sector. In the first year we see a worker we initialize their experience using their report of how long they have been at their current job. For example, if a worker enters the sample working in the wage sector and has been working at that job for 8 years we say they have 8 years of wage experience and no entrepreneurial experience. We then update experience each year with their observed work in each sector. We include workers in our sample only when we can follow their work experience starting at age 30 or earlier.⁵ Because we estimate individual-specific earnings effects we further restrict the sample to individuals who report at least 3 years of labor earnings in either sector. After these restrictions, we are left with a sample of just under 15,000 men and women. On average, we observe 10 years of earnings for each worker in our sample, with a maximum of 29 years.

2.2 The Choice to Become an Entrepreneur

We define an entrepreneur as someone who is self-employed in their main job.⁶ We use this definition, rather than one based on business ownership, because we are considering entrepreneurship as primarily a sectoral labor supply choice, although it may also represent a financial investment. 72% of workers in the entrepreneurship sector own a business. The rest work as contractors or are otherwise self-employed without owning a business. 7% of workers who we classify as wage workers also own businesses, but run these businesses on the side and work for someone else on their main job.

Table 1 describes these workers who ever spend time in entrepreneurship and those who only ever work in the wage sector. Moves in and out of entrepreneurship are quite common. A quarter of our sample experiments with entrepreneurship at some point, but each year only 10% or so of workers are entrepreneurs. In fact, we see the average member of our entrepreneur sample in wage work for 9 years and entrepreneurial work for only 5 years. Our entrepreneurs are more likely to be white and slightly better educated on average than the wage-only group, but otherwise look quite similar to other wage

⁵In other words, we keep all workers who enter the sample by age 30, plus any worker who enters the sample at an older age but reports being in their current job since before they were 30. The PSID only began asking about job tenure in 1976, but we can use observed wage-earning or self-employed work from 1968-1975 to help construct our experience measures.

⁶This definition is consistent with other studies such as Evans and Jovanovic (1989) that focus on entrepreneurship as a labor investment choice rather than as a financial investment.

workers.

The median entrepreneur is 31 when he or she first enters entrepreneurship. Figure 1 plots the hazard rate of first entering entrepreneurship by age.⁷ The hazard rate peaks at 4% for 27 year olds. The probability of moving into entrepreneurship falls through the 30s and levels off at 1.5% in the 40s. More than three quarters of our entrepreneur sample spend some years in wage work at the beginning of their working life, but a few enter the labor force as entrepreneurs.

2.3 Earnings in Wage Work and Entrepreneurship

Measuring earnings for the self-employed is not straightforward. In the PSID, all workers are asked about their wages or salaries, but not all respondents answer the question. Owners of unincorporated businesses are asked about their net profit from that business, but owners of incorporated businesses are not. Our first choice for both wage and self-employed workers is to use reported wages or salaries. For entrepreneurs who do not report a wage or salary but do report profit from a business we use that profit as their labor earnings (this will overstate labor earnings in cases where workers have also invested substantial financial capital in their businesses). Finally, if workers do not report detailed wage and salary information but do answer a question on their total labor earnings for the year we use that number. Because work hours are difficult to define for self-employed workers we run our estimates on weekly earnings rather than hourly.

Earnings in entrepreneurship are more variable than earnings in the wage sector. Figure 2 presents the distribution of real weekly earnings in each sector. The distribution of earnings for workers currently in entrepreneurship is flatter than for wage workers, with more weight on the lowest values and a thicker long right tail. Controlling for age, sex, race, and education, we find that the mean of earnings in entrepreneurship is somewhat higher than the mean in wage work, but the median is lower.⁸ Table 2 presents OLS and quantile regressions of real weekly earnings including an indicator for being an entrepreneur and basic demographics. In our sample, the average entrepreneur earns \$180 more at the

⁷Wishing to exclude workers who enter entrepreneurship as a second career or retirement project, who may have different objectives than younger entrepreneurs, we exclude the small number of workers who first enter entrepreneurship when they are over 50 from our analysis.

⁸Hamilton (2000) finds a similar result in the Survey of Income and Program Participation, using a somewhat different measure of earnings in entrepreneurship.

mean, but \$45 less at the median per week. For a 30 year old white man, these regressions predict mean earnings of \$645 and median earnings of \$608, so these gaps represent a 28% increase and 7% drop respectively.

2.4 Transitions and the Value of Entrepreneurship

Table 2 compares earnings for workers currently in wage work and workers currently in entrepreneurship, but these static comparisons miss non-random selection in and out of entrepreneurship. Figure 3 plots the probability of moving into entrepreneurship next year by the worker's current earnings percentile in the wage sector and reveals two distinct paths into entrepreneurship. The probability of moving into entrepreneurship is roughly U-shaped in wage earnings. Workers in the bottom of the wage earning distribution have the highest probability of moving to entrepreneurship next period, suggesting that some workers transition to entrepreneurship when they face unusually bad shocks in the wage sector. Workers who spent at least 8 weeks unemployed in the wage sector in the past year are almost twice as likely to move into entrepreneurship as other wage workers. However, workers with the highest earnings in the wage sector are also somewhat more likely to transition into entrepreneurship than those with somewhat lower earnings, suggesting that some workers are drawn into entrepreneurship by the possibility of landing in the thick right tail or other non-pecuniary benefits of entrepreneurship.

Selection out of entrepreneurship is also non-random. As presented in Figure 4, nearly a quarter of workers who enter entrepreneurship leave after only a year. The probability of exiting entrepreneurship exhibits strong negative duration dependence; by the time workers have remained in entrepreneurship for 15 years they have only a 5% change of leaving the following year. This pattern is consistent with a model where workers are uncertain of their entrepreneurial abilities when they enter entrepreneurship and gradually learn their ability as they observe their earnings in that sector. The first year of earnings provides workers with a much clearer signal of their prospects in entrepreneurship and many leave. Subsequent years of earnings provide ever smaller updates to the worker's beliefs of their abilities and prompt fewer exits.

Workers who stay in entrepreneurship longer earn more from their first year in entrepreneurship. Figure 5 plots earnings in each year of entrepreneurship for workers who remain in that sector for 2 years or less, 3-5 years, and 6 years or more. In the first year of entrepreneurship the average worker who will leave

within 2 years earns less than \$400 per week while those who will end up staying for at least 6 years earn almost \$600 on average. This pattern is again consistent with workers who can learn their entrepreneurial ability only by experimenting with work in the entrepreneurial sector. Those workers with high entrepreneurial earnings stay in that sector, while the less successful entrepreneurs can return to wage work. We lay out a model with this type of selection in more detail in the following section.

3 Model

In each period $t = 0, 1, \dots, T_i$, starting after the last year of schooling and continuing to retirement at age 65, risk-neutral individual i chooses between supplying labor in the paid sector ($d_{it} = 0$) or the entrepreneurial sector ($d_{it} = 1$). The utility from choosing the paid sector is

$$U(0, S_{it}) = \beta_1 W_{it} + \beta_2 (d_{it-1} = 1) + \nu_{it}(0),$$

where $\nu_{it}(0)$ is an iid Type-1 extreme value taste-shock from choosing paid work that is unobserved to the econometrician, W_{it} is the wage in the paid sector, and β_1 translates the wage into units of utility, scaled relative to the variance of the taste shock. The parameter β_2 captures switching costs between sectors and is paid if the agent moves from entrepreneurship to the paid sector. As a normalization, the mean utility from choosing the paid sector if $W_{it} = 0$ and with no switching costs is set to zero.

The expected utility from choosing entrepreneurship is

$$U(1, S_{it}) = \beta_0 + \beta_1 R_{it} + \beta_2 (d_{it-1} = 0) + \beta_3 (x_E = 0) + \nu_{it}(1),$$

where $\nu_{it}(1)$ is an iid Type-1 extreme value taste-shock that is unobserved to the econometrician, R_{it} is expected current earnings in entrepreneurship, scaled by β_1 , and β_2 again captures switching costs. Two new parameters, β_0 and β_3 , capture nonpecuniary benefits and startup costs from choosing entrepreneurship, respectively. The nonpecuniary benefit, β_0 , has the interpretation of a completely persistent taste preference for entrepreneurship. In the baseline version of the model, this is estimated as a common value for all individuals.⁹

⁹We are working on extensions that allow unobserved heterogeneity in nonpecuniary benefits.

Person i is assumed to maximize the present value of expected utility from each choice, given by the following value function

$$V_{it} = \max_{d_{it} \in \{0,1\}} E \left[\sum_{\tau=0}^{T_i} \delta^\tau \sum_{j \in \{0,1\}} U_{i\tau}(d_{i\tau}, S_{i\tau}) | S_{it} \right],$$

where δ is the discount rate and S_{it} is the state.

To parameterize the wage and entrepreneurial earnings process, we begin by specifying a flexible baseline model for the wage. In addition to unit-root and transitory wage shocks, workers in the paid sector face a risk of a semi-persistent very low wage shock. We interpret this shock as an unemployment shock, but abstract from search behavior or endogenous moves in and out of employment. Wages are given by

$$\begin{aligned} W_{it} &= \exp[G_{paid}(x_{paid}, x_{self})] P_t M_t (1 - \rho_S(U_{t-1})) + \rho_S(U_{t-1}) W_U \quad (1) \\ P_t &= P_{t-1} \zeta_t (1 - U_{t-1}) + c_U P_{t-1} \zeta_t U_{t-1}. \end{aligned}$$

The agent experiences the bad wage shock with probability $\rho_S(U_{t-1})$, where the probability of being in the bad wage state this period depends on whether the agent was in the bad state the period before, $U_{t-1} = 1$. If the agent is employed his earnings depend on his accumulated work experience in each sector, $\exp[G_{paid}(x_{paid}, x_{self})]$, a unit-root wage shock, P_t , and a transitory shock M_t . With probability ρ_S , the person is unemployed and earns a fixed benefit W_U . The unit-root component, P_t , has permanent shocks ζ_t . If the worker was employed in the previous period, then P_t is a standard unit-root process. If he was unemployed in the last period, then the process incorporates a multiplicative scarring cost of unemployment, c_U , that carries over into future earnings. The shocks ζ_t and M_t are distributed log-normally, $\ln \zeta_t \sim N(0, \sigma_\zeta^2)$ and $\ln M_t \sim N(0, \sigma_M^2)$.

This formulation allows a simple expression for the expected earnings in the paid sector in period t ,¹⁰

$$E(W_{it}) = (1 - \rho_S) \exp \left[G_{paid}(x_{paid}, x_{self}) + \log(P_{t-1})(1 - U_{t-1}) + c_U \log(P_{t-1}) U_{t-1} + \frac{\sigma_\zeta^2 + \sigma_M^2}{2} \right] \quad (2)$$

¹⁰A sufficient statistic to calculate this expectation is lagged years of experience in the paid sector and entrepreneurship, lagged residual log compensation in the last year of working in the paid sector (net of the experience function), and the lagged unemployment indicator. We calculate $\log(P_{t-1})$ as $\log(W_{t-1}) - G_{paid}(\cdot)$ if $U_{t-1} = 0$. Otherwise, let τ be the last lagged value at which the log wage is observed (assuming no entrepreneurial spell). Then $\log(P_{t-1})$ is calculated as $\tau c_U + \log(W_{t-\tau}) - G_{paid}(\cdot)$.

$$+\rho_S W_U.$$

In self-employment, workers have a fixed individual earning ability, η_i . A worker does not know his ability with certainty and learns about it through experience in self-employment. His expected log earnings are given by

$$E \log R_{it} = G_{Self}(x_{paid}, x_{self}) + \hat{\eta}(S_{it}) + \varepsilon_{it},$$

where $\hat{\eta}_{it}(S_{it})$ is the mean of his belief about his entrepreneurial ability given state S_{it} . Expected earnings are determined by a sector-specific function of accumulated experience along with this expected belief about entrepreneurial ability and log-normally distributed transitory shock, $\ln \varepsilon_{it} \sim N(0, \sigma_\varepsilon^2)$.

In this model transitions in and out of entrepreneurship are driven by the evolution of the beliefs about entrepreneurial ability. For individuals with no work experience in either sector, these beliefs are assumed to be normally distributed with mean $\hat{\eta}_{i0}(S_{it})$ and variance $\sigma_{\eta 0}^2$. If observed entrepreneurial experience is 0, the mean belief reflects the population correlation between paid earnings and entrepreneurial earnings. For individuals with x_{self} years of entrepreneurial experience, the mean belief is denoted $\hat{\eta}_{ix}$ and is updated according to the standard Bayesian procedure. This yields

$$\hat{\eta}_{ix} = \frac{\sigma_\varepsilon^2 \hat{\eta}_{i0} + x_{self} \sigma_\eta^2 \overline{\log(\tilde{R})}}{x_{self} \sigma_\eta^2 + \sigma_\varepsilon^2} \quad (3)$$

where x_{self} is years of total experience in entrepreneurship at $t - 1$, $\overline{\log(\tilde{R})}$ is the mean of the log earnings history in entrepreneurship from experience levels 0 through x_{self} net of the experience profile in entrepreneurship, $G_{self}(\cdot)$.

The variance of the prior distribution is updated in a deterministic fashion in each period. If $x_{self} = 0$ at $t - 1$, $\sigma_{\eta 0}^2$ is simply the population variance of earnings in entrepreneurship net of the transitory variance. If $x_{self} > 0$, the variance of the prior is $\sigma_{\eta X}^2 = \frac{\sigma_{\eta 0}^2 \times \sigma_\varepsilon^2}{x_{self} \sigma_{\eta 0}^2 + \sigma_\varepsilon^2}$.

The function defining earnings in entrepreneurship was specified previously in log form, but the risk-neutral agents in this problem care about earnings in levels. Because the log of earnings in entrepreneurship is normally distributed

with mean $G_{self}(\cdot) + \hat{\eta}_{iX}$, the expected earnings in levels is given by

$$E(R_{it}) = \exp \left[G_{self}(x_{paid}, x_{self}) + \hat{\eta}_{iX}(S_{it}) + \frac{\sigma_{\eta X}^2 + \sigma_{\varepsilon}^2}{2} \right]. \quad (4)$$

As is clear from equation 4, the expected value of entrepreneurial earnings is increasing in $\sigma_{\eta X}^2$. Because $\hat{\eta}_{iX}(S_{it})$ reflects an estimated population statistic, the only quantities that change in expectation with entrepreneurial experience are $\sigma_{\eta X}^2$ and $G_{self}(x_{paid}, x_{self})$. That is, beliefs are a martingale and $G_{self}(x_{paid}, x_{self})$ is a deterministic function, so the reduction in variance that comes with entrepreneurial experience reduces the attractiveness of staying in entrepreneurship holding experience fixed.

4 Estimation (Planned)

We follow Rust and assume that the shocks $\nu_{it}(0)$ and $\nu_{it}(1)$ are serially independent and distributed Type-1 extreme value. This gives a conditional logit form for the alternative specific value functions

$$\begin{aligned} v_{it}(j, S_{it}) &= U(j, S_{it}) + & (5) \\ &\delta E_t(\max\{v_{it+1}(0, S_{it+1}), v_{it+1}(1, S_{it+1})\} | S_{it}, d_{it} = j) \\ &= U(j, S_{it}) + \delta \int \log\{\sum_j \exp[v_{it+1}(j, S_{it+1})]\} dF(S_{it+1} | S_{it}, d_{it} = j) \end{aligned}$$

which conveniently maps into conditional choice probabilities. The conditional probability that the agent chooses j is

$$\Pr(d_{it} = j | S_{it}) = \frac{\exp[v_{it}(j, S_{it})]}{\sum_j \exp[v_{it}(j, S_{it})]}. \quad (6)$$

The choice probabilities are thus a function of the current flow payoffs plus an offset due to the discounted continuation value from choosing alternative j .

4.1 State Variables and Transitions

From the payoffs and expected wages and earnings, $E(W_{it})$ and $E(R_{it})$, the state for the decision problem, S_{it} , is a vector with the following elements: 1) The expected entrepreneurial belief, $\hat{\eta}_{iX}$. 2) The lag of the log residual wage

net of the wage experience profile, denoted $\log(\tilde{W}_{it-1})$. 3) Experience in the paid sector. 4) Experience in the entrepreneurial sector. 5) The lagged sectoral choice. 6) An indicator that the agent was unemployed in $t-1$. With knowledge of $\sigma_{\eta_0}^2$ and σ_ε^2 , $\sigma_{\eta_X}^2$ is a deterministic function of experience in entrepreneurship.

The state transitions happen in a straightforward way. After a sectoral choice is made, age always advances by 1 period. Experience advances by 1 period in the sector chosen by the agent if the agent is employed. Otherwise, experience is held constant. In addition, earnings, wages, or unemployment are realized, and from this realization, the state is updated for the next period according to either (1) or (3).

Because some of the elements of the state vector are continuous, the states are discretized into a finite number of points at which the value function is calculated. To calculate the *EMAX* term, which is the continuation value in (5), the integral $\int \log\{\sum_j \exp[v_{it+1}(j, S_{it+1})]\} dF(S_{it+1}|S_{it}, d_{it} = j)$ must also be computed. A standard difficulty with continuous state variables is that the transition probabilities defined in $dF(S_{it+1}|S_{it}, d_{it} = j)$ involve points not defined on the original grid. Multidimensional linear interpolation is used to approximate $\log\{\sum_j \exp[v_{it+1}(j, S_{it+1})]\}$ when S_{it+1} implied by $dF(S_{it+1}|S_{it}, d_{it} = j)$ is not on the original grid; with the distributional assumptions made on the state transitions, this integral is computed via 5-point Gauss-Hermite quadrature for functions of normal random variables.¹¹

4.2 Two-Step Estimation

The parameters in G_{self} and G_{paid} are estimated in a first step, along with σ_ζ^2 , $\sigma_{\eta_0}^2$, and σ_ε^2 . In addition, $\hat{\eta}_{i0}$ is computed from a regression of $\log(\tilde{E}_{it})$ on $\log(\tilde{W}_{t-1})$, $\log(\tilde{W}_{t-1})^2$, $\log(\tilde{W}_{t-1})^3$ and a constant for those who are in the first year of entrepreneurship. The estimated parameters are used to project $\hat{\eta}_{i0}$ for those without entrepreneurial experience, and thus the expected earnings in entrepreneurship depend on revealed wages in the paid sector.

This allows estimation of β using backwards recursion to solve for (6) at each

¹¹When entrepreneurship is chosen, the quadrature points are computed by recognizing that the mean of $\hat{\eta}_{iX+1}$ is $\hat{\eta}_{iX}$ and $Var(\hat{\eta}_{iX+1}) = \frac{\sigma_{\eta_X}^4}{\sigma_{\eta_X}^4 + \sigma_\varepsilon^2}$. When the paid sector is chosen, the quadrature points come from the unit root process with mean equal to the lag wage and variance σ_ζ^2 . The ultimate expected value accounts for the discrete probability of transition to unemployment.

age beginning at 65. With $\Pr(d_{it} = j|S_{it})$ in hand, the partial log likelihood is

$$\sum_i \sum_{t=0}^{T_i} \sum_j (d_{it} = j) \log(\Pr(d_{it} = j|S_{it})).$$

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Table 1: Summary Statistics by Employment Choice

	Never Entrepreneurs	Sometime Entrepreneurs
Number of Individuals	11,018	3,864
Years spent in wage work	11.8	9.4
Years spent in entrepreneurship	0	5.5
Average age	36	39
Female	0.47	0.46
White	0.75	0.86
Black	0.14	0.07
Hispanic	0.09	0.06
Other non-white	0.02	0.01
Less than HS diploma	0.13	0.12
High school diploma	0.38	0.36
Some college	0.26	0.27
College graduate	0.19	0.20
Graduate degree	0.04	0.05

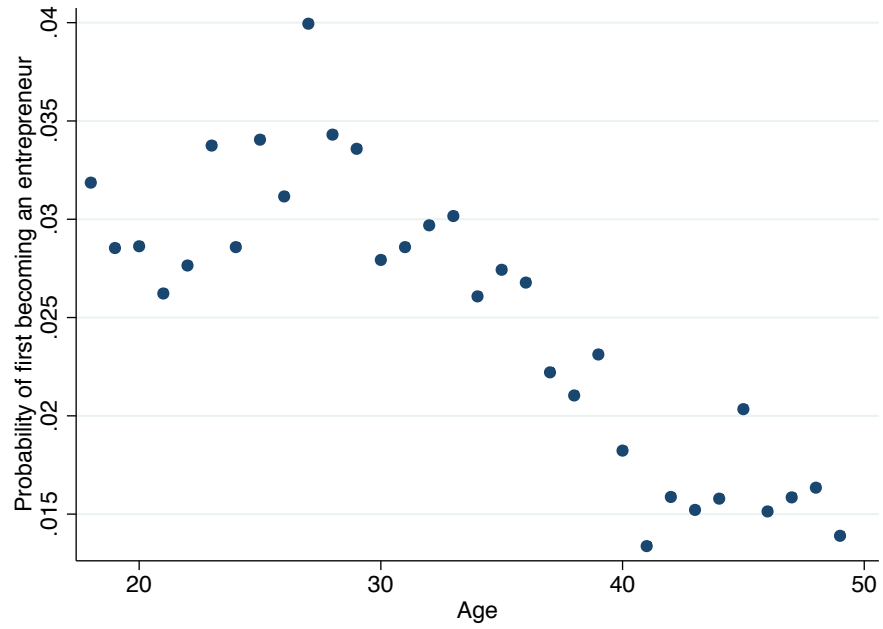
Source: PSID 1976-2011. Averages use weights as described in the text.

Table 2: Earnings in Wage Work and Entrepreneurship

	(1)	(2)	(3)	(4)
	Mean	25th pctile	Median	75th pctile
Entrepreneur	180.9 (13.82)	-93.91 (2.683)	-45.18 (2.884)	102.0 (4.331)
Age	29.88 (1.695)	20.07 (0.577)	25.19 (0.620)	31.07 (0.931)
Age ²	-0.240 (0.024)	-0.192 (0.007)	-0.220 (0.008)	-0.252 (0.012)
Female	-296.0 (3.580)	-170.1 (1.712)	-224.4 (1.840)	-290.2 (2.763)
Black	-102.5 (3.644)	-64.13 (2.778)	-81.93 (2.986)	-95.79 (4.485)
Hispanic	-6.871 (7.877)	-6.763 (3.898)	-20.61 (4.190)	-28.66 (6.292)
Other non-white	82.85 (24.94)	16.79 (7.787)	40.58 (8.371)	113.8 (12.57)
Less than HS grad	-114.5 (3.259)	-74.61 (3.045)	-97.35 (3.274)	-118.0 (4.916)
Some college	86.73 (3.969)	38.83 (2.138)	59.95 (2.299)	89.27 (3.452)
College degree	372.5 (6.951)	197.7 (2.385)	269.7 (2.564)	371.1 (3.850)
Graduate degree	639.4 (15.98)	337.9 (3.550)	441.0 (3.817)	641.4 (5.731)
Constant	-35.45 (27.94)	20.53 (10.92)	50.32 (11.74)	93.03 (17.63)
Observations	159,286	159,286	159,286	159,286

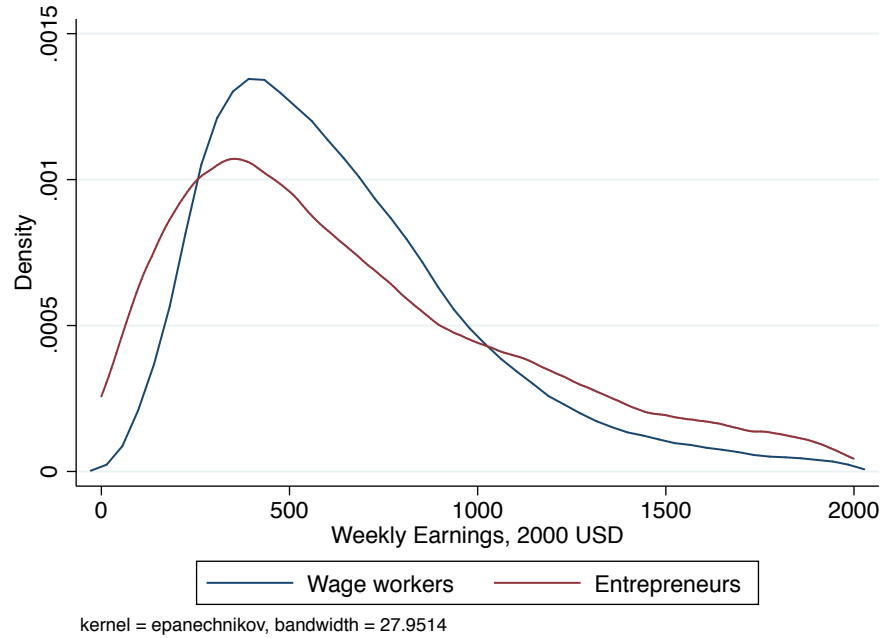
Source: PSID 1976-2011. Columns present OLS and quantile regressions where the dependent variable is real weekly earnings in 2000 dollars. Standard errors in parentheses. Estimates use weights as described in the text.

Figure 1: Propensity to Move to Entrepreneurship by Age



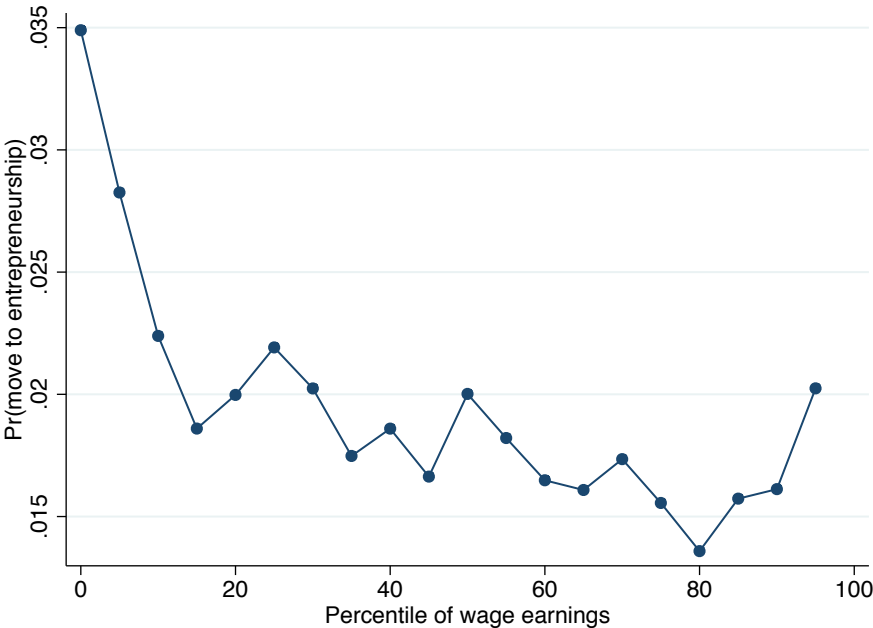
Source: PSID 1976-2011. Probability of moving to entrepreneurship for the first time calculated from all workers observed at that age. Weighted as described in the text.

Figure 2: Distribution of Earnings in Wage Work and Entrepreneurship



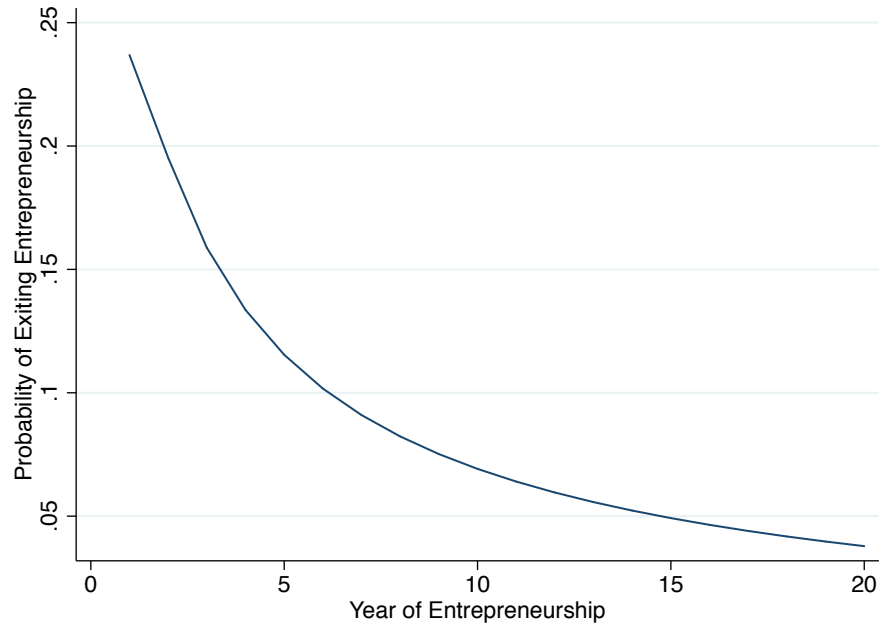
Source: PSID 1976-2011. Distribution of real weekly earnings in 2000 dollars. Truncated at \$2,000 per week, which excludes the top 2% of earnings. Weighted as described in the text.

Figure 3: Propensity to Move to Entrepreneurship by Percentile of Wages



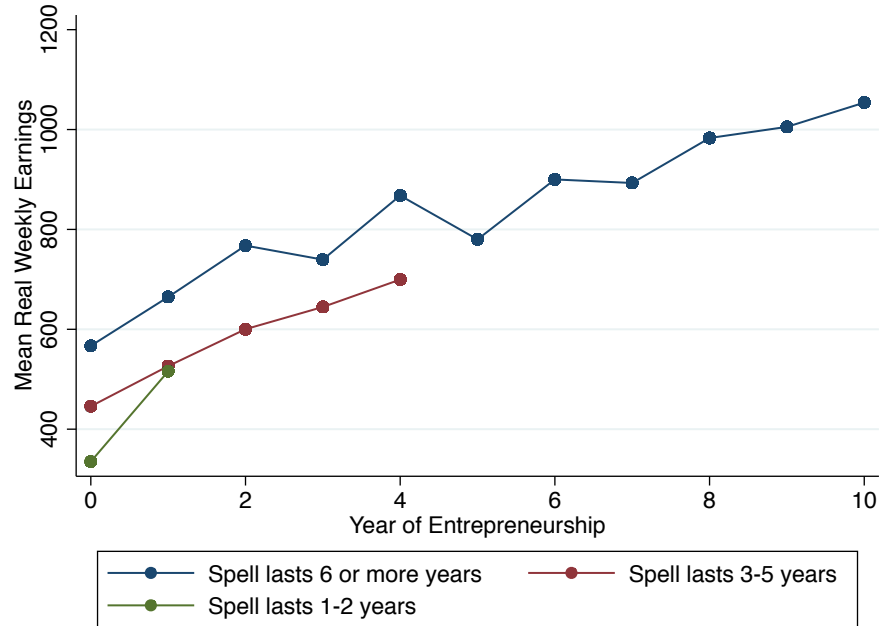
Source: PSID 1976-2011. Probability of moving to entrepreneurship calculated from all wage workers. Percentiles calculated separately by calendar year. Weighted as described in the text.

Figure 4: Propensity to Leave Entrepreneurship by Entrepreneurial Experience



Source: PSID 1976-2011. Predictions from fitted polynomial. Weighted as described in the text.

Figure 5: Earning Profiles by Persistence in Entrepreneurship



Source: PSID 1976-2011. Profiles are average real weekly earnings for entrepreneurs in 2000 dollars. Weighted as described in the text. The gap between each of the two lower profiles and the top profile are statistically significant with 99% confidence.