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Author(s): David S. Evans and Linda S. Leighton

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Some Empirical Aspects of Entrepreneurship

By DAVID S. EVANS AND LINDA S. LEIGHTON*

About 4.2 million men and women operate businesses on a full-time basis. Comprising more than a tenth of all workers, they run most of our nation's firms and employ about a tenth of all wage workers. The fraction of the labor force that is self-employed has increased since the mid-1970s after a long period of decline.¹ This paper examines the process of selection into self-employment over the life cycle and the determinants of self-employment earnings using data from the *National Longitudinal Survey of Young Men* (NLS) for 1966-1981 and the *Current Population Surveys* for 1968-1987.

Small-business owners are central to several recent lines of research.² First, the static models of entrepreneurial choice developed by Robert Lucas (1978) and Richard Kihlstrom and Jean-Jacques Laffont (1979) have renewed interest in a topic to which the last seminal contributions were made by Frank Knight (1921) and Joseph Schumpeter (1950).³ David Blau (1985), William Brock and David Evans (1986), and Hedley Rees

and Anup Shah (1986) use these models to motivate their empirical work on self-employment selection and earnings. Second, current research on industry dynamics focuses on smaller firms which, because they tend to be younger, have faster and more variable growth, and fail more frequently than larger firms, are a major source of industry changes. For example, Boyan Jovanovic's (1982) model of industry evolution in which heterogeneous entrepreneurs learn about their abilities over time has stimulated empirical work by Timothy Dunne, Mark Roberts, and Larry Samuelson, 1987, Evans, 1987a, b, and Ariel Pakes and Richard Ericson, 1987. These authors analyze entry, exit, and growth of primarily small firms. Third, David Birch's (1979) claim that small firms create a disproportionate share of new jobs has generated much interest in the role of small businesses in the labor market.⁴ Many states have programs designed to stimulate small-firm formation. Great Britain, France, Belgium, and the Netherlands have programs that help unemployed workers start small businesses.⁵

While recent studies have enhanced our empirical knowledge of the role of small businesses in the economy, data limitations have forced these studies to sidestep a number of issues that are basic to an economic understanding of firm formation, dissolution, and growth. Several studies (for example, George Borjas, and Stephen Bronars, 1987, Rees and Shah, 1986, and Brock and Evans, 1986, have used cross-sectional data on self-employed and wage workers to esti-

*Fordham University, Department of Economics, Bronx, NY 10458-5158. We are grateful to Christopher Flinn, Boyan Jovanovic, Jules Lichtenstein, Edward Starr, Hideki Yamawaki, participants of the International Conference on Small Business Economics held at the International Institute of Management, West Berlin, November 1988, and the referee for helpful comments and suggestions. Portions of our research were supported by the U.S. Small Business Administration under Contract No. SBA-1067-AER-86 to Fordham University and by faculty research fellowships provided by Fordham University to both authors. We retain responsibility for the views expressed below. We will provide a copy of a statistical appendix and the data set used in this paper on AT-compatible diskettes upon request for 1 year after the publication date of this paper.

¹See David Evans and Linda Leighton (1987), William Brock and Evans (1989), Eugene Becker (1984), and David Blau (1987) for details. Evans and Leighton find that self-employment rates peaked in about 1983 and have decreased since.

²See Brock and Evans (1989) for a review of recent research.

³See Brock and Evans (1986) for a survey.

⁴For criticisms of this argument see Jonathan Leonard (1986) and Dunne, Roberts, and Samuelson (1987).

⁵See Mark Bendick and Mary Egan (1987). The U.S. Department of Labor is planning to conduct an experiment in which a sample of unemployment insurance recipients will be given the option to receive business startup funds in lieu of unemployment benefits.

mate static models of self-employment selection and earnings. But these studies are limited by their lack of data on such important factors as the length of time in business and previous business experience. Recent dynamic studies (for example, Evans, 1987a, b and Pakes and Ericson, 1987, rely on crude firm characteristics such as size and age but lack information on the entrepreneur himself.⁶

We use longitudinal data that permit a closer examination of some key aspects of entrepreneurship. We focus on white men who comprised 76 percent of all full-time self-employed workers in 1985.⁷ Our main source of data is the *National Longitudinal Survey of Young Men* which contains detailed information on a sample of almost 4,000 white men who were between the ages of 14 and 24 in 1966 and who were surveyed 12 times between 1966 and 1981. The self-employed include all sole proprietors, partners, and sole owners of incorporated businesses.

These data permit several innovations over previous research. First, they allow us to track business starts and stops as the cohort of men ages. Second, they enable us to determine the length of time an individual has operated his current business and previous businesses and thereby to distinguish business and wage experience. Third, they permit us to evaluate several theories of entrepreneurship that have been proposed by psychologists and sociologists.⁸

⁶For example, taken literally Jovanovic's model (1979) assumes that an individual learns about his entrepreneurial ability over time. Firm age is a crude proxy for the duration and intensity of entrepreneurial learning.

⁷We concentrate on white males for several reasons. The self-employment rate differs substantially between sex and race groups. The rate for women and blacks is only about a third that for white men. Investigating the source of these disparities would take us too far afield. (See George Borjas and S. Bronars, 1987, for a recent analysis of race differences). Moreover, because blacks and women have low self-employment rates, available longitudinal data sets provide too few observations on self-employment entry and exit for these demographic groups.

⁸There is an extensive theoretical and empirical literature on entrepreneurship in our sister disciplines. But

We also use data for about 150,000 white men from *Current Population Surveys* for 1968–1987 as a check on and supplement to our NLS findings. These men were in contiguous years of the CPS March surveys giving us a 2-year panel for each individual. To keep our inquiry open ended—an important consideration given the limited empirical information on this topic—we do not develop and estimate structural models of entrepreneurship in this paper. The reader should exercise caution in placing behavioral interpretations on our results.

We report seven key findings. (1) The probability of switching into self-employment is roughly independent of age and total labor-market experience. This result is not consistent with standard job-shopping models such as William Johnson (1978) and Robert Miller (1984) which predict that younger workers will try riskier occupations first. (2) The probability of departing from self-employment decreases with duration in self-employment, falling from about 10 percent in the early years to 0 by the eleventh year in self-employment. About half of the entrants return to wage work within seven years.⁹ (3) The fraction of the labor force that is self-employed increases with age until the early 40s and then remains constant until the retirement years. This relationship results from the process of entry and exit over the life cycle. (4) Men with greater assets are more likely to switch into self-employment all else equal. This result is consistent with the view that entrepreneurs face liquidity constraints.¹⁰ (5) Wage experience has a much smaller return in self-employment than in wage work while business experience has just about the same return in wage work as in self-employment. These differences may

the empirical work generally does not control for anything more than rudimentary demographic characteristics.

⁹This is probably an underestimate because short spells of self-employment (under 1 year) are underrepresented in the data.

¹⁰See Evans and Jovanovic (1989) for an estimated structural model of entrepreneurship with liquidity constraints using the NLS data.

reflect some combination of true productivity differences and the results of selection into and out of self-employment over time. (6) Poorer wage workers—that is, unemployed workers, lower-paid wage workers, and men who have changed jobs a lot—are more likely to enter self-employment or to be self-employed at a point in time, all else equal. These results are consistent with the view of some sociologists that “misfits” are pushed into entrepreneurship.¹¹ (7) As predicted by one of the leading psychological theories, men who believe their performance depends largely on their own actions—that is, have an internal locus of control as measured by a psychologist test known as the Rotter Scale—have a greater propensity to start businesses.¹²

Section I describes the data. Section II presents aggregate statistics on self-employment entry and exit over the life cycle and reports estimates of the probability of entering into and exiting out of self-employment. Section III examines the determinants of self-employment earnings. It focuses on the relative returns to business and wage experience and education in self-employment versus wage work. Section IV suggests avenues for further research.

I. Data Sources

The *National Longitudinal Survey* is based on a national probability sample of men who were between the ages of 14 and 24 in 1966 and who were surveyed yearly between 1966 and 1971 and in 1973, 1975, 1976, 1978, 1980, and 1981.¹³ There were 3,918 white men in the initial survey of whom 2,731 were still in the survey in 1981. The appendix presents definitions for the variables used in this paper. Because the data are described in

detail in Evans and Linda Leighton (1987), we focus on the advantages of these data over those used in previous research.

(1) Using information on employment status and tenure we have calculated total experience in wage work and self-employment for each year of the sample.¹⁴ Previous studies that rely on cross-sectional data have not disaggregated experience. (2) We have found that workers who report themselves as self-employed often have no self-employment earnings and substantial wage earnings which suggests that either the workers are misclassified or their earnings are misclassified. We have found that it is possible to explain most of these inconsistencies using available data on dual jobs, tenure, and incorporation status. Our findings suggest some caution in taking reported self-employment earnings at face value.¹⁵ (3) The panel data on employment status allow us to track entry and exit over time. Previous studies of self-employment selection that rely on cross-sectional data confound the entry and exit decisions. In a cross section, self-employed workers are workers who entered and remained in self-employment. (4) Data on assets, job changes, unemployment, and some standard psychological test scores enable us to look at a number of issues which cannot be examined with the data sets used by previous researchers. It turns out that these variables are important determinants of self-employment selection and earnings.

One disadvantage of the NLS is that the sample sizes for analyzing self-employment entry and exit are small. For example, the number of entrants into self-employment averages about 50 per year. Another disadvantage is that data are available only for men who are all younger than 40 by the end of the survey. A further problem is that there

¹¹See Pyong Gap Min (1984) for a review of the major sociological theories.

¹²An internal locus of control is also a characteristic of individuals who have a high need for achievement which David McClelland (1964) has argued is a key determinant of entrepreneurship.

¹³Blacks were oversampled. About 25 percent of the initial respondents were black or other minorities.

¹⁴Some imputations, especially for workers with pre-1966 experience, were necessary. See Evans and Leighton (1987).

¹⁵On the other hand, the fact that most of the individuals who report themselves as being self-employed either report self-employed earnings or report themselves as having an incorporated business suggests that errors in reporting self-employment status are not substantial.

is substantial attrition—almost a third—between 1966 and 1981. To obtain larger and more representative samples for analyzing self-employment entry and exit we use data drawn from the March Supplement to the *Current Population Surveys* for 1968–1987. Each CPS survey contains information on the employment status of each respondent for the survey week and for the previous year. About half of all respondents are in contiguous surveys for most survey years.¹⁶ We have matched these respondents for the pairs of years where this was possible. The resulting data set contains up to 2.33 years of employment information for about 150,000 white men who were between the ages of 18 and 65 at the time of the first observation on them and who were full-time labor-market participants in the first observation year. For each individual, we have information pertaining to the survey week for two years and information pertaining to the longest-held job in the preceding year. We have used the data to calculate entry and exit rates between jobs held as of the survey week and between the longest-held jobs in each year.¹⁷ A deficiency of the CPS data is that individuals who operate incorporated businesses were included with wage workers for the survey-week job in all years and for the longest-held job for the surveys before 1976. For this reason we concentrate on unincorporated self-employment for the CPS data.

II. Entry and Exit

The probability that an individual operates a business T years after entering the labor force equals the probability that he started a business at time t , $t \leq T$, times the probability that he remained self-employed from time t to time T .¹⁸ We examine several

aspects of this process of entry and exit over the life cycle in this section. We begin by summarizing the rates of entry into and exit out of self-employment for the NLS cohorts and for the matched CPS data. We show that a simple time-homogeneous Markov model in which entry and exit rates are constant over time provides a helpful first approximation to the cross-sectional relationship between self-employment and age. We then investigate whether the entry or exit rates exhibit duration dependence. We find that entry is time-homogeneous—it is constant in both age and labor-market experience—but that exit decreases sharply with time in business. Finally, we report estimates of the hazard into entrepreneurship that control for a variety of characteristics suggested by social science theories of the entrepreneur.

An Overview of Entry and Exit. Table 1 reports summary statistics on the evolution of self-employment for the NLS white men. The fraction of labor-force participants who enter self-employment exceeds the fraction who exit self-employment thereby increasing the fraction who are self-employed from 3.9 percent in 1966 to 17.7 percent in 1981. Since 1971, when the average age of the labor-market participants was 25 years, the entry rate—the percent of wage workers who enter self-employment—has been about 4.0 percent per year and the exit rate—the fraction of self-employed workers who return to wage work—has been about 13.8 percent per year. The entry rate was lower and the exit rate was somewhat higher prior to 1971.

A simple time-homogeneous Markov model provides a helpful first approximation to this process. Denote the probability of entering self-employment by e and the probability of exiting self-employment by x . Assume that e and x are independent of time or age. Then the probability that an individual will operate a business T years after entering the labor force is (see, for example, William Feller, 1968, p. 432),

$$\frac{e}{x+e} \left[1 - (1-x-e)^T \right].$$

¹⁶The exceptions being 1971–1972, 1972–1973, 1976–1977, and 1985–1986.

¹⁷The construction of these data is described in Evans and Leighton (1987).

¹⁸Note that survival in self-employment is not necessarily equivalent to survival of a business since an individual may remain self-employed as he opens and closes successive businesses.

TABLE 1—SELF-EMPLOYMENT ENTRY AND EXIT, 1966–1981

Survey Year	Percent of Labor Force Participants Who Enter Self-Employment Between Survey Years	Percent of Labor Force Participants Who Exit Self-Employment Between Survey Years	Percent of Labor Force Participants Who Are in Self-Employment as of the Survey Year	Percent of Self-Employed Workers Who Exit Self-Employment Between Survey Years
1966	1.92	1.49	3.89	30.36
1967	2.78	0.97	4.50	18.03
1968	2.43	1.71	5.54	25.30
1969	2.93	1.41	5.92	19.59
1970	2.35	2.10	7.04	27.50
1971 ^a	5.24 (3.67)	1.83 (0.92)	6.64	24.06 (12.86)
1973 ^a	4.77 (3.13)	2.91 (1.47)	9.16	26.73 (14.40)
1975	4.22	2.33	10.74	19.09
1976 ^a	6.89 (4.82)	3.18 (1.60)	12.00	23.08 (12.30)
1978 ^a	6.24 (4.37)	3.76 (1.90)	14.71	20.82 (11.02)
1980	4.04	2.68	16.68	12.93
1981	—	—	17.73	—

Source: White males drawn from the *National Longitudinal Survey of Young Men*.

^aDenotes a two-year transition. We obtained annual rates that are comparable to the one-year transitions under the following assumptions. For entry we assumed that 40 percent of new entrants fail in the first year so that the average annual rate of entry is 1.4 times the two-year entry rate divided by 2. For failure we assumed that the annual rate of survival is s so that the probability of surviving two years is s^2 . The annual rate of failure is simply $1 - s$. These adjusted rates are reported in parentheses beside the actual rate.

This simple model has two predictions. The first is that the probability of self-employment increases at a diminishing rate with the length of time in the labor force.¹⁹ The second prediction is that the probability of self-employment converges to a plateau given by $e/x + e$ for older men. We check these predictions with the CPS data which contain many more observations and a broader age range than do the NLS data. The relationship between unincorporated self-employment and age found in the CPS data is displayed in Figure 1 for 150,275 white men who were between the ages of 18 and 65 between 1968 and 1987.²⁰ The rate of

self-employment increases at a diminishing rate with age and approaches a plateau at about age 40 which lasts until about age 60. The average rate of unincorporated business formation (entry into self-employment between successive March survey weeks) was 2.5 percent per year and the average rate of unincorporated business dissolution (exit out of self-employment between successive March survey weeks) was 21.6 percent per year for the CPS sample.²¹ The predicted asymptote of 10.4 percent is close to the plateau of about 11.6 percent shown in Figure 1.

The Time-Dependence of Entry and Exit. The Markov model assumes that the probabilities of forming or dissolving a business are independent of time in the labor force.²² We examined the dependence of entry on

¹⁹This prediction is consistent with cross-sectional studies by Brock and Evans (1986), Rees and Shah (1986), and Borjas (1987) which find that the probability of self-employment is convex in age. For the NLS men the probability of self-employment increases linearly with age for each of the 12 cross sections. The lack of convexity is probably due to the fact that these men are all under 40 even at the end of the sample period.

²⁰The underlying data are reported in the Appendix.

²¹Entry rates are substantially lower for men under 25 and higher for men over 60 (see below). Excluding these two extremes we obtain a predicted asymptote of 11.0 percent.

²²Because the probability of leaving a job decreases with age, the probability of starting a business condi-

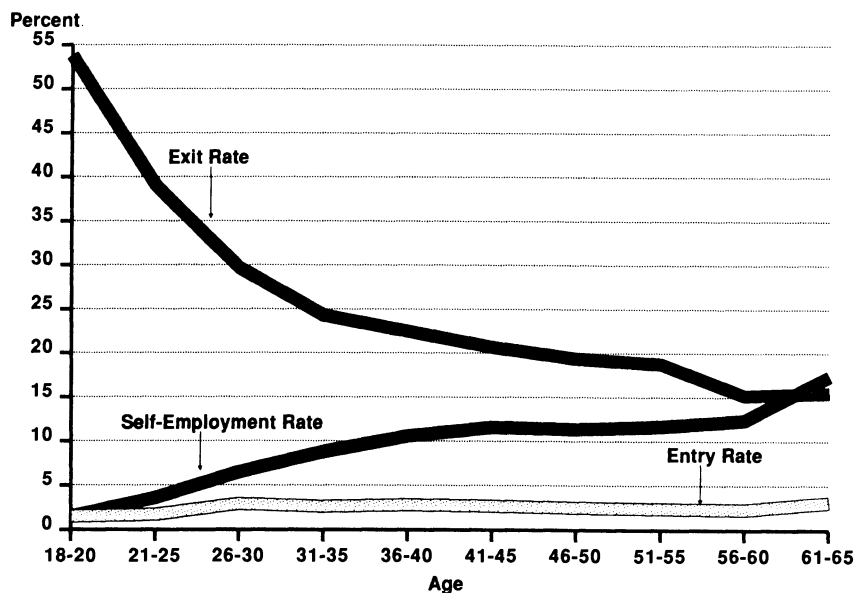


FIGURE 1. SELF-EMPLOYMENT AND AGE, WHITE MEN, AGES 21-65. BASED ON DATA OF 150,275 EMPLOYED WHITE MEN FROM THE CURRENT POPULATION SURVEYS, 1968-87

time in the labor force in several ways. First, we estimated the probit for entering self-employment as a function of age or labor-market experience for the NLS sample for each year. We can reject the hypothesis that entry depends upon age or labor-market experience at conventional levels of significance for all specifications and years.²³ This finding suggests that the probability of starting a business is independent of age or experience at least until age 40. Second, Table 2 and Figure 1 report entry rates by 5-year age categories for the CPS white men. The rate of entry is fairly constant between ages 25 and 50 and then decreases somewhat between ages 50 and 60.²⁴

TABLE 2—SELF-EMPLOYMENT ENTRY RATE BY AGE, WHITE MEN AGES 21-65^a

Ages	Entry Rate (Percent)	Ages	Entry Rate (Percent)
21-25	1.7	46-50	2.5
26-30	2.9	51-55	2.4
31-35	2.6	56-60	2.3
36-40	2.8	61-65	3.1
41-45	2.7	21-65	2.5

Source: Based on data on 135,752 employed white men from the *Current Population Surveys*, 1968-1987.

^aEntry rate is the percent of men who were wage workers as of the March survey week who were unincorporated self-employed during the March survey week of the following year.

tional upon leaving a job must increase with age. We would like to thank Jacob Mincer for this point.

²³Results are available upon request.

²⁴It increases after age 60, a reflection of the tendency of older men to switch to self-employment upon retirement. See Victor Fuchs (1982) for an analysis of this phenomenon.

We examined the dependence of exit from self-employment on the length of time in business by estimating the probability that an individual will survive T years in continuous self-employment and the probability of leaving self-employment during the next year, given that the individual has been em-

TABLE 3—ESTIMATED SURVIVAL AND HAZARD RATES FOR SELF-EMPLOYMENT^a

Self-Employment Duration in Years	Survival Rate (Percent)	Hazard Rate ^b (Percent)
0	100.0	—
2	79.4	10.3
4	61.5	11.3
6	51.4	8.2
8	47.0	4.3
10	41.2	6.2
12	39.9	1.6
14	39.9	0.0

^aBased on estimates obtained from the Kaplan-Meier procedure using LIMDEP.

^bAnnual hazard rate based on the estimated survivorship function.

ployed for T years. We used data for 460 NLS white men who were observed from the time of entry to the end of the survey.²⁵ Table 3 summarizes life-table estimates of the survivorship and hazard rates obtained from the Kaplan-Meier procedure.²⁶ About a third of the entrants leave self-employment within the first 3 years of entry, about a half within 7 years, and about three-fifths within 10 years. The hazard rate decreases with duration in self-employment, falling from about 10 percent in the early years to 0 by the eleventh year in self-employment.²⁷

²⁵There were a total of 396 individuals, some of whom entered more than once (i.e., entered, failed, and reentered).

²⁶We also attempted to control for individual characteristics using parametric hazards formulations. None of the characteristics such as education, wage experience, previous job tenure, or marital status was substantively or statistically important.

²⁷The survivorship function is probably biased upward because short spells of self-employment are underrepresented in our sample since many of our observations are 1–2 years apart. Using the *Current Population Survey* data on the unincorporated self-employed we estimated the failure rate over a one-year period of white men who were wage workers on their longest-held job in the previous year (generally a period of at least six months) and who were self-employed in the survey week. Generally these people would have been self-employed less than nine months as of the survey week. Of these individuals, 41.4 percent were no longer self-employed in the subsequent survey week.

Estimates of the Probability of Entering Self-Employment. Individuals will switch from self-employment to wage work if the expected utility of self-employment exceeds the expected utility of wage work. The difference between these expected values depends upon the difference between expected earnings in the two occupations and upon relative tastes for the two. Expected wage earnings depend upon current wage earnings, education, job tenure, and wage experience. Expected self-employment earnings depend upon education and experience. We therefore conjecture that the probability of switching into self-employment will decline with current wage earnings but may increase or decrease with education and experience depending upon whether these characteristics are more important in self-employment or wage work. Another observable characteristic, which psychologists and sociologists have found to be correlated with selection into entrepreneurship, is the extent to which individuals have an internal locus of control.²⁸ We measure the internal locus of control by the individual's score on the Rotter test (which was administered in 1976). Finally, an individual will be more likely to switch into self-employment the greater his net worth if there are liquidity constraints as in Evans and Jovanovic (1989). As additional measures of worker quality we include the frequency of job changes (number of changes divided by total labor-market experience), unemployment as a fraction of time in the labor force, marital status, and whether the individual has a health problem.²⁹

Table 4 reports probit estimates of a basic specification of the determinants of entry into self-employment for 1976–1978, 1978–

²⁸See, for example, J. Schere (1982) and Janak Pandey and N. B. Tewary (1979) for empirical studies of the relationship between the internal locus of control and small-business ownership. The hypothesis that entrepreneurs have a high need for achievement is due to McClelland's (1964) pioneering study. Also see McClelland and David Winter (1969).

²⁹Ivan Light (1979) has argued that these sorts of disadvantages push minorities into self-employment. For a recent study of self-employment of disadvantaged workers see Steven Balkin (in press).

TABLE 4—PROBABILITY OF ENTERING SELF-EMPLOYMENT FROM WAGE WORK PROBIT ESTIMATES^a, 1980–81

<i>National Longitudinal Survey of Young Men White Men</i> 1980–1981					
Variable	Coefficient	Std. Error	<i>t</i>	Prob > <i>t</i>	Mean
Enter					.0252039
Tenure	-.0238353	.0081510	-2.924	0.004	43.54411
Tenure ²	.0001638	.0000619	2.645	0.008	3096.182
Income	-.5163689	.2901084	-1.780	0.075	2.063929
Income ²	.0663933	.0541532	1.226	0.220	5.139952
Wage Exp.	.0462285	.0285732	1.618	0.106	13.3198
Prev. Self	.9107385	.2171792	4.193	0.000	.1030393
Education	.055382	.0434853	1.274	0.203	13.88288
Unemploy	.0478407	.0187881	2.546	0.011	2.361186
Changes	.3698019	.3711313	0.996	0.319	.3244283
Assets ^{a,b}	.0985545	.0228677	4.310	0.000	4.645619
Assets ²	-.0010812	.0003849	-2.809	0.005	89.78229
Married	-.5815598	.2076951	-2.800	0.005	.7916976
Urban	.0516553	.2181547	0.237	0.813	.7249815
Handicap	-.0494911	.3936484	-0.126	0.900	.0518903
Constant	-2.909767	.9611979	-3.027	0.003	1
Number of obs = 1349			chi2(14) = 101.53		
Log likelihood = -107.94862			Prob > chi2 = 0.0000		
<i>F</i> -Tests	<i>F</i>	<i>P</i> -value			
Income = 0	2.27	.1041			
Asset = 0	11.12	.0000			
Tenure = 0	4.28	.0141			
1978–1980					
Variable	Coefficient	Std. Error	<i>t</i>	Prob > <i>t</i>	Mean
Enter					.0526658
Tenure	-.0025117	.0060118	-0.418	0.676	37.36151
Tenure ²	.0000356	.0000573	0.621	0.535	2345.797
Income	-.2613197	.234179	-1.116	0.265	1.678607
Income ²	.0327625	.0491364	0.667	0.505	3.379527
Wage Exp.	-.0322216	.0197113	-1.635	0.102	11.60596
Prev. Self	.6916842	.153986	4.492	0.000	.0838752
Education	.0217275	.0256107	0.848	0.396	13.70546
Unemploy	-.020861	.0155898	-1.338	0.181	2.55832
Changes	.3529475	.2204601	1.601	0.110	.3494789
Assets ^b	.0609102	.0246713	2.469	0.014	1.617229
Assets ²	-.0007327	.0004154	-1.764	0.078	21.10421
Married	-.0153407	.1432351	-0.107	0.915	1.210663
Urban	-.1589805	.1215175	-1.308	0.191	.7041612
Handicap	-.0253471	.2350554	-0.108	0.914	.0643693
Constant	-1.381862	.561222	-2.462	0.014	1
Number of obs = 1538			chi2(14) = 53.69		
Log Likelihood = -290.4314			Prob > chi2 = 0.0000		
<i>F</i> -Tests	<i>F</i>	<i>P</i> -value			
Income = 0	1.14	.3215			
Asset = 0	3.39	.0338			
Tenure = 0	0.26	.7741			

TABLE 4—CONTINUED

<i>National Longitudinal Survey of Young Men White Men</i>					
Variable	1976–1978		<i>t</i>	Prob > <i>t</i>	Mean
	Coefficient	Std. Error			
Enter					.0563978
Tenure	-.0188406	.0059464	-3.168	0.002	32.44633
Tenure ²	.0001893	.0000577	3.278	0.001	1783.905
Income	-.0027703	.2210893	-0.013	0.990	1.307402
Income ²	.0148635	.0522132	0.285	0.776	2.088686
Wage Exp.	.0282834	.0188645	1.499	0.134	9.883356
Prev. Self	.6944128	.1503571	4.618	0.000	.0794421
Education	.0121024	.0245543	0.493	0.622	13.58702
Unemploy	.0036077	.0118607	0.304	0.761	2.796006
Changes	.4891922	.1692598	2.890	0.004	.3675908
Assets	.0787118	.0394622	1.995	0.046	1.52344
Assets ²	-.0023117	.0017761	-1.302	0.193	15.06044
Married	-.3480157	.1239067	-2.809	0.005	.7671316
Urban	.0254816	.1227831	0.208	0.836	.7064888
Handicap	-.1958478	.2220587	-0.882	0.378	.0721649
Constant	-1.976281	.4987808	-3.962	0.000	1
Number of obs = 1649			chi2(14)	= 67.10	
Log Likelihood = -324.18232			Prob > chi2	= 0.0000	
<i>F</i> -Tests	<i>F</i>	<i>P</i> -value			
Income = 0	0.19	.8268			
Asset = 0	2.21	.1105			

CURRENT POPULATION SURVEYS, 1968–86
 LINEAR-PROBABILITY MODEL ESTIMATES
Current Population Surveys, 1968–1986
 White Men, Ages 25–60^a

Variable	Coefficient	Std. Error	<i>t</i>	Prob > <i>t</i>
Enter				
Income	-7.06372E-06	2.5543E-06	-2.765	.0057
Income ²	5.05253E-05	8.7298E-06	5.788	.0000
Liquidity	7.75240E-07	1.1777E-07	6.583	.0000
Age	-2.42493E-04	3.9411E-04	-.615	.5384
Age ²	2.71727E-06	4.4914E-06	.605	.5452
High School Drop	-6.72032E-04	.0013228	-.506	.6127
College Dropout	.003173	.001376	2.306	.0211
College Graduate	.006408	.001628	3.936	.0001
Post Graduate	.013793	.001651	8.352	.0000
Urban	-.005001	9.9962E-04	-5.003	.0000
Married	.002432	9.6085E-04	2.531	.0114
Veteran	-.002762	.001019	-2.710	.0067
Constant	.027483	.008177	3.361	.0008
Number of jobs	.106239			
<i>R</i> -Square	.00286			
<i>F</i> -Statistic	12.7062			

^aEstimates obtained using STATA.

^bAssets are for 1976.

^cEstimates obtained using SPSSX.

1980, and 1980–1981 for the NLS. For comparison, we also report linear probability model estimates for the 1968–1986 matched CPS data. The samples consist of individuals who were in the labor force in both survey weeks. Several findings are robust. (1) The probability of switching into self-employment increases with net worth (measured by assets for the NLS and by the difference between family earnings and family income for the CPS). This finding is consistent with Evans and Jovanovic (1989) and suggests that individuals face liquidity constraints.³⁰ (2) Individuals with low wages are more likely to switch into self-employment. This relationship is highly significant when we control for assets but not for other labor-market characteristics. It remains but is much less statistically significant when we also condition on labor-market characteristics. (3) Wage experience is neither statistically nor substantively significant.³¹ Thus, as we found earlier, the hazard into self-employment from wage work is independent of the length of time in wage work. (4) Individuals with longer job tenures are less likely to switch into self-employment.³² (5) The probability of entry is higher for individuals who have had prior self-employment experience. (6) Individuals who have changed jobs frequently are more likely to switch into self-employment. (7) The effect of previous unemployment on the probability of entering self-employment is not consistent across the years: it is positive and significant for 1980–1981, positive and insignificant for 1976–1978, and negative and insignificant for 1978–1980. But we have found that men

who are unemployed are more likely to enter self-employment. For the CPS white men observed, entry rate was 4.7 percent for men who were unemployed (5,664 men) as of the initial survey week and 2.4 percent for men who were employed wage workers (126,750 men) as of the initial survey week.³³ (8) There is a negative relationship between the Rotter score and entry for most years but the relationship is generally not statistically significant.³⁴

The general message of these results is that relatively poor wage workers—that is, workers with low wages and a history of instability—are most likely to switch to self-employment holding assets and education constant.

III. Self-Employment Selection and Earnings

In this section we report cross-sectional estimates of the probability that an individual is self-employed rather than a wage worker and estimates of self-employment and wage earnings for individuals who were self-employed workers or wage workers in 1981. Several other authors report estimates of self-employment selection and earnings models. Borjas and Bronars (1987), Evans (1985), and Brock and Evans (1986) use 1980 Census data, Rees and Shah (1985) use U.K. data on a small cross section, and Blau (1985) uses data on Malaysian farmers. These previous estimates suffer from two data problems. First, these studies have no information on self-employment versus wage experience. Indeed, all of these studies use proxies for aggregate experience (age less years of education). Second, they have rather sparse information on personal characteristics. The NLS data permit us to estimate a much more refined model and to investigate

³⁰ Evans and Jovanovic test and reject the alternative hypothesis that high-asset individuals are high-entrepreneurial ability individuals. For further evidence that small firms face liquidity constraints see Steven Fazzari, R. Glenn Hubbard, and Bruce Petersen (1987). For the 1980–1981 entrants we used 1981 assets.

³¹ The fact that wage experience is not important is consistent with the comparative advantage model since the coefficient on this term reflects the difference in the returns to wage experience in self-employment versus wage work.

³² The coefficients on wage experience are smaller and less significant when we do not condition on job tenure.

³³ We get similar results for the NLS men although the sample sizes are very small.

³⁴ Below, however, we report estimates that show that the Rotter score has a statistically significant negative effect on the probability of being self-employed at a point in time—and therefore having entered and survived up to a point in time. The results reported in the text are qualitatively the same when the Rotter score is included.

the effects of wage and self-employment experience on wage and self-employment earnings.

The results reported in this section are primarily descriptive. It is very difficult to place behavioral interpretations on cross-sectional estimates of self-employment selection and earnings. For example, the probability of being self-employed at time T depends upon the underlying probability of switching into self-employment at some previous time and surviving until time T . The cross-sectional estimates confound the determinants of switching and survival. To take another example, the effect of wage experience on self-employment earnings confounds the productivity-enhancing effects of wage experience on business earnings and a variety of potential selection problems, for example, the possibility that workers who accumulated more wage experience before switching into self-employment had higher opportunity costs of switching into self-employment and therefore must have discovered unusually good self-employment opportunities to induce them to switch.³⁵ Nevertheless, the results reported here are helpful because they place some restrictions on the behavioral models of entrepreneurial selection and earnings that might be entertained.

The data for the analysis consist of 2,405 white men who were in the 1981 NLS survey, were employed as of the 1981 survey week, and were not enrolled in school full time. To have a clean comparison of the choice between self-employment and wage work we deleted individuals who held both wage and self-employment jobs. We found a number of possible errors in the self-employment status and earnings information and made several adjustments and deletions to minimize the effects of such errors. Some incorporated self-employed individuals reported wage earnings but no self-employment earnings; we assumed their wage earn-

ings were from their incorporated business. Some individuals switched into self-employment or wage work during the year; we prorated their earnings according to the proportion of the year they spent in the type of job held as of the survey week. Individuals who had inconsistent information—for example, who reported wage earnings but who were unincorporated self-employed and who had not switched during the year—were deleted. A total of 272 individuals were deleted either because they held both wage and self-employment jobs or because information was inconsistent.³⁶ A few other individuals were deleted for some of the analyses because of missing information.

Table 5 reports probit estimates of the probability that an individual is self-employed rather than a wage worker in 1981. We report estimates both with and without the Rotter score and an indicator of whether the individual's father held a managerial job since there were a substantial number of missing values on these variables. Several findings are notable. First, the probability of being self-employed increases with labor-market experience.³⁷ This result is consistent with the simple Markov model of self-employment: Individuals who have been in the labor market a longer time are more likely to have switched to self-employment. Second, the probability of being self-employed is higher for individuals who have changed jobs frequently. This finding is consistent with our entry estimates which also indicated that men with more unstable work histories were more likely to enter self-employment. Third, the probability of self-employment is higher for individuals with relatively more unemployment experience. This result is consistent with our earlier finding that unemployed workers are more likely to enter self-employment. Fourth, the

³⁶The probit results reported below are similar when these individuals are included.

³⁷The second-order term in experience was not significant. We would not expect the concave relationship found by Brock and Evans (1986), Rees and Shah (1986), and Borjas (1987) because our sample only includes individuals under the age of 40 in 1981.

³⁵These kinds of problem are analogous to those found in the recent labor-economics literature on the returns to seniority. See Joseph Altonji and Shakotko (1987), Robert Topel (1986), and Katherine Abraham and Henry Farber (1987) for discussion.

TABLE 5—ESTIMATED PROBABILITY OF BEING SELF-EMPLOYED IN 1981,
WHITE MEN PROBIT ESTIMATES^a

Variable	Model 1		<i>t</i>	Prob > <i>t</i>	Mean
	Coefficient	Std. Error			
Self-Employed					.161165
Urban	-.1845696	.0788463	-2.341	0.019	.7067961
Married	.0705539	.0923126	0.764	0.445	.776699
Divorced	.1504005	.101406	1.483	0.138	.1446602
Handicapped	-.2205851	.1354426	-1.629	0.104	.0859223
Experience	.0631149	.011388	5.542	0.000	14.45653
Education	.0468791	.0159466	2.940	0.003	13.83447
Unemployment	.0008846	.0001591	5.561	0.000	138.5192
Changes	.0129181	.0027347	4.724	0.000	16.87336
Farmer	1.852521	.1674885	11.061	0.000	.038835
Professional	1.318865	.1805655	7.304	0.000	.0286408
Military	.2254239	.1098127	2.053	0.040	.3504854
Mil. Exp.	-.0039777	.0032259	-1.233	0.218	9.865049
Constant	-3.077114	.3627388	-8.483	0.000	1
Number of obs = 2060		chi2(12) = 293.63			
Log Likelihood = -762.87545		Prob > chi2 = 0.0000			
Variable	Model 2		<i>t</i>	Prob > <i>t</i>	Mean
	Coefficient	Std. Error			
Self-Employed					.1618435
Urban	-.2040773	.0838386	-2.434	0.015	.7073955
Married	.0178929	.0986787	0.181	0.856	.7808146
Divorced	.0951484	.1097263	0.867	0.386	.142015
Handicapped	-.2174593	.142506	-1.526	0.127	.0846731
Experience	.0553762	.0123014	4.502	0.000	14.60937
Education	.0179523	.017547	1.023	0.306	13.86549
Unemployment	.0008873	.0001769	5.016	0.000	131.2435
Changes	.013667	.0029617	4.615	0.000	16.71073
Farmer	1.908768	.1732564	11.017	0.000	.0401929
Military	.3334698	.1235012	2.700	0.007	.3494105
Mil. Exp.	-.0111616	.0042291	-2.639	0.008	9.019829
Professional	1.364592	.197819	6.898	0.000	.0273312
Rotter Score	-.0216171	.0073045	-2.959	0.003	21.8612
Manager Father	.3363427	.0962543	3.494	0.000	.1709539
Constant	-2.102342	.442666	-4.749	0.000	1
Number of obs = 1866		chi2(14) = 303.83			
Log Likelihood = -674.18848		Prob > chi2 = 0.0000			

^a Estimates obtained using STATA.

probability of being self-employed is higher for more highly educated individuals even after we control for individuals in professional occupations. Fifth, as suggested by psychologists, individuals who have a more internal locus of control are more likely to become entrepreneurs. Controlling for the internal locus of control renders the coefficient on education small and statistically insignificant. Sixth, men whose fathers were managers are more likely to be self-employed.

Using the probit selection equation reported above we were not able to reject the hypothesis that the correlation between selection and earnings is zero; controlling for selection had little effect on the coefficient estimates.³⁸ On the basis of a Chow test it

³⁸ The selection correction was performed using James Heckman's (1976) Lambda method using LIMDEP. Evans and Leighton (1987) report statistically significant negative selection but also find little effect on

TABLE 6—ESTIMATED LOG EARNINGS EQUATIONS FOR SELF-EMPLOYED AND WAGE WORKERS', REGRESSION ESTIMATES^a

Self-Employed Workers					
Variable	Coefficient	Std. Error	<i>t</i>	Prob > <i>t</i>	Mean
Log Annual Earnings					9.722387
Urban	.2984078	.0959255	3.111	0.002	.5886525
Married	.1426724	.1182799	1.206	0.229	.8262411
Handicapped	-.7237983	.1653379	-4.378	0.000	.0744681
Wage Exp.	.0212041	.0106104	1.998	0.047	8.838993
Bus. Exp.	.1127724	.0267228	4.220	0.000	6.831969
Bus. Exp. ²	-.0048672	.0012519	-3.881	0.000	78.364
Prev. Bus.	.2638763	.1084132	2.434	0.016	.2234043
Education	.102862	.0187483	5.486	0.000	13.85816
Unemploy Wks	-.0076448	.0023534	-3.248	0.001	12.71631
Changes	-.0019309	.0039824	-0.485	0.628	18.22286
Farmer	.0088565	.1262476	0.070	0.944	.1950355
Professional	.1607639	.1705543	0.943	0.347	.0957447
Military	-.1787064	.122895	-1.454	0.147	.3439716
Mil. Exp.	.0065334	.0037604	1.737	0.083	7.723404
Constant	7.547442	.3774288	19.997	0.000	1
Number of obs	= 282	F(14,267)	= 10.69		
R-Square	= 0.3591	Prob > F	= 0.0000		
Adj R-Square	= 0.3255	Root MSE	= .71254		
Wage Workers					
Variable	Coefficient	Std. Error	<i>t</i>	Prob > <i>t</i>	Mean
Log Earnings					9.888144
Urban	.2116573	.0287379	7.365	0.000	.7239521
Married	.2301503	.0304746	7.552	0.000	.7694611
Handicapped	-.180494	.0451322	-3.999	0.000	.0874251
Wage Exp.	.0984876	.0198633	4.958	0.000	13.97031
Wage Exp. ²	-.0024167	.0006396	-3.778	0.000	210.6699
Self Exp.	.0447571	.011243	3.981	0.000	.3203938
Education	.0706433	.0054855	12.878	0.000	13.82814
Unemploy Wks	-.0042027	.0005479	-7.670	0.000	16.44012
Changes	-.0035781	.0009934	-3.602	0.000	16.32626
Farmer	-.4048178	.1277192	-3.170	0.002	.0101796
Professional	.15914	.1064927	1.494	0.135	.0149701
Military	.0213733	.0400467	0.534	0.594	.3556886
Mil. Exp.	.0018262	.0010989	1.662	0.097	10.36886
Constant	7.818336	.1790618	43.663	0.000	1
Number of obs	= 1670	F(13,1656)	= 49.85		
R-Square	= 0.2813	Prob > F	= 0.0000		
Adj R-Square	= 0.2756	Root MSE	= .51578		

^a Estimates obtained using STATA.

was also possible to reject the hypothesis that self-employed and wage workers have the same earnings equation at the 1 percent level.

coefficient estimates. The difference in the importance of the selection term appears to be due to the inclusion of blacks in our earlier work.

Table 6 reports regression estimates of log-earnings equations for self-employed workers and wage workers for our final specification. There are several important differences and similarities in the earnings functions. First, the return to wage experience in self-employment (2.1 percent) is lower than the return to wage experience in wage work (5.6 percent) and lower than the return to

self-employment experience in self-employment (4.6 percent).³⁹ One interpretation of these differences is that human-capital accumulated through wage work is less valuable in self-employment than wage work. Another interpretation is that individuals who switch into self-employment later in their careers (and who have thereby accumulated more wage experience) are relatively poorer wage workers. Second, the return to self-employment experience in wage work (4.5 percent) is higher than the return to wage experience in wage work (3.1 percent) although the difference is not statistically significant. This result suggests that workers who fail at self-employment return to wage work at roughly the same wages they would have received had they not tried self-employment.⁴⁰ It is not possible to determine the extent to which this result reflects the value of business experience in wage work or the fact that those self-employed workers with the best wage opportunities will tend to switch. Third, even after controlling for professional workers the returns to education are somewhat higher in self-employment than in wage work—10.3 percent per year versus 7.1 percent. Fourth, unemployment experience carries a substantially larger penalty in self-employment than in wage work—0.8 percent per week vs. 0.4 percent per week. This result suggests that unemployed workers with the poorest opportunities in the wage sector switch to and remain in self-employment.

IV. Conclusions and Suggestions for Further Research

Economists have a lot to learn about entrepreneurship. Our results suggest some avenues to pursue. An interesting finding is

that the probability of entering self-employment is independent of age or experience for the first 20 years of employment. This result is contrary to popular wisdom and inconsistent with imperfect-information models of occupational choice. Behavioral models of entrepreneurial selection that can explain this relationship would be helpful. One possible explanation examined by Evans and Jovanovic (1989) is that individuals face liquidity constraints and have to accumulate assets in order to start viable businesses. Another possible explanation is that it takes time to discover a business opportunity. Older people might be more likely to have identified an opportunity but less likely to choose to exploit it.⁴¹

Our results suggest that some theories are more consistent with the data than others. The disadvantage theory which views entrepreneurs as misfits cast off from wage work is consistent with many of our findings. People who switch from wage work to self-employment tend to be people who were receiving relatively low wages, who have changed jobs frequently, and who experienced relatively frequent or long spells of unemployment as wage workers.⁴² The psychological theory based on the internal locus of control is also consistent with our findings. Self-employed workers at a point in time tend to have a more internal locus of control (a result which is statistically significant) and individuals with a more internal locus of control are more likely to enter self-employment (a result which is generally not statistically significant). The sociological and psychological literature on entrepreneurship contains many insights that economists might consider incorporating in their models.

³⁹Evaluated at the mean experience levels for self-employed workers.

⁴⁰There is a selection bias here too. Workers who leave self-employment for wage work will tend to be workers who were receiving relatively low wages in self-employment or who receive relatively high offers from wage employers.

⁴¹The fact that wage experience carries a higher return in wage work than in self-employment is consistent with this explanation.

⁴²Of course it is easy enough to restate the sociologist's disadvantage theory in terms of the economist's comparative advantage model. See Table A for the definition of Variables for the NLS *Survey of Young Men*.

TABLE A—DEFINITION OF VARIABLES FOR *National Longitudinal Survey of Young Men*^a

Variable	Definition
Categorical Variables ^b	
Entry	Dummy for Individual Who Was a Wage Worker in the Survey Week and Self-Employed in the Next Survey Week Observed
Handicapped	Dummy for Individuals Who Have Poor Health
Veteran	Dummy for Individuals Who Served in the Military
Urban	Dummy for Individuals Who Live Within an SMSA
Professional	Dummy for Individuals in Professional Occupations
Farmer	Dummy for Individual in Farm Occupation
Manager Father	Dummy for Individuals Whose Fathers Were in a Managerial Occupation When Individual Was 14
Married	Dummy for Individual Who Is Married
Divorced	Dummy for Individual Who Has Been Divorced
Continuous Variables	
Income	Total Earnings in the Previous Year
Education	Years of Education
Business Experience	Years in Current Business
Previous Business	Years in Previous Business
Wage Experience	Years of Wage Experience
Liquidity	Net Family Assets
Military Experience	Weeks of Military Experience
Tenure	Years in Current Job
Rotter Score	Total Score on Rotter Test for 1976
Job Changes	Number of Jobs Held by Individual Since 1966 Divided by Wage Experience
Unemployment	Weeks of Unemployment Divided by Wage Plus Unemployment Experience Times 100.
Unemployment Weeks	Weeks of Unemployment Since 1966
Wage Earnings	Wage Earnings of Wage Workers
Self Earnings	Self-Employment Earnings of Self-Employed Workers or Wage Earnings of Incorporated Self-Employed Workers Who Report Wage But No Self-Employment Earnings
Assets	Net Worth (Assets Minus Liabilities) of Family

^aFurther details are provided in Evans and Leighton (1987).

^bDummy equal to 1 if condition holds and zero otherwise.

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