CERA

ENTREPRENEURIAL CHOICE AND SUCCESS

by

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1980

Characteristic	Percentage Impact Men	Women
Urban	-21.9*	-26.9
Black	-54.4*	-
Immigrants	-2.5	67.8
Post-Vietnam Era Veterans	-54.9*	-
Vietnam Veterans	-24.9*	-
Veterans of Vietnam or Later	-	-43.4
Age[b]	15.5*	-

* There is a less than one out of twenty chance that the true impact is zero.

[a] Calculated from reduced-form probit model estimates reported in Table C.3a-C.3b in Appendix C. A dash indicates that estimates were not obtained for the variable because preliminary analysis indicated that the variable was not an important determinant.

[b] Percentage change in the probability of self-employment per additional year of age, calculated for a 42 year old man.

Table II

IMPACT OF DEMOGRAPHIC CHARACTERISTICS ON SELF-EMPLOYMENT EARNINGS[a]
1980

Characteristic	Percent Differences	
	Males	Females
Urban	43.73*	-14.22*
Black	19.71	16.72
Asian	5.57	-31.87
Immigrant	-30.42*	29.73
Poor English	-11.49	31.93
Elementary School Education	8.82	-23.88
High School Dropout	-7.75	-16.97
High School Graduate	0.00	0.00
College Dropout	-0.32	-2.72
College Graduate	13.42*	28.34
Postgraduate	-6.31	32.39
Handicapped	-37.54*	-38.50*
Post-Vietnam War Era Veterans	70.47*	-
Vietnam War Era Veterans[c]	10.16	146.97
Pre-Vietnam War Era Veterans	1.18	-

Korean War Era Veterans	-2.69	-
World War II Era Veterans	2.97	-
Other Veterans	-14.75	197.41
Nonveterans	0.00	0.00
Managers	-23.13*	370.06*
Professionals	0.26	6.68
Salesmen	-52.72*	351.35*
Clerical Workers	10.75	7.45
Service Workers	-10.95	211.28*
Craftsmen	-40.25*	95.76*
Operators	0.00	0.00
Percent change in earnings per year of:[b]		
Education	0.71+0.09Age*	-0.04Age
Age	9.04-0.39Age*	9.10-0.66Age*
Residence in this country for immigrant	1.70*	1.04

* Difference is statistically significant.

[a] Calculated from the estimated earnings equations reported in Tables C.4b and C.4d in Appendix C. Entries equal the percentage difference in earnings between people who possess the characteristic and otherwise comparable people who do not possess the characteristic. A dash indicates that estimates were not obtained for the variable because preliminary analysis indicated that the variable was not an important determinant.

[b] The percentage change in earnings due to a change in education or age varies with age level. To find the percentage change at any particular age level insert the relevant value of age (e.g., 42 for the average individual in the sample) for Age in the expression.

[c] Includes Post-Vietnam Era veterans.

EXECUTIVE SUMMARY

Introduction

Approximately nine million men and women in this country work primarily for themselves. They constitute almost nine percent of the workforce and operate the vast majority of businesses. Yet little is known about the factors that influence an individual's decision to work for himself or the factors that determine his earnings from self-employment.

The little we know about the self-employed comes mainly from sociological and psychological studies of entrepreneurs who are generally self-employed. These studies find that entrepreneurs are more likely than the average individual to be immigrants or the sons of immigrants; to be orphans or half orphans or to have had fathers who were away for long periods of time; to have had fathers who were company owners, professionals, or otherwise self-employed; to be college educated; to be displaced persons whose niche in life has been upset through job loss, divorce, or military discharge; and to have common psychological characteristics such as unwillingness to submit to authority, to push themselves more, and to feel that they have a great deal of influence over the course of events. Unfortunately, most of these studies rely on small samples that may not be representative of the population of self-employed workers. Whether the results of these studies hold true generally is open to question.

Several economists have recently proposed theories of entrepreneurial choice. Robert Lucas argues that people who have relatively more "entrepreneurial ability" become entrepreneurs and those who have relatively less become workers. Richard Kihlstrom and Jean-Jacques Laffont argue that people who are relatively less averse towards risk become entrepreneurs and those who are relatively more risk averse become workers. Neither of these theories has been tested with

data on entrepreneurs and workers.

This report uses data on self-employed and wage and salary workers from the 1980 population census to examine what factors influence an individual's decision to work for himself and what factors influence an individual's earnings from self-employment. It pays particular attention to whether veterans are more or less likely than nonveterans to work for themselves and whether self-employed veterans are more or less successful than self-employed nonveterans. It also tests some of the theories of entrepreneurial choice that have been proposed by psychologists, sociologists, and economists.

Statistical Methods

The statistical methods we use to investigate these issues enable us to quantify the separate influence of each of many socioeconomic and demographic characteristics on self-employment choice and success. An example illustrates the power and importance of these methods in understanding why some people are self-employed and some are not and why some self-employed people earn more than others.

In 1982, 11.6 percent of males between the ages of 25 and 64 who had not served in the military were self-employed and 11.2 percent of males between the ages of 25 and 64 who had served in the military were self-employed. These data suggest that veterans are just about as likely as non-veterans to go into business for themselves. In 1982, 8.0 percent of males between the ages of 25 and 64 who had served during the Vietnam War were self-employed. This fact suggests that Vietnam veterans are less likely to go into business for themselves than either veterans who did not serve in Vietnam or non-veterans.

Neither conclusion is necessarily correct. If we compare men who are roughly the same age

we find that veterans are less likely to be self-employed than are nonveterans. The finding above that veterans and nonveterans are equally likely to choose self-employment is a statistical illusion. The illusion result from the fact that older men are more likely than younger men to have seen military service and the fact that older men are more likely than younger men to be self-employed. Roughly two-thirds of nonveterans are between the ages of 25 and 39 while only one-third of veterans are between these ages. Vietnam veterans are less likely to be self-employed than are veterans of other wars partly because they are younger than veterans of earlier wars and because younger men are less likely to be self-employed.

These results demonstrate the importance of separating the influence of age on self-employment choice from the influence of military service on self-employment choice. It is important to separate out the influence of many other factors such as education, race, sex, and health as well. This study does so.

Our ability to isolate the separate influence of each of many demographic and socioeconomic characteristics enables us to examine the impact of one characteristic (or changes in one characteristic) on self-employment choice and success holding all other characteristics the same. This ability permits us to make the following kinds of statements: a black is less likely to work for himself than an "otherwise comparable" white; an immigrant earns less at self-employment than an "otherwise comparable" non-immigrant; a Vietnam veteran is less likely to work for himself than an "otherwise comparable" veteran of earlier eras. The term "otherwise comparable" means that except for the characteristic in question (race, immigration status, and military service respectively) both individuals have the same demographic characteristics (such as age and education).

The statistical methods we use also enable us to say whether the relationships we observe between various demographic and socioeconomic characteristics and self-employment choice and success are likely to hold generally or whether they are due to chance. When there is less than one chance out of twenty that a relationship we observe could be spurious we say that the

relationship is "statistically significant". When there is more than one chance out of twenty we say that the relationship is "statistically insignificant" (or based on "limited evidence"). These criteria for determining whether relationships are spurious or not are widely accepted by statisticians and social scientists.

Summary of Major Results

The sample of individuals considered for this study was drawn from the 1980 Public Use Sample of the U. S. Bureau of the Census. (The report also examines a sample of individuals drawn from the 1970 Public Use Sample of the U. S. Bureau of the Census. We concentrate on the more recent results in this summary.) Farmers, doctors, lawyers, and other professionals were excluded from the sample because the determinants of self-employment choice and success are likely to be different for these professions than for most other occupations. Individuals who worked fewer than 36 hours per week or for fewer than 40 weeks during 1979 were also excluded from the sample because the determinants of self-employment choice and success are likely to be different for individuals who are unemployed or who are part-time workers than for individuals who are employed full time.

The major results of the study are described below.

1. Men who entered military service during or after the period of the Vietnam War were less likely than other men to work for themselves rather than work for someone else. But there is no evidence that, of the men who were of draft age during or after the period of the Vietnam War, those men who served in the military during this period earned less at self-employment than men who did not serve. (The Bureau of the Census takes August 5, 1964 as the starting date of the Vietnam War period. We also adopt this date.)

2. Women who entered military service during or after the period of the Vietnam War were less likely than other women to work for themselves rather than work for someone else. Women veterans of all eras earned more at both self-employment and wage work than other women

3. Black males were less likely to choose self-employment than were non-black males. But while black males who chose wage employment earned 21 percent less than otherwise comparable non-black males who chose wage employment, black males who chose self-employment earned 20 more than otherwise comparable non-black males who chose self-employment.

4. Black females were just as likely to choose self-employment as non-black females. But whereas black females who chose wage employment earned 8 percent less than otherwise comparable non-black females who chose wage employment, black females who chose self-employment earned 17 percent more than otherwise comparable non-black females who chose self-employment.

5. Male immigrants were no more likely to choose self-employment than were other men. Male immigrants earned less at self-employment than other men. The difference between self-employment earnings of an immigrant and an otherwise comparable nonimmigrant decreased the longer an immigrant has been in this country.

6. There is some limited evidence that female immigrants earned more than female nonimmigrants at self-employment. There is also some limited evidence that female immigrants were more likely than female nonimmigrants to choose self-employment. But these differences could be due to chance.

7. Education had little influence on the propensity of either males or females to choose self-employment.

8. For males, there is a strong relationship between self-employment earnings and education. The relationship between education and earnings varies by age. For example a 42 (30) year

old college graduate earned 32 (27) percent more than an otherwise comparable 42 (30) year old high school graduate in self-employment.[1]

9. There is some limited evidence that self-employment earnings increase with education for women. Women with an elementary education earn 29 percent less and women with a college education earn 37 percent more than women with a high school education. It is possible, however, that these differences are due to chance.

10. The probability of self-employment increases at a diminishing rate with age for men but not for women.

11. Self-employment earnings increase at a diminishing rate with age for men and women.

12. The probability of self-employment increases with the difference between expected earnings from self-employment and expected earnings from wage-employment. This finding holds for both men and women.

Tables I and II summarize the impact of various demographic characteristics on entrepreneurial choice and success. Starred entries indicate that the estimated impact is statistically significant and that we are therefore reasonably confident that the estimated impact is not due to chance.

Implications for Theories of the Entrepreneur

This report develops and estimates a model of entrepreneurial choice and success. It uses the estimated model to test various alternative hypotheses concerning the relationship between various socioeconomic and demographic variables, the propensity to become self-employed, and

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1. The average individual in our sample is 42 years old.

success at self-employment. The results have several implications for existing theories of entrepreneurship.

First, the evidence is consistent with the economic theory proposed by Robert E. Lucas that individuals who are more able at entrepreneurship start businesses and that individuals who are less able at entrepreneurship work for someone else. Individuals whose expected earnings are relatively higher at self-employment than at wage work tend to become self-employed.

Second, the evidence is not consistent with Kihlstrom and Laffont's theory that individuals who are more risk averse are more likely to choose to work for themselves rather than for someone else. To the extent that our crude data and methods permit us to infer differences in the degree of risk aversion across the individuals in our sample, we find that differences in risk aversion are not important in explaining the choice between self-employment and wage work.

Third, the evidence is not consistent with Albert Shapero's psychological theory that displaced person's tend to become entrepreneurs. Individuals who have been divorced are no more likely to become entrepreneurs than are individuals who have not been divorced. Moreover, recent veterans are less likely to become entrepreneurs than are nonveterans.

Fourth, the evidence is not consistent with various sociological studies that claim that immigrants are more likely to become entrepreneurs. It is important to note, however, that the data used in this study probably underrepresents illegal immigrants, non-English speaking immigrants and possibly other immigrant groups.

Suggestions for Further Research

This study develops what we believe to be a promising approach towards the study of self-employed workers, identifies a number of empirical relationships concerning socioeconomic

characteristics and entrepreneurial choice and success, and presents some crude tests of several economic, psychological, and sociological theories of entrepreneurial choice. Although the study addresses many important questions concerning the determinants of entrepreneurial choice and success, many other questions remain unanswered because of the limited data available on people who work for themselves.

Data on previous work experience (in either self-employment or wage work, in related or unrelated occupations, in family-owned or other business, for example), type of education (vocational training or college major for example), and IQ would be help us gain a better understanding of the impact of an individual's "human capital" on entrepreneurial choice and success. Some of these data are available on other datasets--notably the National Longitudinal Survey which contains information on work experience and vocational training--but these datasets provide information on too few self-employed workers for reliable statistical analysis.

Longitudinal data--that is data that track an individual over time--would also help us determine when and why people switch between self-employment and wage work and would help us sort out the influence of human capital accumulated in wage work on subsequent self-employment income and vice versa. The Continuous Work History Sample constructed by the Social Security Administration has useful data on switches but does not contain the demographic information necessary for making appropriate comparisons. Collection of such data should be an important objective of future research on entrepreneurial choice and success.

CHAPTER 1

INTRODUCTION

Approximately nine million men and women in this country work primarily for themselves.[1] They constitute almost nine percent of the workforce and operate the vast majority of businesses.[2] Yet little is known about the factors that influence an individual's decision to work for himself or the factors that determine his earnings from self-employment.

What we know about the self-employed comes mainly from sociological and psychological studies of entrepreneurs.[3] Entrepreneurs are generally self-employed. Studies by David McClelland and David Winter (1969), D. F. Collins, D. G. Moore, and D. B. Unvala (1964), and Albert Shapero (1975) find that entrepreneurs have several common characteristics. Entrepreneurs are more likely than the average individual to be immigrants or the sons of immigrants; to be orphans or half orphans or to have had fathers who were away for long periods of time; to have had fathers who were company owners, professionals, or otherwise self-employed; to be college educated; and to be displaced persons whose niche in life has been upset through job loss, divorce, or military discharge. They also have common psychological characteristics such as unwillingness to submit to authority, to push themselves more, and to feel that they have a great deal of influence over

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1. Based on 1981 data for employed workers from U. S. Bureau of the Census (1982, p. 385).

2. There were somewhat more than 16 million businesses in 1981 including 12 million sole proprietorships. Many of these businesses are either not active or are operated on a part-time basis by people who are primarily wage earners. See U. S. Bureau of the Census (1982 p. 529).

3. The major economic studies are Victor Fuchs (1982) and Thomas Gray and David Hirschberg (1983). Fuchs examines the determinants of switches to self-employment among older workers only and does not examine the determinants of self-employment earnings. Gray and and Hirschberg provide interesting information on the frequency of switches between self-employment and wage work but do not investigate the impact of demographic and human capital characteristics on these switches.

the course of events.[4] Most of these studies rely on small samples that are unrepresentative of the population of self-employed workers. Whether their results hold true generally is open to question.

The purpose of this report is twofold. First, to identify the factors that influence an individual's decision to become self-employed. Second, to identify factors that influence an individual's earnings from self-employment. For both purposes, we are particularly interested in determining whether veterans are more or less likely than nonveterans to choose self-employment and whether veterans achieve better or worse financial success at self-employment than do nonveterans.

Our study relies on data drawn from the 1980 Public Use Sample of the U. S. Bureau of the Census.[5] Chapter 2 describes these data and uses them to compare the characteristics of self-employed workers with wage and salary workers. Chapter 3 describes our framework for analyzing self-employment choice and success. It identifies the factors that are likely to play an important role in determining whether an individual chooses self-employment and how much an individual will earn at self-employment. Chapter 4 reports the results of a statistical analysis of the probability that individuals will choose self-employment. Chapter 5 reports the results of a statistical analysis of the determinants of self-employment and wage earnings. In addition to reporting separate results for men and women, Chapters 4 and 5 also report separate results for men who were of draft age during the Vietnam War era or later. Chapter 6 presents our conclusions and suggestions for further research. Appendix A surveys several alternative economic theories of the entrepreneur and provides the background for our theoretical framework.

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4. Entrepreneurs receive much different scores than nonentrepreneurs on psychological tests.

5. Although our major analysis relies on 1980 data, we also report results based on the 1970 Public Use Sample in Chapters 2,4,5, and Appendix C for the purposes of comparison. We concentrate on the 1980 results because there were too few Vietnam veterans in the 1970 sample for reliable analysis and because those Vietnam veterans that were in the sample were mostly in the early stages of their working careers. In addition, the 1970 PUS provides no information on female veterans.

Appendix B presents the technical details of the theoretical framework described in Chapter 3. Appendix C details our statistical procedures and results.

CHAPTER 2

COMPARISON OF THE SELF-EMPLOYED WITH WAGE AND SALARY WORKERS

2.1--Description of the Data

The data used for this study were obtained from the 1970 and 1980 Public Use Samples (PUS) prepared by the U. S. Bureau of the Census as part of its decennial survey of the population.[1] All self-employed workers and 8 percent of wage and salary workers were drawn from the 1980 PUS. All self-employed workers and 15 percent of wage and salary workers were drawn from the 1970 PUS.

The purpose of this sample design was to obtain the most statistically reliable estimates of the determinants of the probability of self-employment given an overall limitation on the number of individuals we could include in our sample.[2] There is some limited evidence that the best sample for this purpose contains roughly equal proportions of the two categories being considered (in our case self-employed workers and wage and salary workers).[3] Thus, the objective

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1. Although other data sources such as the National Longitudinal Samples provide richer information on individuals, the number of self-employed workers included in these samples is too small for reliable analysis.

2. Some of the statistical techniques used in this study are extremely costly. In order to conserve on computer costs we limited the sample to approximately 6000 individuals.

3. See Coslett (1981) for a discussion of the evidence.

4. We analyzed the 1980 data first. Because we found that after the deletion of the groups listed less than 50 percent of our sample consisted of wage and salary workers, we increased the proportion of wage and salary workers sampled for the 1970 PUS.

sample design was to obtain roughly equal size samples of self-employed and wage

only individuals who worked full time in the preceding year were included in the sample.[5] part-time self-employed workers are probably substantially different from full-time self-employed workers. Part-time self-employed workers probably include individuals engaging in self-employment in order to tide them over between wage jobs. Part-time workers probably also include retired individuals who are supplementing their pensions with self-employment.[6] While the determinants of part-time self-employment may be interesting in their own right, they are likely to differ from the determinants of full-time self-employment. Professionals (e.g., lawyers, dentists, and veterinarians) were excluded from the sample because individuals in these occupations are predominantly self-employed and because the determinants of self-employment choice and success for these groups are probably substantially different from the determinants for occupations where there is less need for substantial investment in human capital. Farmers were also excluded for a similar set of reasons. Finally, only individuals between the ages of 18 and 65 were considered.

This report analyzes men and women separately for three reasons. First, it is well known that the labor market behavior of women differs markedly from that of men.[7] Second, women engage in self-employment less frequently than do men. In 1980, 4 percent of the women and 10 percent of the men who satisfy the criteria for being included in our sample were self-employed.[8] Third, women are much less likely to be veterans than are men. In 1980, 53 percent of the men in

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full-time workers are defined to be those who worked more than 40 weeks out of the year and usually worked at least an average of 36 hours per week.

See Parnes (1982) for evidence on self-employment among retired individuals.

See Heckman (1984) for further discussion.

These percentages were obtained by projecting the results obtained for our sample to the population as a whole.

Table 2.1
SAMPLE SIZES BY EMPLOYMENT STATUS AND SEX
1970 AND 1980[a]

	Males		Females	
	1970	1980	1970	1980
Self-Employed	3032	3735	488	833
Wage and Salary	4243	2475	1904	1404
Total	7275	6205	2392	2237

[a] Samples drawn from 1970 and 1980 Public Use Samples (5 percent-1/1000) of the U. S. Bureau of the Census. All self-employed workers and 7.1 (14.2) percent of wage and salary workers were drawn for 1970 (1980). Farmers, professionals such as doctors and lawyers, individuals younger than 18 or older than 65, and individuals who work less than 30 hours per week or 40 weeks per year were excluded from the sample.

our sample were veterans while only 1.5 percent of the women in our sample were veterans. Table 2.1 reports the number of individuals in our sample according to employment status.

2.2--Self-Employed vs. Wage and Salary Workers

It is useful to compare the characteristics of self-employed and wage and salary workers. Table 2.2a and 2.2b report some characteristics of self-employed and wage workers for men and women respectively. Self-employed workers are slightly older and much less likely to be black than are wage and salary workers. The self-employed are just about as likely as other workers to be veterans, immigrants, urban dwellers, or college educated.[9]

Table 2.3 reports the percentage of male self-employed and wage workers by military status for 1980.[10] Approximately the same percentage of self-employed and wage workers are veterans. But the period of military service differs markedly between self-employed men and working men.[11] Self-employed men are more likely to have first seen military service during World War II: 20.6 percent of self-employed men but only 13.8 percent of working men were World War II-era veterans. Self-employed men are just as likely to have seen military service between the end of World War II and the start of the Vietnam War as working men. Finally, self-employed men are less likely to have seen military service during or after the start of the Vietnam War: 10.2 percent of self-employed men but 17.4 percent of working men saw military service during the

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9. Female self-employed workers are somewhat less likely to be college educated than are female wage and salary workers.

10. We do not report results for women because only 1.7 percent of women were veterans in 1980. We concentrate on 1980 because if includes the full sample of Vietnam veterans.

11. See Table 2.4 for the starting and ending dates of each military era.

period of the Vietnam War; 0.9 percent of self-employed men but 3.2 percent of working men saw military service after the Vietnam War.

These differences in the propensity to choose self-employment across veterans of different eras could be due to many possible factors. Let us give two examples. First, the training and experience received by veterans may better equip veterans of some eras for running their own businesses than veterans of other eras. Second, the probability that an individual will be self-employed may increase with age. Older veterans may choose self-employment more frequently than younger veterans not because of any service-related differences but simply because they are older. This report will test these and other alternative explanations in some detail.

Table 2.4 defines the variables used in the statistical analysis. Tables 2.5a and 2.5b report the average values of these variables for men and women respectively.

Table 2.2a

CHARACTERISTICS OF SELF-EMPLOYED AND WAGE AND SALARY WORKERS
1970 and 1980
Males

Percent

	Self-Employed Workers		Wage and Salary Workers	
	1970	1980	1970	1980
Age[a]	45.6	43.6	40.8	39.6
College Educated	22.1	23.8	20.9	22.6
Veterans	55.8	52.6	43.2	52.5
Black	3.1	2.6	7.5	8.1
Urban	70.5	78.5	74.6	82.5
Immigrants	7.2	6.9	6.6	7.2

[a] Arithmetic average age. All other variables are percentages of population with given characteristic.

Table 2.2b

CHARACTERISTICS OF SELF-EMPLOYED AND WAGE AND SALARY WORKERS
1970 and 1980
Females

Percent

Occupations	Self-Employed Workers		Wage and Salary Workers	
	1970	1980	1970	1980
Age[a]	47.4	44.1	41.0	38.3
College Educated	12.2	16.4	16.9	18.6
Veterans	-	1.7	-	1.3
Black	3.6	4.2	12.5	12.5
Urban	69.3	78.5	78.4	84.4
Immigrants	6.2	8.2	5.6	6.2

[a] Arithmetic average age. All other variables are percentages of population with given characteristic.

TABLE 2.3

PERIOD OF MILITARY SERVICE BY EMPLOYMENT STATUS
Males-1980

Percent

Period of Service	Self-Employed	Wage and Salary
Post-Vietnam	0.9	3.2
Vietnam	10.2	17.4
Pre-Vietnam	9.4	10.7
Korea	11.0	10.0
World War II	20.6	13.8
Other	0.5	0.6
Nonveteran	47.4	44.3
TOTAL	100.0	100.0

Table 2.4

DEFINITION OF VARIABLES

Variable	Definition
Dichotomous Variables[a]	
SELFEMP	Individual is self-employed
URBAN	Individual resides in an urban area
LITKID	Household has child under 6
OLDKID	Household has child between 6 and 17 but no child under
NOKID[b]	Household has no kids
MARHLD	Married couple household
BLACK	Individual is black
ASIAN	Individual is of Asian descent
WHITE[b]	Individual is not Black or Asian
HISPANIC[d]	Individual has Spanish surname
IMMIG	Individual not born in U.S. or abroad of U.S. parents
BADENG	Individual has no or little command of English language
ELEM	Individual has less than high school education
HSDROP	Individual dropped out of highschool
HSGRAD[b]	Individual graduated from highschool
COLDROP	Individual dropped out of college
COLGRAD	Individual graduated from college
POSTGRAD	Individual has postgraduate education
HANDICAP[c]	Individual has some physical handicap

Table 2.5
SUMMARY STATISTICS ON VARIABLES USED IN THE ANALYSIS
Choice-Based Sample

	Males		Females	
Variables	1970	1980	1970	1980
Dichotomous Variables[a]				
SELFEMP	0.418	0.615	0.222	0.391
URBAN	0.729	0.800	0.764	0.821
LITKID	0.274	0.213	0.130	0.126
OLDKID	0.493	0.318	0.348	0.320
NOKID	0.233	0.469	0.522	0.554
MARHLD	0.906	0.864	0.654	0.684
BLACK	0.056	0.047	0.105	0.093
ASIAN	0.010	0.013	0.009	0.020
HISPANIC	0.017	-	0.009	-
WHITE	0.944	0.940	0.886	0.887
IMMIG	0.069	0.070	0.057	0.070
BADENG	0.026	0.013	0.025	0.016
ELEM	0.165	0.078	0.128	0.053
HSDROP	0.178	0.122	0.168	0.118
HSGRAD	0.295	0.337	0.379	0.416
COLDROP	0.237	0.230	0.021	0.243
COLGRAD	0.101	0.122	0.804	0.098
POSTGRAD	0.054	0.111	0.049	0.072

ties. Commissioned and noncommissioned officers might obtain more managerial experience
eadership training at an earlier stage of their careers than non-veterans with otherwise .110
r demographic characteristics. Veterans might obtain vocational skills that they can best .654
forming their own businesses. On the other hand, military training and experience might 1.236
t abilities and skills which are valued by employers. The managerial skills of officers, for –
e, might have a higher payoff in a large corporate bureaucracy than in a small –
eneurial firm. Military service typically augments both entrepreneurial and –
epreneurial skills and thereby raises both potential profits from entrepreneurship and –
l wages from employment by others. We are interested in determining the net impact of –
service on the decision to become an entrepreneur and on the financial success of –
eurs. Notably, Fredland and Little (1980) found that people who take and subsequently –
ary training in civilian occupations earn a pay premium of around seven percent. –
al and managerial training in particular receives a premium in the private sector. 0.096
tary service may also have indirect financial effects on entrepreneurs. First, military 0.223
20 years of service receive pensions which increase their financial security. Many 0.074
rsonnel can retire in their early 40's and pursue another career while drawing a 0.350
military pension. This pension might increase the veteran's willingness to start a 0.165
risky business. Second, the GI Bill decreases the cost of education to veterans. This 0.026
ubsidy might enable veterans to obtain skills useful in entrepreneurial activities. It 0.066
able veterans to obtain skills which increase their wage rate and thereby dampen
es to become entrepreneurs. O'Neill (1980) found that vocational training taken –
ill raises earnings more than similar training taking under CETA (the Comprehensive –
d Training Act Program). Blacks are especially more likely to take benefits under 4.247

ately, the available data are not sufficiently detailed to isolate the impact of each 18.634
tive sources of influence. We do not know whether a veteran volunteered or was 4.897 –

MAR0	Individual never married
MAR1[b]	Individual married only once for 1980; individual currently married with spouse present for 1970
MAR2	Individual married more than once for 1980; individual divorced, separated, or spouse not present for 1970
NEWVET[c]	Individual veteran of post-Vietnam era (not available for 1970) (service after May 7, 1975)
VIETVET	Individual Vet of Vietnam era (service between August 5, 1964 and May 7, 1975)
PREVIET[c]	Individual Vet of era between Korean and Vietnam (not available for 1970) (service between February 1, 1955 and August 4, 1964)
KORVET	Individual Vet of Korean era (service between June 27, 1950 and January 31, 1955)
WWIIVET	Individual Vet of WWII (service between September 16, 1940 and July 25, 1947)
OTHVET	Individual Vet of other era (pre-WWII or between WWII and Korea)
REMVET	Female individual who is veteran of pre-Vietnam era
NONVET[b]	Individual not a veteran
MANAGE	Management occupation
PROF	Professional occupation
SALES	Sales occupation
CLERIC	Clerical occupation
SERVICE	Service occupation
CRAFT	Craft occupation
OPERATOR[b]	Machine operator occupation
Continuous Variables	
IMGYRS	Number of years individual has been in this country
YRSIMG[c]	IMMIG*IMGYRS

AGE	Individual's age in years divided by 10
AGESQ	AGE*AGE
EDUC	Number of years of education
FERTILITY	Number of children born to female individual
VETAGE	VET*AGE
EDVET	VET*EDUC
LINC	Lográrithmic value of sum of all income received by individual
SPSEINC	Difference between family income and individual income divided by 1,000,000
SELF-WORK	Difference between expected log self-employment income and expected log wage income

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[a] Variable equals one if individual possesses characteristic and zero otherwise.

[b] Base categogory for regression analysis.

[c] Not available for 1970.

[d] Not available for 1980.

[e] Variable calculated from regression estimates of self-employment and wage earnings equations

EDVET[b]	6.895	6.154	-	0.192
SPSEINC[c]	2.523	3.538	6.488	11.906
LINC	9.009	9.783	8.140	9.127

[a] Mean of dichotmous variables gives the fraction of the population with this characteristic.

[b] Actual age has been divided by 10.

[c] This variable divided by 1000 was used in the regression analysis.

CHAPTER 3

FRAMEWORK FOR ANALYZING SELF-EMPLOYMENT CHOICE AND SUCCESS

An entrepreneur for the purposes of this report is anyone who has control over the direction and operation of a business and bears risks as the residual claimant of business profits.[1] Any individual who works for himself in return for an uncertain residual income rather than for someone else in return for a certain wage is therefore an entrepreneur.

This chapter develops a framework for studying entrepreneurial choice and success. The framework integrates key aspects of several economic, sociological, and psychological theories of entrepreneurial choice and success. The first section reviews the psychological and sociological literature on entrepreneurs. The second section reviews the economic literature on entrepreneurs. The third section presents a framework that integrates the major theories.

This chapter also discusses the relationship between military service and entrepreneurial choice and success. Although we are not aware of any previous studies on military service and entrepreneurship, several researchers have examined the relationship between military service and wage earnings. In the fourth section, we review these studies and discuss their possible implications for the relationship between military service and entrepreneurship.

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1. Most economists view as entrepreneurs anyone who has control over the direction and operation of a business and bears risk as the residual claimant on business profits. This definition, which is due to Frank Knight, Risk, Uncertainty and Profit (New York: Houghton Mifflin, 1921), obviously includes most self-employed workers. This definition has been criticized for being overly broad and not capturing the essential features of the entrepreneur. The Austrians view the entrepreneur as a spotter of opportunities. The entrepreneur can shift risks onto the capitalist (although he may choose not to). Consequently, risk-bearing is not essential to entrepreneurship. We believe this argument has substantial merit. But the Austrian definition is too narrow for our purposes. It would exclude many small businessmen who operate fairly standard businesses and cannot claim to have developed a new product or service, the hallmark of the entrepreneur. Moreover, we suspect there are insurmountable observational problems in determining whether a particular small businessman is a "spotter" or just a "risk bearer". Most empirical studies of entrepreneurs are plagued by arbitrary criteria for selecting the sample of entrepreneurs.

3.1--Sociological and Psychological Studies of Entrepreneurship

Psychologists and sociologists have studied the personal characteristics of select groups of entrepreneurs. The studies by McClelland and Winter (1969), Collins and Moore (1964), and Shapero (1975) found that entrepreneurs have a number of common characteristics.[2]

1. Entrepreneurs are often orphans or half orphans or had fathers who were away for long periods of time. Entrepreneurs are often "on their own" as kids.
2. Entrepreneurs are more likely to be immigrants or the sons of immigrants than non-entrepreneurs.
3. Enterpreneurs are less able to submit to authority, push themselves more, and put less stock in getting ahead (in the sense of gaining approval from society) than non-entrepreneurs.[3]
4. Entrepreneurs are much more likely to have fathers who were company owners, professionals, or otherwise self-employed than are non-entrepreneurs. Shapero found that more than 50 percent of the entrepreneurs he studied had self-employed fathers versus

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2. The scientific validity of these studies, which are seldom based on random samples and often use ambiguous or overly inclusive definitions of an entrepreneur, is open to question. The regularities reported below, however, appear fairly robust across studies and therefore provide useful working hypotheses concerning who becomes an entrepreneur.

3. In a study of 22 R&D companies that were no more than 10 years old, Henry Schrage (1965) found that the successful entrepreneur has an "accurate perceptions of the market's response to his firm's products or services as well as a keen understanding of the determinants of his employee's morale..." The most successful entrepreneurs (as measured by the profitability of their companies) were high in achievement motivation, low in power motivation, and high in total awareness of their business environment.

less than 10 percent for non-entrepreneurs.

5. Entrepreneurs are often people who feel they have a great deal of influence over the course of events. They downplay luck.

6. Entrepreneurs are relatively well educated. Douglas (1976) found that 37 percent of the entrepreneurs he studied had at least a college degree compared with 14 percent of the population at large.[4]

7. Entrepreneurs are often displaced persons whose niche in life has been upset and who are therefore outside the mainstream of society. Shapero found that, in 65 percent of the cases he examined, the primary influence on the entrepreneur was negative. The entrepreneur had lost a job, received a divorce, or had left the military.

8. Once an entrepreneur always an entrepreneur. Shapero found that 72 percent of the entrepreneurs he surveyed would start a new company if their present one folded. Copulsky and McNulty also note that entrepreneurs often drift from one entrepreneurial pursuit to another.[5] They note that, "Some entrepreneurs have spent as much as 20 years in seemingly aimless drifting and dragon-tilting before they struck a successful deal."

9. People typically become entrepreneurs when they are young, between 25 and 40.

These studies suggest that entrepreneurs are intrinsically different from non-entrepreneurs and that there is a correlation between certain personality traits and entrepreneurial success. McClelland and Winter, Shapero, and Schrage emphasize that

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4. Douglas studied 153 entrepreneurs in the Atlanta metropolitan area who had been in business for at least three years and who had no more than 30 employees. He found that 40 percent of the college-educated entrepreneurs major in business or economics. Interestingly, he also found that there was no statistically significant correlation between education and success (as measured by firm size or sales growth; he had no data on profitability) among the entrepreneurs he studied. The most successful group of entrepreneurs (according to his criteria) were those with some college but without a degree.

5. William Copulsky and Herbert McNulty, Entrepreneurship and the Corporation (New York: AMACOM, 1974).

entrepreneurs receive much different scores than nonentrepreneurs on psychological tests. Several economists have developed models of entrepreneurial choice that also assume that people who choose to become entrepreneurs tend to be intrinsically different from people who choose to work for someone else. We present a nontechnical summary of the major assumptions and implications of these models in the next section.

3.2--Economic Theories of Entrepreneurship

Economists have largely suppressed the role of the entrepreneur in modern theory by relying on abstract production functions to describe the firm and by ignoring the process by which the economy evolves over time.[6] Because of this theoretical vacuum economists have performed few empirical studies of entrepreneurship. The major exceptions are Miller's studies of the background of 190 business leaders in the first decade of this century, Gregory and Neu's study of 247 business leaders in the 1870's, and Taussig and Joslyn's study of the origins of business leaders.[7] These studies found that business leaders come from a select portion of the population. Businessmen were often sons of professional men, often came from urban areas, were more highly educated than their countrymen, and were seldom immigrants. But these leaders were more often managers than founders. Only 14 percent of the leaders studied by Miller founded

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6. For a critical review of the role of entrepreneurs in economic theory, see William A. Baumol (1968). The entrepreneur has been neglected by modern theory largely because this theory focuses on the general equilibrium for the economy. The importance of the entrepreneur lies in upsetting economic equilibria and setting the forces of change into motion. The entrepreneur plays a central role in the Austrian economic theory that focuses on the competitive process that continually transforms the economy over time.

7. In William Miller (1962) see William Miller, "The Business Elite in Business Bureaucracies," and "The Recruitment of the Business Elite," and Frances Gregory and Irene Neu, "The American Industrial Elite in the 1870's." Also see Jocelyn Maynard Ghent and Frederic Cople Jaher (1976).

their own company. Most managed large companies with many stockholders and bore little financial risk themselves. Thus these leaders were bureaucrats rather than entrepreneurs. Dahmen's massive study of entrepreneurship in Sweden, although it did not examine the demographic characteristics of entrepreneurs, did discover some interesting patterns. The first generation of entrepreneurs in an industry usually came from a related industry--e.g., textile manufacturers evolved not from the tailor trade but from clothing merchants--while the second generation usually came from people who worked for the first generation firms.[8]

In the last several years, some economists have developed theories of entrepreneurial choice. These theories assume that people have some characteristic that is associated with the propensity for entrepreneurship. People who have more of this characteristic are more likely to become entrepreneurs than people who have less of this characteristic. Lucas (1978) assumes that this characteristic is "entrepreneurial ability". People with greater entrepreneurial ability can earn more money by running their own businesses than by working for someone else. Kihlstrom and Laffont (1978) and Kanbur (1978) assume that this characteristic is a "taste for risk". Running a business is more risky than working for someone else. People who have a stronger taste for risk are more likely to operate their own businesses.[9] Because these models are technically complex, we have relegated further discussion of them to an appendix.

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8. Erik Dahmen, Entrepreneurial Activity and the Development of Swedish Industry, Axel Leijonhufvud, trans. (Homewood, Ill.: Richard D. Irwin, 1970).

9. In both of these theories, it is possible to show that there is a particular level of the entrepreneurial characteristic above which people will become entrepreneurs and below which people will become workers. This "critical level" is that level at which the supply of labor by individuals who choose to become workers equals the demand for labor by individuals who choose to become entrepreneurs.

3.3--An Integrated Framework for Studying Entrepreneurial Choice and Success

The theories reviewed above suggest that the probability that an individual chooses to become an entrepreneur depends upon his entrepreneurial ability and his taste for entrepreneurship.

Taste for Entrepreneurship--The psychological and sociological studies suggest that whether an individual is an immigrant, whether he has been divorced, whether he has served in the military, whether his father was self-employed, whether he was an orphan and other social characteristics affect his taste for working on his own. The psychological studies find that entrepreneurs like to be in control. Finally, people with a greater taste for risk may have a greater taste for entrepreneurship.

Entrepreneurial Ability--People who can earn relatively more working for themselves than working for someone else have a relatively higher propensity to become entrepreneurs. Entrepreneurial ability may depend upon observable characteristics such as work experience and education and on unobservable characteristics such as " drive".[10]

The remainder of this section describes an empirical framework that integrates these main theories and which can be used to estimate the impact of certain observable characteristics on the propensity for an individual to become an entrepreneur.[11] The value of being in an occupation

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10. These implications follow from Lucas' theory of entrepreneurship and from the psychological studies that find that successful entrepreneurs have different psychological profiles than other individuals.

11. The framework described below is an extremely simplified version of the framework that we actually used. For further technical details on our framework, see Appendix B.

(either self-employment or wage work) is the sum of two components. First, the value of income which the individual can expect from that occupation. Second, the nonmonetary value of that occupation based on the individual's taste for that occupation. Symbolically,

$$E = E_I + E_T \tag{3.1}$$

$$W = W_I + W_T \tag{3.2}$$

where E_I and W_I denote the income value of entrepreneurship and wage work respectively and E_T and W_T denote the taste value of entrepreneurship and wage work respectively. An individual will choose entrepreneurship if the value of entrepreneurship is greater than the value of wage work and vice versa.

The income received from entrepreneurship or wage work is a function of various personal characteristics such as race, education, and work experience. We can denote these characteristics by $\underline{x}=(x_1,x_2,\ldots,x_n)$ and write E_I and W_I as functions of these characteristics

$$E_I = E_I(\underline{x}) \tag{3.3a}$$

$$W_I = W_I(\underline{x}) \tag{3.3b}$$

The taste for entrepreneurship or wage work is also a function a personal characteristics such as family status, race, whether the person is an immigrant, and age/ We can denote these characteristics by $\underline{z}=(z_1,z_2,\ldots,z_m)$ and write E_T and W_T as function of these characteristics

$$E_T = E_T(\underline{z}) \tag{3.4a}$$

$$W_T = W_T(\underline{z}) \tag{3.4b}$$

Substituting (3.3)-(3.4) into (3.1)-(3.2) we can write E and W as functions of the earnings characteristics x and the taste characteristics z

$$E = E(\underline{x},\underline{z}) \tag{3.6}$$

$$W = W(\underline{x},\underline{z}) \tag{3.7}$$

If $\underline{x}$ and $\underline{z}$ summarized all the characteristics that affect the value of entrepreneurship and wage work and if people behave systematically, then we could determine whether an individual will choose to become an entrepreneur by observing the values of $\underline{x}$ and $\underline{z}$ for an individual, calculating $E(\underline{x},\underline{z})$ and $W(\underline{x},\underline{z})$, and comparing the values of these alternative occupations. But such is not the case. We cannot observe (let alone imagine) all of the myriad of factors that might influence the relative values of entrepreneurship and wage work to an individual. Moreover, people with the same characteristics may behave differently in economic terms from one another simply because people do not behave systematically and may have different perceptions and preferences. We can capture these unobserved factors by assuming that there is a value of being an entrepreneur or worker which depends upon characteristics that we cannot observe. Let E_U and W_U denote that these values based on unobservable characteristics for entrepreneurs and workers respectively. Then we can rewrite (3.6) and (3.7) as

$$E = E(\underline{x},\underline{z})+E_U \tag{3.8}$$

$$W = W(\underline{x},\underline{z})+W_U \tag{3.9}$$

An individual will become an entrepreneur if E-W is greater than zero which implies that he will become an entrepreneur if

$$E(\underline{x},\underline{z}) - W(\underline{x},\underline{z}) > W_U-E_U \tag{3.10}$$

Although we cannot observe the right-hand side of (3.10) we can assume that the right-hand side is randomly distributed in the population. If so, then "on average" people with values of x and z that lead to a positive difference on the left-hand side of (3.10)--i.e. a premium in the entrepreneurial occupation--will become entrepreneurs. The statement is true only "on average" because occasionally people with a large difference between $E(\underline{x},\underline{z})$ and $W(\underline{x},\underline{z})$ may have an even

larger difference between W_U and E_U and therefore choose wage work.[12] Alternatively, people with a small difference between $E(\underline{x},\underline{z})$ and $W(\underline{x},\underline{z})$ may have an even smaller difference between W_U and E_U and therefore choose entrepreneurship.

Figure 3.1 helps clarify the entrepreneurial choice decision. The curved line in the figure gives the probability distribution of $R=W_U-E_U$ in the population. Consider an individual with attributes x and z. For him the left-hand side of (3.10) is $D(\underline{x},\underline{z})=E(\underline{x},\underline{z})-W(\underline{x},\underline{z})$. The probability that this individual will become an entrepreneur is equal to the probability that $D(\underline{x},\underline{z})>R$ This probability is given by the shaded portion of the graph to the right of R. This probability gives the fraction of individuals in the population with characteristics x and z who have values of the unobservable quantity R greater than $D(\underline{x},\underline{z})$. Individuals with higher values of D(x,z) will have higher probabilities of becoming entrepreneurs rather than workers.

We can determine the impact of the various components of x and z on the propensity to choose entrepreneurship by examining whether people with certain values of x and z are more likely than people with other values of x and z to be self-employed. There are widely accepted statistical techniques for examining the impact of personal characteristics (such as those included in $\underline{x}$ and $\underline{z}$) on the probability that an individual will choose a certain option (in this case self-employment over wage work).[13] We describe these techniques in the next chapter. But before doing so, it will prove useful to examine how service in the military might affect the propensity to become an entrepreneur.

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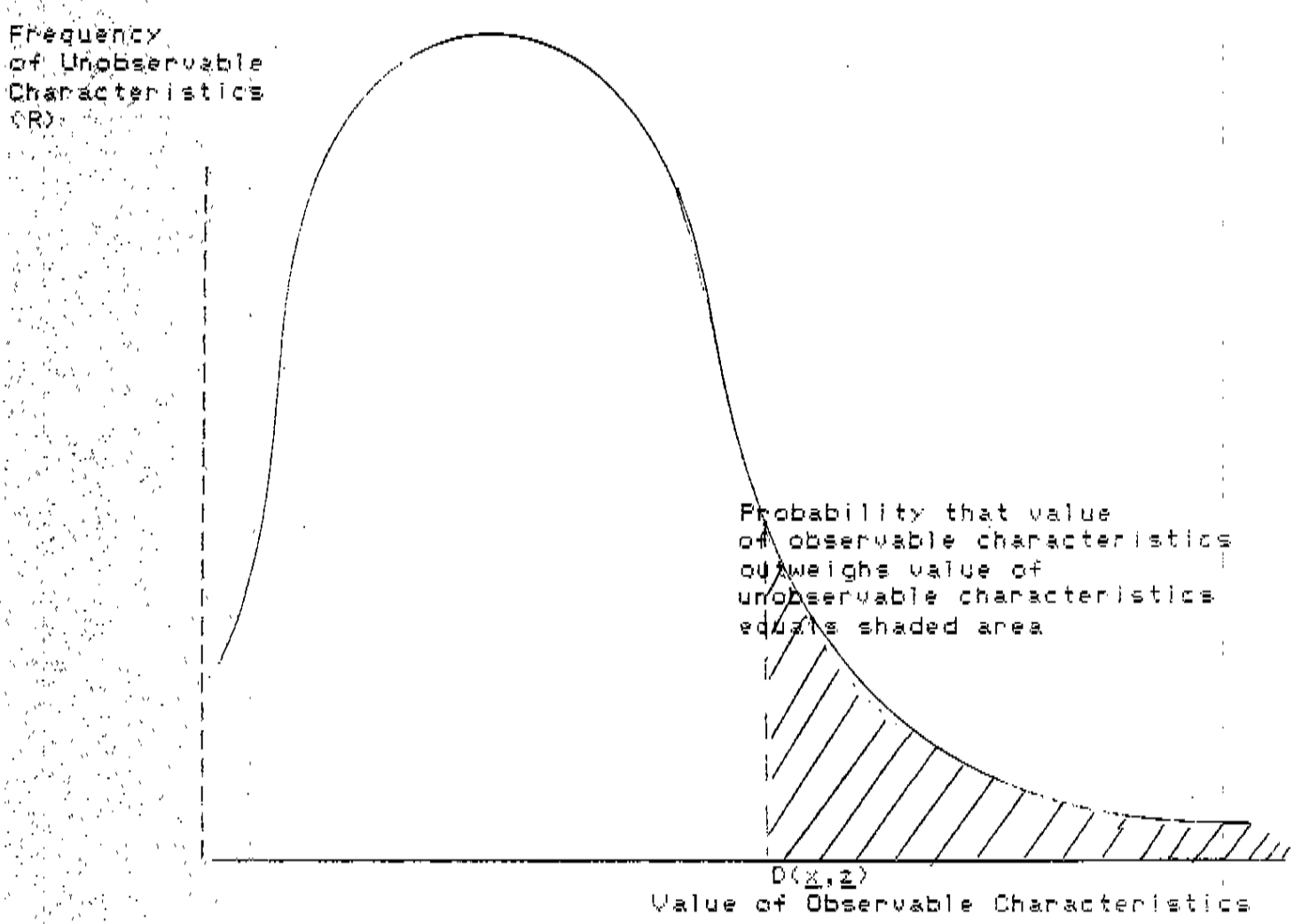
12. In this case the relative value of entrepreneurship is high based on observable taste and income characteristics but low based on unobservable characteristics.

13. The technique we use is called probit analysis, a statistical method that has been used widely by both biostatisticians and econometricians.

Figure 3.1

ENTREPRENEURIAL CHOICE



3.4--The Impact of Military Service on Entrepreneurial Choice and Success

Are veterans more likely to go into business for themselves? Are Vietnam veterans? Data from the Current Population Survey (CPS) provide crude answers to these questions.[14] In 1982, 11.6 percent of males between the ages of 25 and 64 who had not served in the military were self-employed and 11.2 percent of males between the ages of 25 and 64 who had served in the military were self-employed. These data suggest that veterans are just about as likely as non-veterans to go into business for themselves. The data reported in Table 2.3 above show a similar pattern. Slightly more than half of all self-employed males are veterans and slightly more than half of all male workers are veterans. In 1982, 8.0 percent of males between the ages of 25 and 64 who had served during the Vietnam War were self-employed. This fact, which is also consistent with the data reported in Table 2.3 suggests that Vietnam veterans are less likely to go into business for themselves than either veterans who did not serve in Vietnam or non-veterans.

In fact, both conclusions are erroneous. Table 3.1 shows why. The table shows the percent of self-employed individuals by age group for veterans, non-veterans, and Vietnam veterans. The percent of self-employed veterans is significantly less than the percent of self-employed non-veterans for every age group. On average, a veteran is only about 75 percent as likely to go into business for himself as a non-veteran in the same age group. Vietnam veterans are even less likely to open their own businesses than the data reported in the previous paragraph indicated.

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14. This table was prepared by the Bureau of Labor Statistics from the 1982 Current Population Survey. We report it here simply as an example of how erroneous inferences can be made from data on veterans. The 1980 Census data used in this study show a similar pattern.

Table 3.1

SELF-EMPLOYMENT OF VETERANS AND NONVETERANS[a]

By Age Group

Percent of Individuals Who Were Self-Employed in 1982

Age	War Veterans	Other Veterans	Vietnam Veterans	Nonveterans
-64	11.4	9.8	8.0	11.6
-29	4.8	3.8	4.8	7.8
-34	7.1	9.6	7.1	10.4
-39	9.0	9.8	9.0	12.4
-44	10.0	9.8	11.1	13.5
-49	12.1	12.5	9.4	13.9
-54	12.3	11.8	8.0	15.3
-59	14.3	14.3	10.1	17.7
-61	16.1	*	21.1	22.1
-64	18.7	*	15.4	26.5
+	30.1	*	16.7	34.7

* Insufficient data.

[a] Based on 1982 Current Population Survey. Special tabulations provided by the Bureau of Labor Statistics. Vietnam veterans are veterans who served during the Vietnam era, but not necessarily in Vietnam. War Veterans are veterans who served during a military conflict, but not necessarily in a war zone. See Table 2.4 for the dates of each military era.

Why the discrepancy between the data reported above and the data reported in Table 3.1? First, the probability of self-employment increases with age for both veterans and non-veterans. A 64 year old man is four times as likely to be self-employed as a 25 year old man. Second, veterans are older on average than nonveterans. Roughly two-thirds of non-veterans are between the ages of 25 and 39 while only one-third of veterans are between the ages of 25 and 39.

These results demonstrate the importance of demographic characteristics in estimating the relationship between the propensity for self-employment and military service. People who are veterans are different from people who are not veterans. The framework described in the previous section enables us to sort out the relationship between military service and entrepreneurial choice and success from the relationships between age, sex, race, education, and other demographic characteristics and entrepreneurial choice and success. The statistical techniques for doing so are described in the next chapter.

This report examines whether the probability of self-employment differs for otherwise comparable veterans and nonveterans or for otherwise comparable veterans of different military eras. There are many reasons why the probability of self-employment might differ between veterans and nonveterans. We give two possibilities.

(1) Veterans might have a different taste for self-employment than nonveterans. Their taste may differ for several reasons. First, veterans might have less aversion to risk. After all, veterans who volunteer for service have chosen to enter a risky occupation. Women veterans might have an especially high taste for risk since most have volunteered for military service. These characteristics are consistent with a relatively strong taste for entrepreneurship by veterans. Second, veterans (especially those who volunteer) might be less prone to experimentation and better able to cope with authority. These characteristics are just the opposite of the characteristics the psychological theories reviewed above suggest that entrepreneurs generally have and are therefore consistent with a relatively weak taste for entrepreneurship by veterans.

(2) Military service might provide experience which augments entrepreneurial skills and

abilities. Commissioned and noncommissioned officers might obtain more managerial experience and leadership training at an earlier stage of their careers than non-veterans with otherwise similar demographic characteristics. Veterans might obtain vocational skills that they can best use by forming their own businesses. On the other hand, military training and experience might augment abilities and skills which are valued by employers. The managerial skills of officers, for example, might have a higher payoff in a large corporate bureaucracy than in a small entrepreneurial firm. Military service typically augments both entrepreneurial and nonentrepreneurial skills and thereby raises both potential profits from entrepreneurship and potential wages from employment by others. We are interested in determining the net impact of military service on the decision to become an entrepreneur and on the financial success of entrepreneurs. Notably, Fredland and Little (1980) found that people who take and subsequently use military training in civilian occupations earn a pay premium of around seven percent. Professional and managerial training in particular receives a premium in the private sector.

Military service may also have indirect financial effects on entrepreneurs. First, military people with 20 years of service receive pensions which increase their financial security. Many military personnel can retire in their early 40's and pursue another career while drawing a respectable military pension. This pension might increase the veteran's willingness to start a particularly risky business. Second, the GI Bill decreases the cost of education to veterans. This educational subsidy might enable veterans to obtain skills useful in entrepreneurial activities. It might also enable veterans to obtain skills which increase their wage rate and thereby dampen their incentives to become entrepreneurs. O'Neill (1980) found that vocational training taken under the GI Bill raises earnings more than similar training taking under CETA (the Comprehensive Employment and Training Act Program). Blacks are especially more likely to take benefits under the GI Bill.

Unfortunately, the available data are not sufficiently detailed to isolate the impact of each of these alternative sources of influence. We do not know whether a veteran volunteered or was

drafted, the veteran's military rank, the kinds of training he received in the military, or whether he took advantage of the GI Bill.[15] Consequently, the most we can hope to do in the following chapters is to examine the net impact of all these possible influences on the propensity of veterans for self-employment and on their financial success as veterans.

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15. There are datasets which provide such information but these datasets provide information on few self-employed individuals.

Table 2.5
SUMMARY STATISTICS ON VARIABLES USED IN THE ANALYSIS
Choice-Based Sample

	Males		Females	
Variables	1970	1980	1970	1980
Dichotomous Variables[a]				
SELFEMP	0.418	0.615	0.222	0.391
URBAN	0.729	0.800	0.764	0.821
LITKID	0.274	0.213	0.130	0.126
OLDKID	0.493	0.318	0.348	0.320
NOKID	0.233	0.469	0.522	0.554
MARHLD	0.906	0.864	0.654	0.684
BLACK	0.056	0.047	0.105	0.093
ASIAN	0.010	0.013	0.009	0.020
HISPANIC	0.017	-	0.009	-
WHITE	0.944	0.940	0.886	0.887
IMMIG	0.069	0.070	0.057	0.070
BADENG	0.026	0.013	0.025	0.016
ELEM	0.165	0.078	0.128	0.053
HSDROP	0.178	0.122	0.168	0.118
HSGRAD	0.295	0.337	0.379	0.416
COLDROP	0.237	0.230	0.021	0.243
COLGRAD	0.101	0.122	0.804	0.098
POSTGRAD	0.054	0.111	0.049	0.072

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ng at an earlier stage of their careers than non-veterans with otherwise
haracteristics. Veterans might obtain vocational skills that they can best
wn businesses. On the other hand, military training and experience might
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Program). Blacks are especially more likely to take benefits under

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0.110	
0.654	
0.236	
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–	
0.096	
0.223	
0.074	
0.350	
0.165	
0.026	
0.066	
–	
–	
4.247	
18.634	
4.897	
–	

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f influence. We do not know whether a veteran volunteered or was

Individual never married

Individual married only once for 1980; individual currently married with spouse present for 1970

Individual married more than once for 1980; individual divorced, separated, or spouse not present for 1970

Individual veteran of post-Vietnam era (not available for 1970) (service after May 7, 1975)

Individual Vet of Vietnam era (service between August 5, 1964 and May 7, 1975)

Individual Vet of era between Korean and Vietnam (not available for 1970) (service between February 1, 1955 and August 4, 1964)

Individual Vet of Korean era (service between June 27, 1950 and January 31, 1955)

Individual Vet of WWII (service between September 16, 1940 and July 25, 1947)

Individual Vet of other era (pre-WWII or between WWII and Korea)

Female individual who is veteran of pre-Vietnam era

Individual not a veteran

Management occupation

Professional occupation

Sales occupation

Clerical occupation

Service occupation

Craft occupation

Machine operator occupation

Number of years individual has been in this country

IMMIG*IMGYRS

AGE	Individual's age in years divided by 10
AGESQ	AGE*AGE
EDUC	Number of years of education
FERTILITY	Number of children born to female individual
VETAGE	VET*AGE
EDVET	VET*EDUC
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SPSEINC	Difference between family income and individual income divided by 1,000,000
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[e] Variable calculated from regression estimates of self-employment and wage earnings equations

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This chapter also discusses the relationship between military service and entrepreneurial choice and success. Although we are not aware of any previous studies on military service and entrepreneurship, several researchers have examined the relationship between military service and wage earnings. In the fourth section, we review these studies and discuss their possible implications for the relationship between military service and entrepreneurship.

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1. Most economists view as entrepreneurs anyone who has control over the direction and operation of a business and bears risk as the residual claimant on business profits. This definition, which is due to Frank Knight, Risk, Uncertainty and Profit (New York: Houghton Mifflin, 1921), obviously includes most self-employed workers. This definition has been criticized for being overly broad and not capturing the essential features of the entrepreneur. The Austrians view the entrepreneur as a spotter of opportunities. The entrepreneur can shift risks onto the capitalist (although he may choose not to). Consequently, risk-bearing is not essential to entrepreneurship. We believe this argument has substantial merit. But the Austrian definition is too narrow for our purposes. It would exclude many small businessmen who operate fairly standard businesses and cannot claim to have developed a new product or service, the hallmark of the entrepreneur. Moreover, we suspect there are insurmountable observational problems in determining whether a particular small businessman is a "spotter" or just a "risk bearer". Most empirical studies of entrepreneurs are plagued by arbitrary criteria for selecting the sample of entrepreneurs.

3.1--Sociological and Psychological Studies of Entrepreneurship

Psychologists and sociologists have studied the personal characteristics of select groups of entrepreneurs. The studies by McClelland and Winter (1969), Collins and Moore (1964), and Shapero (1975) found that entrepreneurs have a number of common characteristics.[2]

1. Entrepreneurs are often orphans or half orphans or had fathers who were away for long periods of time. Entrepreneurs are often "on their own" as kids.
2. Entrepreneurs are more likely to be immigrants or the sons of immigrants than non-entrepreneurs.
3. Enterpreneurs are less able to submit to authority, push themselves more, and put less stock in getting ahead (in the sense of gaining approval from society) than non-entrepreneurs.[3]
4. Entrepreneurs are much more likely to have fathers who were company owners, professionals, or otherwise self-employed than are non-entrepreneurs. Shapero found that more than 50 percent of the entrepreneurs he studied had self-employed fathers versus

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2. The scientific validity of these studies, which are seldom based on random samples and often use ambiguous or overly inclusive definitions of an entrepreneur, is open to question. The regularities reported below, however, appear fairly robust across studies and therefore provide useful working hypotheses concerning who becomes an entrepreneur.

3. In a study of 22 R&D companies that were no more than 10 years old, Henry Schrage (1965) found that the successful entrepreneur has an "accurate perceptions of the market's response to his firm's products or services as well as a keen understanding of the determinants of his employee's morale...." The most successful entrepreneurs (as measured by the profitability of their companies) were high in achievement motivation, low in power motivation, and high in total awareness of their business environment.

less than 10 percent for non-entrepreneurs.

5. Entrepreneurs are often people who feel they have a great deal of influence over the course of events. They downplay luck.

6. Entrepreneurs are relatively well educated. Douglas (1976) found that 37 percent of the entrepreneurs he studied had at least a college degree compared with 14 percent of the population at large.[4]

7. Entrepreneurs are often displaced persons whose niche in life has been upset and who are therefore outside the mainstream of society. Shapero found that, in 65 percent of the cases he examined, the primary influence on the entrepreneur was negative. The entrepreneur had lost a job, received a divorce, or had left the military.

8. Once an entrepreneur always an entrepreneur. Shapero found that 72 percent of the entrepreneurs he surveyed would start a new company if their present one folded. Copulsky and McNulty also note that entrepreneurs often drift from one entrepreneurial pursuit to another.[5] They note that, "Some entrepreneurs have spent as much as 20 years in seemingly aimless drifting and dragon-tilting before they struck a successful deal."

9. People typically become entrepreneurs when they are young, between 25 and 40.

These studies suggest that entrepreneurs are intrinsically different from non-entrepreneurs and that there is a correlation between certain personality traits and entrepreneurial success. McClelland and Winter, Shapero, and Schrage emphasize that

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4. Douglas studied 153 entrepreneurs in the Atlanta metropolitan area who had been in business for at least three years and who had no more than 30 employees. He found that 40 percent of the college-educated entrepreneurs major in business or economics. Interestingly, he also found that there was no statistically significant correlation between education and success (as measured by firm size or sales growth; he had no data on profitability) among the entrepreneurs he studied. The most successful group of entrepreneurs (according to his criteria) were those with some college but without a degree.

5. William Copulsky and Herbert McNulty, Entrepreneurship and the Corporation (New York: AMACOM, 1974).

[illegible] receive much different scores than nonentrepreneurs on psychological tests. [illegible] economists have developed models of entrepreneurial choice that also assume that people [illegible] to become entrepreneurs tend to be intrinsically different from people who choose to [illegible] someone else. We present a nontechnical summary of the major assumptions and [illegible] of these models in the next section.

3.2--Economic Theories of Entrepreneurship

[illegible] economists have largely suppressed the role of the entrepreneur in modern theory by [illegible] abstract production functions to describe the firm and by ignoring the process by which [illegible] evolves over time.[6] Because of this theoretical vacuum economists have performed [illegible] studies of entrepreneurship. The major exceptions are Miller's studies of the [illegible] of 190 business leaders in the first decade of this century, Gregory and Neu's study of [illegible] leaders in the 1870's, and Taussig and Joslyn's study of the origins of business [illegible] These studies found that business leaders come from a select portion of the [illegible]. Businessmen were often sons of professional men, often came from urban areas, were [illegible] educated than their countrymen, and were seldom immigrants. But these leaders were [illegible] managers than founders. Only 14 percent of the leaders studied by Miller founded

[illegible] critical review of the role of entrepreneurs in economic theory, see William A. Baumol [illegible] the entrepreneur has been neglected by modern theory largely because this theory focuses [illegible] general equilibrium for the economy. The importance of the entrepreneur lies in upsetting [illegible] equilibria and setting the forces of change into motion. The entrepreneur plays a central [illegible] Austrian economic theory that focuses on the competitive process that continually [illegible] the economy over time.

[illegible] Miller (1962) see William Miller, "The Business Elite in Business Bureaucracies," and [illegible] Recruitment of the Business Elite," and Frances Gregory and Irene Neu, "The American [illegible] Elite in the 1870's." Also see Jocelyn Maynard Ghent and Frederic Cople Jaher (1976).

their own company. Most managed large companies with many stockholders and bore little financial risk themselves. Thus these leaders were bureaucrats rather than entrepreneurs. Dahmen's massive study of entrepreneurship in Sweden, although it did not examine the demographic characteristics of entrepreneurs, did discover some interesting patterns. The first generation of entrepreneurs in an industry usually came from a related industry--e.g., textile manufacturers evolved not from the tailor trade but from clothing merchants--while the second generation usually came from people who worked for the first generation firms.[8]

In the last several years, some economists have developed theories of entrepreneurial choice. These theories assume that people have some characteristic that is associated with the propensity for entrepreneurship. People who have more of this characteristic are more likely to become entrepreneurs than people who have less of this characteristic. Lucas (1978) assumes that this characteristic is "entrepreneurial ability". People with greater entrepreneurial ability can earn more money by running their own businesses than by working for someone else. Kihlstrom and Laffont (1978) and Kanbur (1978) assume that this characteristic is a "taste for risk". Running a business is more risky than working for someone else. People who have a stronger taste for risk are more likely to operate their own businesses.[9] Because these models are technically complex, we have relegated further discussion of them to an appendix.

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8. Erik Dahmen, Entrepreneurial Activity and the Development of Swedish Industry, Axel Leijonhufvud, trans. (Homewood, Ill.: Richard D. Irwin, 1970).

9. In both of these theories, it is possible to show that there is a particular level of the entrepreneurial characteristic above which people will become entrepreneurs and below which people will become workers. This "critical level" is that level at which the supply of labor by individuals who choose to become workers equals the demand for labor by individuals who choose to become entrepreneurs.

3.3--An Integrated Framework for Studying Entrepreneurial Choice and Success

The theories reviewed above suggest that the probability that an individual chooses to become an entrepreneur depends upon his entrepreneurial ability and his taste for entrepreneurship.

Taste for Entrepreneurship--The psychological and sociological studies suggest that whether an individual is an immigrant, whether he has been divorced, whether he has served in the military, whether his father was self-employed, whether he was an orphan and other social characteristics affect his taste for working on his own. The psychological studies find that entrepreneurs like to be in control. Finally, people with a greater taste for risk may have a greater taste for entrepreneurship.

Entrepreneurial Ability--People who can earn relatively more working for themselves than working for someone else have a relatively higher propensity to become entrepreneurs. Entrepreneurial ability may depend upon observable characteristics such as work experience and education and on unobservable characteristics such as " drive".[10]

The remainder of this section describes an empirical framework that integrates these main theories and which can be used to estimate the impact of certain observable characteristics on the propensity for an individual to become an entrepreneur.[11] The value of being in an occupation

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10. These implications follow from Lucas' theory of entrepreneurship and from the psychological studies that find that successful entrepreneurs have different psychological profiles than other individuals.

11. The framework described below is an extremely simplified version of the framework that we actually used. For further technical details on our framework, see Appendix B.

(either self-employment or wage work) is the sum of two components. First, the value of income which the individual can expect from that occupation. Second, the nonmonetary value of that occupation based on the individual's taste for that occupation. Symbolically,

(3.1) $E = E_I + E_T$

(3.2) $W = W_I + W_T$

where E_I and W_I denote the income value of entrepreneurship and wage work respectively and E_T and W_T denote the taste value of entrepreneurship and wage work respectively. An individual will choose entrepreneurship if the value of entrepreneurship is greater than the value of wage work and vice versa.

The income received from entrepreneurship or wage work is a function of various personal characteristics such as race, education, and work experience. We can denote these characteristics by $\underline{x}=(x_1,x_2,\ldots,x_n)$ and write E_I and W_I as functions of these characteristics

(3.3a) $E_I = E_I(\underline{x})$

(3.3b) $W_I = W_I(\underline{x})$

The taste for entrepreneurship or wage work is also a function a personal characteristics such as family status, race, whether the person is an immigrant, and age/ We can denote these characteristics by $\underline{z}=(z_1,z_2,\ldots,z_m)$ and write E_T and W_T as function of these characteristics

(3.4a) $E_T = E_T(\underline{z})$

(3.4b) $W_T = W_T(\underline{z})$

Substituting (3.3)-(3.4) into (3.1)-(3.2) we can write E and W as functions of the earnings characteristics x and the taste characteristics z

(3.6) $E = E(\underline{x},\underline{z})$

(3.7) $W = W(\underline{x},\underline{z})$

If $\underline{x}$ and $\underline{z}$ summarized all the characteristics that affect the value of entrepreneurship and wage work and if people behave systematically, then we could determine whether an individual will choose to become an entrepreneur by observing the values of $\underline{x}$ and $\underline{z}$ for an individual, calculating $E(\underline{x},\underline{z})$ and $W(\underline{x},\underline{z})$, and comparing the values of these alternative occupations. But such is not the case. We cannot observe (let alone imagine) all of the myriad of factors that might influence the relative values of entrepreneurship and wage work to an individual. Moreover, people with the same characteristics may behave differently in economic terms from one another simply because people do not behave systematically and may have different perceptions and preferences. We can capture these unobserved factors by assuming that there is a value of being an entrepreneur or worker which depends upon characteristics that we cannot observe. Let E_U and W_U denote that these values based on unobservable characteristics for entrepreneurs and workers respectively. Then we can rewrite (3.6) and (3.7) as

(3.8) $$E = E(\underline{x},\underline{z})+E_U$$

(3.9) $$W = W(\underline{x},\underline{z})+W_U$$

An individual will become an entrepreneur if E-W is greater than zero which implies that he will become an entrepreneur if

(3.10) $$E(\underline{x},\underline{z}) - W(\underline{x},\underline{z}) > W_U-E_U$$

Although we cannot observe the right-hand side of (3.10) we can assume that the right-hand side is randomly distributed in the population. If so, then "on average" people with values of x and z that lead to a positive difference on the left-hand side of (3.10)--i.e. a premium in the entrepreneurial occupation--will become entrepreneurs. The statement is true only "on average" because occasionally people with a large difference between $E(\underline{x},\underline{z})$ and $W(\underline{x},\underline{z})$ may have an even

larger difference between W_U and E_U and therefore choose wage work.[12] Alternatively, people with a small difference between $E(\underline{x},\underline{z})$ and $W(\underline{x},\underline{z})$ may have an even smaller difference between W_U and E_U and therefore choose entrepreneurship.

Figure 3.1 helps clarify the entrepreneurial choice decision. The curved line in the figure gives the probability distribution of $R=W_U-E_U$ in the population. Consider an individual with attributes x and z. For him the left-hand side of (3.10) is $D(\underline{x},\underline{z})=E(\underline{x},\underline{z})-W(\underline{x},\underline{z})$. The probability that this individual will become an entrepreneur is equal to the probability that $D(\underline{x},\underline{z})>R$ This probability is given by the shaded portion of the graph to the right of R. This probability gives the fraction of individuals in the population with characteristics x and z who have values of the unobservable quantity R greater than $D(\underline{x},\underline{z})$. Individuals with higher values of D(x,z) will have higher probabilities of becoming entrepreneurs rather than workers.

We can determine the impact of the various components of x and z on the propensity to choose entrepreneurship by examining whether people with certain values of x and z are more likely than people with other values of x and z to be self-employed. There are widely accepted statistical techniques for examining the impact of personal characteristics (such as those included in $\underline{x}$ and $\underline{z}$) on the probability that an individual will choose a certain option (in this case self-employment over wage work).[13] We describe these techniques in the next chapter. But before doing so, it will prove useful to examine how service in the military might affect the propensity to become an entrepreneur.

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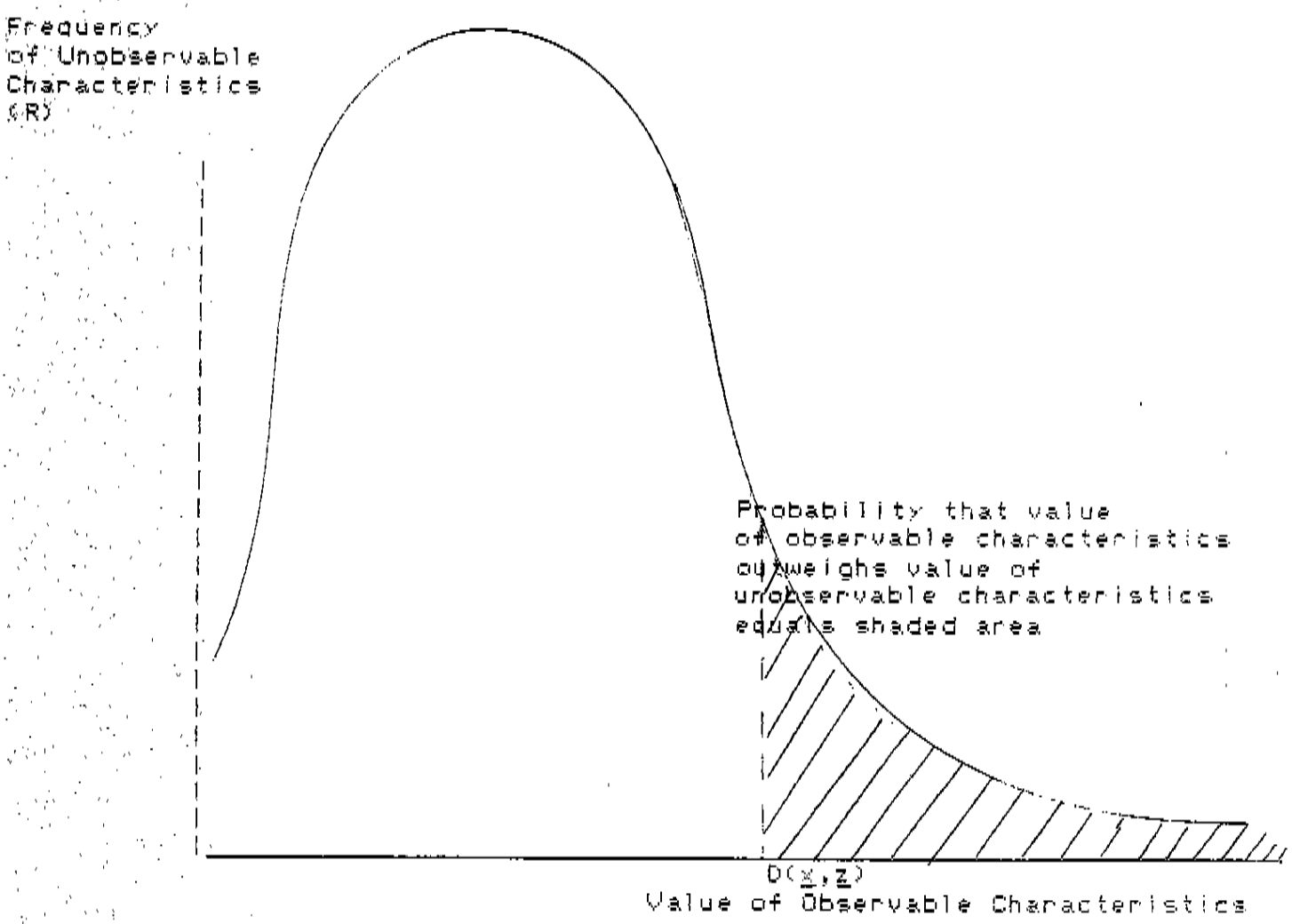
12. In this case the relative value of entrepreneurship is high based on observable taste and income characteristics but low based on unobservable characteristics.

13. The technique we use is called probit analysis, a statistical method that has been used widely by both biostatisticians and econometricians.

Figure 3.1

ENTREPRENEURIAL CHOICE



3.4—The Impact of Military Service on Entrepreneurial Choice and Success

Are veterans more likely to go into business for themselves? Are Vietnam veterans? Data from the Current Population Survey (CPS) provide crude answers to these questions.[14] In 1982, 11.6 percent of males between the ages of 25 and 64 who had not served in the military were self-employed and 11.2 percent of males between the ages of 25 and 64 who had served in the military were self-employed. These data suggest that veterans are just about as likely as non-veterans to go into business for themselves. The data reported in Table 2.3 above show a similar pattern. Slightly more than half of all self-employed males are veterans and slightly more than half of all male workers are veterans. In 1982, 8.0 percent of males between the ages of 25 and 64 who had served during the Vietnam War were self-employed. This fact, which is also consistent with the data reported in Table 2.3 suggests that Vietnam veterans are less likely to go into business for themselves than either veterans who did not serve in Vietnam or non-veterans.

In fact, both conclusions are erroneous. Table 3.1 shows why. The table shows the percent of self-employed individuals by age group for veterans, non-veterans, and Vietnam veterans. The percent of self-employed veterans is significantly less than the percent of self-employed non-veterans for every age group. On average, a veteran is only about 75 percent as likely to go into business for himself as a non-veteran in the same age group. Vietnam veterans are even less likely to open their own businesses than the data reported in the previous paragraph indicated.

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14. This table was prepared by the Bureau of Labor Statistics from the 1982 Current Population Survey. We report it here simply as an example of how erroneous inferences can be made from data on veterans. The 1980 Census data used in this study show a similar pattern.

Table 3.1

SELF-EMPLOYMENT OF VETERANS AND NONVETERANS[a]

By Age Group

Percent of Individuals Who Were Self-Employed in 1982

Age Group	War Veterans	Other Veterans	Vietnam Veterans	Nonveterans
25-64	11.4	9.8	8.0	11.6
25-29	4.8	3.8	4.8	7.8
30-34	7.1	9.6	7.1	10.4
35-39	9.0	9.8	9.0	12.4
40-44	10.0	9.8	11.1	13.5
45-49	12.1	12.5	9.4	13.9
50-54	12.3	11.8	8.0	15.3
55-59	14.3	14.3	10.1	17.7
60-61	16.1	*	21.1	22.1
62-64	18.7	*	15.4	26.5
65+	30.1	*	16.7	34.7

* Insufficient data.

[a] Based on 1982 Current Population Survey. Special tabulations provided by the Bureau of Labor Statistics. Vietnam Veterans are veterans who served during the Vietnam era, but not necessarily in Vietnam. War Veterans are veterans who served during a military conflict, but not necessarily in a war zone. See Table 2.4 for the dates of each military era.

Why the discrepancy between the data reported above and the data reported in Table 3.1? First, the probability of self-employment increases with age for both veterans and non-veterans. A 64 year old man is four times as likely to be self-employed as a 25 year old man. Second, veterans are older on average than nonveterans. Roughly two-thirds of non-veterans are between the ages of 25 and 39 while only one-third of veterans are between the ages of 25 and 39.

These results demonstrate the importance of demographic characteristics in estimating the relationship between the propensity for self-employment and military service. People who are veterans are different from people who are not veterans. The framework described in the previous section enables us to sort out the relationship between military service and entrepreneurial choice and success from the relationships between age, sex, race, education, and other demographic characteristics and entrepreneurial choice and success. The statistical techniques for doing so are described in the next chapter.

This report examines whether the probability of self-employment differs for otherwise comparable veterans and nonveterans or for otherwise comparable veterans of different military eras. There are many reasons why the probability of self-employment might differ between veterans and nonveterans. We give two possibilities.

(1) Veterans might have a different taste for self-employment than nonveterans. Their taste may differ for several reasons. First, veterans might have less aversion to risk. After all, veterans who volunteer for service have chosen to enter a risky occupation. Women veterans might have an especially high taste for risk since most have volunteered for military service. These characteristics are consistent with a relatively strong taste for entrepreneurship by veterans. Second, veterans (especially those who volunteer) might be less prone to experimentation and better able to cope with authority. These characteristics are just the opposite of the characteristics the psychological theories reviewed above suggest that entrepreneurs generally have and are therefore consistent with a relatively weak taste for entrepreneurship by veterans.

(2) Military service might provide experience which augments entrepreneurial skills and

abilities. Commissioned and noncommissioned officers might obtain more managerial experience and leadership training at an earlier stage of their careers than non-veterans with otherwise similar demographic characteristics. Veterans might obtain vocational skills that they can best use by forming their own businesses. On the other hand, military training and experience might augment abilities and skills which are valued by employers. The managerial skills of officers, for example, might have a higher payoff in a large corporate bureaucracy than in a small entrepreneurial firm. Military service typically augments both entrepreneurial and nonentrepreneurial skills and thereby raises both potential profits from entrepreneurship and potential wages from employment by others. We are interested in determining the net impact of military service on the decision to become an entrepreneur and on the financial success of entrepreneurs. Notably, Fredland and Little (1980) found that people who take and subsequently use military training in civilian occupations earn a pay premium of around seven percent. Professional and managerial training in particular receives a premium in the private sector.

Military service may also have indirect financial effects on entrepreneurs. First, military people with 20 years of service receive pensions which increase their financial security. Many military personnel can retire in their early 40's and pursue another career while drawing a respectable military pension. This pension might increase the veteran's willingness to start a particularly risky business. Second, the GI Bill decreases the cost of education to veterans. This educational subsidy might enable veterans to obtain skills useful in entrepreneurial activities. It might also enable veterans to obtain skills which increase their wage rate and thereby dampen their incentives to become entrepreneurs. O'Neill (1980) found that vocational training taken under the GI Bill raises earnings more than similar training taking under CETA (the Comprehensive Employment and Training Act Program). Blacks are especially more likely to take benefits under the GI Bill.

Unfortunately, the available data are not sufficiently detailed to isolate the impact of each of these alternative sources of influence. We do not know whether a veteran volunteered or was

drafted, the veteran's military rank, the kinds of training he received in the military, or whether he took advantage of the GI Bill.[15] Consequently, the most we can hope to do in the following chapters is to examine the net impact of all these possible influences on the propensity of veterans for self-employment and on their financial success as veterans.

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15. There are datasets which provide such information but these datasets provide information on few self-employed individuals.

Table 2.5
SUMMARY STATISTICS ON VARIABLES USED IN THE ANALYSIS
Choice-Based Sample

	Males		Females	
Variables	1970	1980	1970	1980
Dichotomous Variables[a]				
SELFEMP	0.418	0.615	0.222	0.391
URBAN	0.729	0.800	0.764	0.821
LITKID	0.274	0.213	0.130	0.126
OLDKID	0.493	0.318	0.348	0.320
NOKID	0.233	0.469	0.522	0.554
MARHLD	0.906	0.864	0.654	0.684
BLACK	0.056	0.047	0.105	0.093
ASIAN	0.010	0.013	0.009	0.020
HISPANIC	0.017	–	0.009	–
WHITE	0.944	0.940	0.886	0.887
IMMIG	0.069	0.070	0.057	0.070
BADENG	0.026	0.013	0.025	0.016
ELEM	0.165	0.078	0.128	0.058
HSDROP	0.178	0.122	0.168	0.118
HSGRAD	0.295	0.337	0.379	0.416
COLDROP	0.237	0.230	0.021	0.248
COLGRAD	0.101	0.122	0.804	0.098
POSTGRAD	0.054	0.111	0.049	0.072

HANDICAP	-	0.059	-	0.035
MAR0	0.044	0.060	0.110	0.089
MAR1	0.908	0.783	0.654	0.724
MAR2	0.048	0.157	0.236	0.187
NEWVET	-	0.018	-	0.011
VIETVET	0.057	0.130	-	0.003
PREVIET	-	0.099	-	0.002
KORVET	0.143	0.106	-	0.001
WWIIVET	0.311	0.180	-	0.006
OTHVET	0.089	0.006	-	0.002
REMVET	-	-	-	0.011
NONVET	0.400	0.461	-	0.985
MANAGE	0.221	0.216	0.096	0.144
PROF	0.340	0.110	0.223	0.154
SALES	0.102	0.175	0.074	0.152
CLERIC	0.060	0.034	0.350	0.272
SERVICE	0.069	0.057	0.165	0.156
CRAFT	0.227	0.267	0.026	0.034
OPERATOR	0.202	0.140	0.066	0.087
Continuous Variables				
IMGYRS	-	20.128	-	19.728
YRSIMG	-	1.409	-	1.311
AGE[b]	4.282	4.210	4.247	4.060
AGESQ[b]	19.681	19.085	18.634	17.956
EDAGE[b]	49.853	54.133	4.897	51.017
VETAGE[b]	2.400	2.182	-	0.074

MAR0	Individual never married
MAR1[b]	Individual married only once for 1980; individual currently married with spouse present for 1970
MAR2	Individual married more than once for 1980; individual divorced, separated, or spouse not present for 1970
NEWVET[c]	Individual veteran of post-Vietnam era (not available for 1970) (service after May 7, 1975)
VIETVET	Individual Vet of Vietnam era (service between August 5, 1964 and May 7, 1975)
PREVIET[c]	Individual Vet of era between Korean and Vietnam (not available for 1970) (service between February 1, 1955 and August 4, 1964)
KORVET	Individual Vet of Korean era (service between June 27, 1950 and January 31, 1955)
WWIIVET	Individual Vet of WWII (service between September 16, 1940 and July 25, 1947)
OTHVET	Individual Vet of other era (pre-WWII or between WWII and Korea)
REMVET	Female individual who is veteran of pre-Vietnam era
NONVET[b]	Individual not a veteran
MANAGE	Management occupation
PROF	Professional occupation
SALES	Sales occupation
CLERIC	Clerical occupation
SERVICE	Service occupation
CRAFT	Craft occupation
OPERATOR[b]	Machine operator occupation
Continuous Variables	
IMGYRS	Number of years individual has been in this country
YRSIMG[c]	IMMIG*IMGYRS

AGE	Individual's age in years divided by 10
AGESQ	AGE*AGE
EDUC	Number of years of education
FERTILITY	Number of children born to female individual
VETAGE	VET*AGE
EDVET	VET*EDUC
LINC	Lográrithmic value of sum of all income received by individual
SPSEINC	Difference between family income and individual income divided by 1,000,000
SELF-WORK	Difference between expected log self-employment income and expected log wage income

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[a] Variable equals one if individual possesses characteristic and zero otherwise.

[b] Base category for regression analysis.

[c] Not available for 1970.

[d] Not available for 1980.

[e] Variable calculated from regression estimates of self-employment and wage earnings equations

EDVET[b]	6.895	6.154	-	0.192
SPSEINC[c]	2.523	3.538	6.488	11.906
LINC	9.009	9.783	8.140	9.127

[a] Mean of dichotmous variables gives the fraction of the population with this characteristic.

[b] Actual age has been divided by 10.

[c] This variable divided by 1000 was used in the regression analysis.

CHAPTER 3

FRAMEWORK FOR ANALYZING SELF-EMPLOYMENT CHOICE AND SUCCESS

An entrepreneur for the purposes of this report is anyone who has control over the direction and operation of a business and bears risks as the residual claimant of business profits.[1] Any individual who works for himself in return for an uncertain residual income rather than for someone else in return for a certain wage is therefore an entrepreneur.

This chapter develops a framework for studying entrepreneurial choice and success. The framework integrates key aspects of several economic, sociological, and psychological theories of entrepreneurial choice and success. The first section reviews the psychological and sociological literature on entrepreneurs. The second section reviews the economic literature on entrepreneurs. The third section presents a framework that integrates the major theories.

This chapter also discusses the relationship between military service and entrepreneurial choice and success. Although we are not aware of any previous studies on military service and entrepreneurship, several researchers have examined the relationship between military service and wage earnings. In the fourth section, we review these studies and discuss their possible implications for the relationship between military service and entrepreneurship.

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3.1--Sociological and Psychological Studies of Entrepreneurship

Psychologists and sociologists have studied the personal characteristics of select groups of entrepreneurs. The studies by McClelland and Winter (1969), Collins and Moore (1964), and Shapero (1975) found that entrepreneurs have a number of common characteristics.[2]

1. Entrepreneurs are often orphans or half orphans or had fathers who were away for long periods of time. Entrepreneurs are often "on their own" as kids.
2. Entrepreneurs are more likely to be immigrants or the sons of immigrants than non-entrepreneurs.
3. Enterpreneurs are less able to submit to authority, push themselves more, and put less stock in getting ahead (in the sense of gaining approval from society) than non-entrepreneurs.[3]
4. Entrepreneurs are much more likely to have fathers who were company owners, professionals, or otherwise self-employed than are non-entrepreneurs. Shapero found that more than 50 percent of the entrepreneurs he studied had self-employed fathers versus

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2. The scientific validity of these studies, which are seldom based on random samples and often use ambiguous or overly inclusive definitions of an entrepreneur, is open to question. The regularities reported below, however, appear fairly robust across studies and therefore provide useful working hypotheses concerning who becomes an entrepreneur.

3. In a study of 22 R&D companies that were no more than 10 years old, Henry Schrage (1965) found that the successful entrepreneur has an "accurate perceptions of the market's response to his firm's products or services as well as a keen understanding of the determinants of his employee's morale...." The most successful entrepreneurs (as measured by the profitability of their companies) were high in achievement motivation, low in power motivation, and high in total awareness of their business environment.

less than 10 percent for non-entrepreneurs.

5. Entrepreneurs are often people who feel they have a great deal of influence over the course of events. They downplay luck.

6. Entrepreneurs are relatively well educated. Douglas (1976) found that 87 percent of the entrepreneurs he studied had at least a college degree compared with 14 percent of the population at large.[4]

7. Entrepreneurs are often displaced persons whose niche in life has been upset and who are therefore outside the mainstream of society. Shapero found that, in 65 percent of the cases he examined, the primary influence on the entrepreneur was negative. The entrepreneur had lost a job, received a divorce, or had left the military.

8. Once an entrepreneur always an entrepreneur. Shapero found that 72 percent of the entrepreneurs he surveyed would start a new company if their present one folded. Copulsky and McNulty also note that entrepreneurs often drift from one entrepreneurial pursuit to another.[5] They note that, "Some entrepreneurs have spent as much as 20 years in seemingly aimless drifting and dragon-tilting before they struck a successful deal."

9. People typically become entrepreneurs when they are young, between 25 and 40.

These studies suggest that entrepreneurs are intrinsically different from non-entrepreneurs and that there is a correlation between certain personality traits and entrepreneurial success. McClelland and Winter, Shapero, and Schrage emphasize that

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4. Douglas studied 153 entrepreneurs in the Atlanta metropolitan area who had been in business for at least three years and who had no more than 30 employees. He found that 40 percent of the college-educated entrepreneurs major in business or economics. Interestingly, he also found that there was no statistically significant correlation between education and success (as measured by firm size or sales growth; he had no data on profitability) among the entrepreneurs he studied. The most successful group of entrepreneurs (according to his criteria) were those with some college but without a degree.

5. William Copulsky and Herbert McNulty, Entrepreneurship and the Corporation (New York: AMACOM, 1974).

entrepreneurs receive much different scores than nonentrepreneurs on psychological tests. Several economists have developed models of entrepreneurial choice that also assume that people who choose to become entrepreneurs tend to be intrinsically different from people who choose to work for someone else. We present a nontechnical summary of the major assumptions and implications of these models in the next section.

3.2--Economic Theories of Entrepreneurship

Economists have largely suppressed the role of the entrepreneur in modern theory by relying on abstract production functions to describe the firm and by ignoring the process by which the economy evolves over time.[6] Because of this theoretical vacuum economists have performed few empirical studies of entrepreneurship. The major exceptions are Miller's studies of the background of 190 business leaders in the first decade of this century, Gregory and Neu's study of 247 business leaders in the 1870's, and Taussig and Joslyn's study of the origins of business leaders.[7] These studies found that business leaders come from a select portion of the population. Businessmen were often sons of professional men, often came from urban areas, were more highly educated than their countrymen, and were seldom immigrants. But these leaders were more often managers than founders. Only 14 percent of the leaders studied by Miller founded

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6. For a critical review of the role of entrepreneurs in economic theory, see William A. Baumol (1968). The entrepreneur has been neglected by modern theory largely because this theory focuses on the general equilibrium for the economy. The importance of the entrepreneur lies in upsetting economic equilibria and setting the forces of change into motion. The entrepreneur plays a central role in the Austrian economic theory that focuses on the competitive process that continually transforms the economy over time.

7. In William Miller (1962) see William Miller, "The Business Elite in Business Bureaucracies," and "The Recruitment of the Business Elite," and Frances Gregory and Irene Neu, "The American Industrial Elite in the 1870's." Also see Jocelyn Maynard Ghent and Frederic Cople Jaher (1976).

their own company. Most managed large companies with many stockholders and bore little financial risk themselves. Thus these leaders were bureaucrats rather than entrepreneurs. Dahmen's massive study of entrepreneurship in Sweden, although it did not examine the demographic characteristics of entrepreneurs, did discover some interesting patterns. The first generation of entrepreneurs in an industry usually came from a related industry--e.g., textile manufacturers evolved not from the tailor trade but from clothing merchants--while the second generation usually came from people who worked for the first generation firms.[8]

In the last several years, some economists have developed theories of entrepreneurial choice. These theories assume that people have some characteristic that is associated with the propensity for entrepreneurship. People who have more of this characteristic are more likely to become entrepreneurs than people who have less of this characteristic. Lucas (1978) assumes that this characteristic is "entrepreneurial ability". People with greater entrepreneurial ability can earn more money by running their own businesses than by working for someone else. Kihlstrom and Laffont (1978) and Kanbur (1978) assume that this characteristic is a "taste for risk". Running a business is more risky than working for someone else. People who have a stronger taste for risk are more likely to operate their own businesses.[9] Because these models are technically complex, we have relegated further discussion of them to an appendix.

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8. Erik Dahmen, Entrepreneurial Activity and the Development of Swedish Industry, Axel Leijonhufvud, trans. (Homewood, Ill.: Richard D. Irwin, 1970).

9. In both of these theories, it is possible to show that there is a particular level of the entrepreneurial characteristic above which people will become entrepreneurs and below which people will become workers. This "critical level" is that level at which the supply of labor by individuals who choose to become workers equals the demand for labor by individuals who choose to become entrepreneurs.

3.3--An Integrated Framework for Studying Entrepreneurial Choice and Success

The theories reviewed above suggest that the probability that an individual chooses to become an entrepreneur depends upon his entrepreneurial ability and his taste for entrepreneurship.

Taste for Entrepreneurship--The psychological and sociological studies suggest that whether an individual is an immigrant, whether he has been divorced, whether he has served in the military, whether his father was self-employed, whether he was an orphan and other social characteristics affect his taste for working on his own. The psychological studies find that entrepreneurs like to be in control. Finally, people with a greater taste for risk may have a greater taste for entrepreneurship.

Entrepreneurial Ability--People who can earn relatively more working for themselves than working for someone else have a relatively higher propensity to become entrepreneurs. Entrepreneurial ability may depend upon observable characteristics such as work experience and education and on unobservable characteristics such as " drive",[10]

The remainder of this section describes an empirical framework that integrates these main theories and which can be used to estimate the impact of certain observable characteristics on the propensity for an individual to become an entrepreneur.[11] The value of being in an occupation

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10. These implications follow from Lucas' theory of entrepreneurship and from the psychological studies that find that successful entrepreneurs have different psychological profiles than other individuals.

11. The framework described below is an extremely simplified version of the framework that we actually used. For further technical details on our framework, see Appendix B.

(either self-employment or wage work) is the sum of two components. First, the value of income which the individual can expect from that occupation. Second, the nonmonetary value of that occupation based on the individual's taste for that occupation. Symbolically,

$$E = E_I + E_T \tag{3.1}$$

$$W = W_I + W_T \tag{3.2}$$

where E_I and W_I denote the income value of entrepreneurship and wage work respectively and E_T and W_T denote the taste value of entrepreneurship and wage work respectively. An individual will choose entrepreneurship if the value of entrepreneurship is greater than the value of wage work and vice versa.

The income received from entrepreneurship or wage work is a function of various personal characteristics such as race, education, and work experience. We can denote these characteristics by $\underline{x}=(x_1,x_2,\ldots,x_n)$ and write E_I and W_I as functions of these characteristics

$$E_I = E_I(\underline{x}) \tag{3.3a}$$

$$W_I = W_I(\underline{x}) \tag{3.3b}$$

The taste for entrepreneurship or wage work is also a function a personal characteristics such as family status, race, whether the person is an immigrant, and age/ We can denote these characteristics by $\underline{z}=(z_1,z_2,\ldots,z_m)$ and write E_T and W_T as function of these characteristics

$$E_T = E_T(\underline{z}) \tag{3.4a}$$

$$W_T = W_T(\underline{z}) \tag{3.4b}$$

Substituting (3.3)-(3.4) into (3.1)-(3.2) we can write E and W as functions of the earnings characteristics x and the taste characteristics z

$$E = E(\underline{x},\underline{z}) \tag{3.6}$$

$$W = W(\underline{x},\underline{z}) \tag{3.7}$$

If $\underline{x}$ and $\underline{z}$ summarized all the characteristics that affect the value of entrepreneurship and wage work and if people behave systematically, then we could determine whether an individual will choose to become an entrepreneur by observing the values of $\underline{x}$ and $\underline{z}$ for an individual, calculating $E(\underline{x},\underline{z})$ and $W(\underline{x},\underline{z})$, and comparing the values of these alternative occupations. But such is not the case. We cannot observe (let alone imagine) all of the myriad of factors that might influence the relative values of entrepreneurship and wage work to an individual. Moreover, people with the same characteristics may behave differently in economic terms from one another simply because people do not behave systematically and may have different perceptions and preferences. We can capture these unobserved factors by assuming that there is a value of being an entrepreneur or worker which depends upon characteristics that we cannot observe. Let E_U and W_U denote that these values based on unobservable characteristics for entrepreneurs and workers respectively. Then we can rewrite (3.6) and (3.7) as

$$E = E(\underline{x},\underline{z})+E_U \tag{3.8}$$

$$W = W(\underline{x},\underline{z})+W_U \tag{3.9}$$

An individual will become an entrepreneur if E-W is greater than zero which implies that he will become an entrepreneur if

$$E(\underline{x},\underline{z}) - W(\underline{x},\underline{z}) > W_U-E_U \tag{3.10}$$

Although we cannot observe the right-hand side of (3.10) we can assume that the right-hand side is randomly distributed in the population. If so, then "on average" people with values of x and z that lead to a positive difference on the left-hand side of (3.10)--i.e. a premium in the entrepreneurial occupation--will become entrepreneurs. The statement is true only "on average" because occasionally people with a large difference between $E(\underline{x},\underline{z})$ and $W(\underline{x},\underline{z})$ may have an even

larger difference between W_U and E_U and therefore choose wage work.[12] Alternatively, people with a small difference between $E(\underline{x},\underline{z})$ and $W(\underline{x},\underline{z})$ may have an even smaller difference between W_U and E_U and therefore choose entrepreneurship.

Figure 3.1 helps clarify the entrepreneurial choice decision. The curved line in the figure gives the probability distribution of $R=W_U-E_U$ in the population. Consider an individual with attributes x and z. For him the left-hand side of (3.10) is $D(\underline{x},\underline{z})=E(\underline{x},\underline{z})-W(\underline{x},\underline{z})$. The probability that this individual will become an entrepreneur is equal to the probability that $D(\underline{x},\underline{z})>R$ This probability is given by the shaded portion of the graph to the right of R. This probability gives the fraction of individuals in the population with characteristics x and z who have values of the unobservable quantity R greater than $D(\underline{x},\underline{z})$. Individuals with higher values of $D(x,z)$ will have higher probabilities of becoming entrepreneurs rather than workers.

We can determine the impact of the various components of x and z on the propensity to choose entrepreneurship by examining whether people with certain values of x and z are more likely than people with other values of x and z to be self-employed. There are widely accepted statistical techniques for examining the impact of personal characteristics (such as those included in $\underline{x}$ and $\underline{z}$) on the probability that an individual will choose a certain option (in this case self-employment over wage work).[13] We describe these techniques in the next chapter. But before doing so, it will prove useful to examine how service in the military might affect the propensity to become an entrepreneur.

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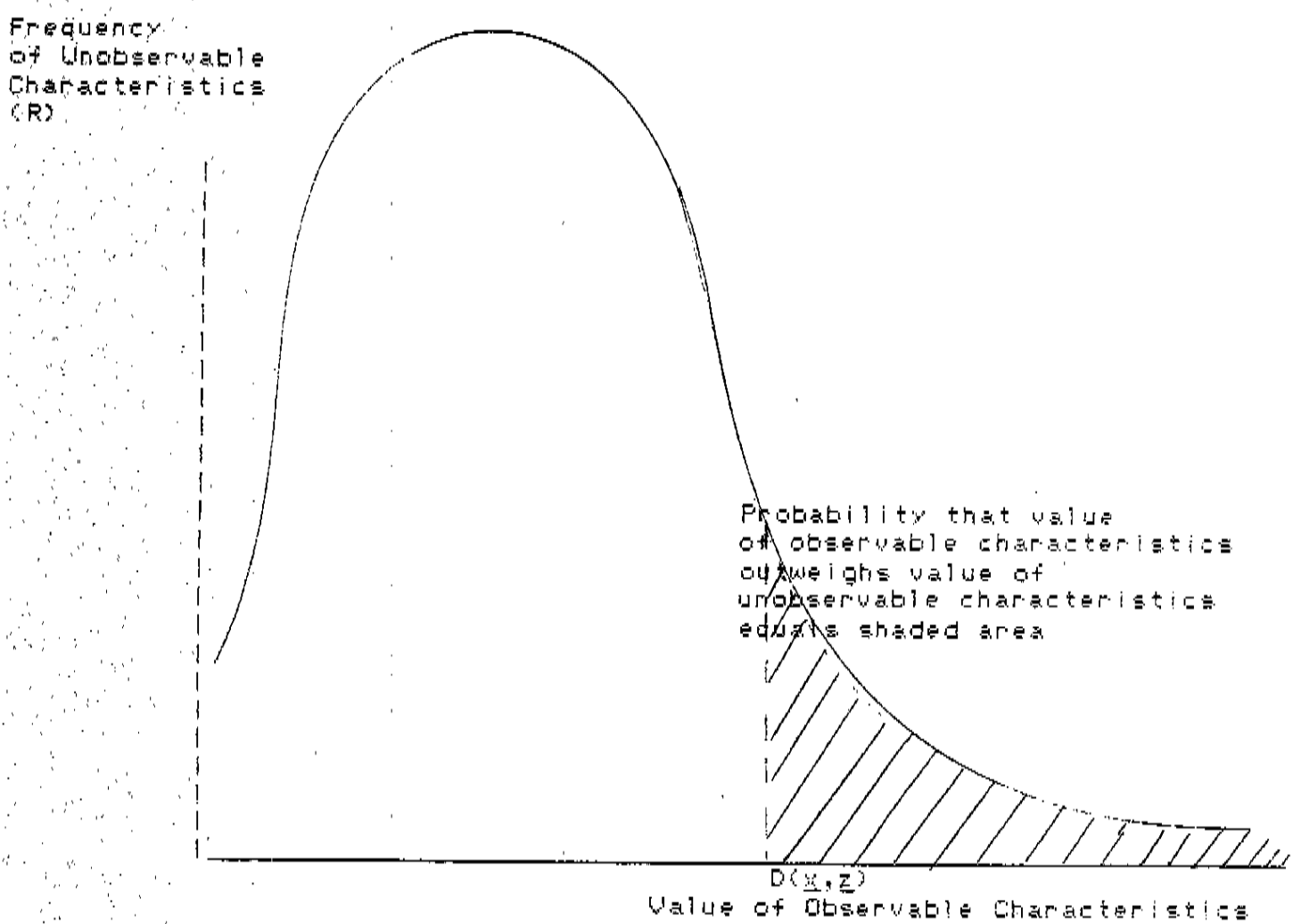
12. In this case the relative value of entrepreneurship is high based on observable taste and income characteristics but low based on unobservable characteristics.

13. The technique we use is called probit analysis, a statistical method that has been used widely by both biostatisticians and econometricians.

Figure 3.1

ENTREPRENEURIAL CHOICE



3.4--The Impact of Military Service on Entrepreneurial Choice and Success

Are veterans more likely to go into business for themselves? Are Vietnam veterans? Data from the Current Population Survey (CPS) provide crude answers to these questions.[14] In 1982, 11.6 percent of males between the ages of 25 and 64 who had not served in the military were self-employed and 11.2 percent of males between the ages of 25 and 64 who had served in the military were self-employed. These data suggest that veterans are just about as likely as non-veterans to go into business for themselves. The data reported in Table 2.3 above show a similar pattern. Slightly more than half of all self-employed males are veterans and slightly more than half of all male workers are veterans. In 1982, 8.0 percent of males between the ages of 25 and 64 who had served during the Vietnam War were self-employed. This fact, which is also consistent with the data reported in Table 2.3 suggests that Vietnam veterans are less likely to go into business for themselves than either veterans who did not serve in Vietnam or non-veterans.

In fact, both conclusions are erroneous. Table 3.1 shows why. The table shows the percent of self-employed individuals by age group for veterans, non-veterans, and Vietnam veterans. The percent of self-employed veterans is significantly less than the percent of self-employed non-veterans for every age group. On average, a veteran is only about 75 percent as likely to go into business for himself as a non-veteran in the same age group. Vietnam veterans are even less likely to open their own businesses than the data reported in the previous paragraph indicated.

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14. This table was prepared by the Bureau of Labor Statistics from the 1982 Current Population Survey. We report it here simply as an example of how erroneous inferences can be made from data on veterans. The 1980 Census data used in this study show a similar pattern.

Table 3.1

SELF-EMPLOYMENT OF VETERANS AND NONVETERANS[a]

By Age Group

Percent of Individuals Who Were Self-Employed in 1982

Age Group	War Veterans	Other Veterans	Vietnam Veterans	Nonveterans
25-64	11.4	9.8	8.0	11.6
25-29	4.8	3.8	4.8	7.8
30-34	7.1	9.6	7.1	10.4
35-39	9.0	9.8	9.0	12.4
40-44	10.0	9.8	11.1	13.5
45-49	12.1	12.5	9.4	13.9
50-54	12.3	11.8	8.0	15.3
55-59	14.3	14.3	10.1	17.7
60-61	16.1	*	21.1	22.1
62-64	18.7	*	15.4	26.5
65+	30.1	*	16.7	34.7

* Insufficient data.

[a] Based on 1982 Current Population Survey. Special tabulations provided by the Bureau of Labor Statistics. Vietnam Veterans are veterans who served during the Vietnam era, but not necessarily in Vietnam. War Veterans are veterans who served during a military conflict, but not necessarily in a war zone. See Table 2.4 for the dates of each military era.

Why the discrepancy between the data reported above and the data reported in Table 3.1? First, the probability of self-employment increases with age for both veterans and non-veterans. A 64 year old man is four times as likely to be self-employed as a 25 year old man. Second, veterans are older on average than nonveterans. Roughly two-thirds of non-veterans are between the ages of 25 and 39 while only one-third of veterans are between the ages of 25 and 39.

These results demonstrate the importance of demographic characteristics in estimating the relationship between the propensity for self-employment and military service. People who are veterans are different from people who are not veterans. The framework described in the previous section enables us to sort out the relationship between military service and entrepreneurial choice and success from the relationships between age, sex, race, education, and other demographic characteristics and entrepreneurial choice and success. The statistical techniques for doing so are described in the next chapter.

This report examines whether the probability of self-employment differs for otherwise comparable veterans and nonveterans or for otherwise comparable veterans of different military eras. There are many reasons why the probability of self-employment might differ between veterans and nonveterans. We give two possibilities.

(1) Veterans might have a different taste for self-employment than nonveterans. Their taste may differ for several reasons. First, veterans might have less aversion to risk. After all, veterans who volunteer for service have chosen to enter a risky occupation. Women veterans might have an especially high taste for risk since most have volunteered for military service. These characteristics are consistent with a relatively strong taste for entrepreneurship by veterans. Second, veterans (especially those who volunteer) might be less prone to experimentation and better able to cope with authority. These characteristics are just the opposite of the characteristics the psychological theories reviewed above suggest that entrepreneurs generally have and are therefore consistent with a relatively weak taste for entrepreneurship by veterans.

(2) Military service might provide experience which augments entrepreneurial skills and

abilities. Commissioned and noncommissioned officers might obtain more managerial experience and leadership training at an earlier stage of their careers than non-veterans with otherwise similar demographic characteristics. Veterans might obtain vocational skills that they can best use by forming their own businesses. On the other hand, military training and experience might augment abilities and skills which are valued by employers. The managerial skills of officers, for example, might have a higher payoff in a large corporate bureaucracy than in a small entrepreneurial firm. Military service typically augments both entrepreneurial and nonentrepreneurial skills and thereby raises both potential profits from entrepreneurship and potential wages from employment by others. We are interested in determining the net impact of military service on the decision to become an entrepreneur and on the financial success of entrepreneurs. Notably, Fredland and Little (1980) found that people who take and subsequently use military training in civilian occupations earn a pay premium of around seven percent. Professional and managerial training in particular receives a premium in the private sector.

Military service may also have indirect financial effects on entrepreneurs. First, military people with 20 years of service receive pensions which increase their financial security. Many military personnel can retire in their early 40's and pursue another career while drawing a respectable military pension. This pension might increase the veteran's willingness to start a particularly risky business. Second, the GI Bill decreases the cost of education to veterans. This educational subsidy might enable veterans to obtain skills useful in entrepreneurial activities. It might also enable veterans to obtain skills which increase their wage rate and thereby dampen their incentives to become entrepreneurs. O'Neill (1980) found that vocational training taken under the GI Bill raises earnings more than similar training taking under CETA (the Comprehensive Employment and Training Act Program). Blacks are especially more likely to take benefits under the GI Bill.

Unfortunately, the available data are not sufficiently detailed to isolate the impact of each of these alternative sources of influence. We do not know whether a veteran volunteered or was

drafted, the veteran's military rank, the kinds of training he received in the military, or whether he took advantage of the GI Bill.[15] Consequently, the most we can hope to do in the following chapters is to examine the net impact of all these possible influences on the propensity of veterans for self-employment and on their financial success as veterans.

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15. There are datasets which provide such information but these datasets provide information on few self-employed individuals.

CHAPTER 4

ENTREPRENEURIAL CHOICE

This chapter reports estimates of the impact of various personal characteristics on the probability that an individual chooses to work for himself. Section 2 reports some preliminary tests of the importance of some of the variables included among the taste characteristics $\underline{z}$ and the income-related characteristics $\underline{x}$. Section 3 reports estimates of the combined influence of the taste and income-related characteristics.[1] Before describing these estimates in detail, it will prove useful to describe our basic statistical approach.

4.1--Statistical Approach and Methodology

In this chapter we are concerned with estimating the impact of various demographic characteristics on the probability that an individual will choose self-employment.[2] Denote the probability that an individual will choose self-employment by P and let us assume to begin with that P depends only upon an individual's age. We could investigate the influence of age on the probability of self-employment by collecting data on the age and employment status of a group of individuals. For individuals at each age level, we could calculate the fraction of these individuals that are self-employed. We could then plot these fractions against age in order to see whether

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1. Many characteristics such as age affect both taste and ability. At the end of the next chapter we show how the taste and ability influences can be disentangled.

2. In terms of the framework developed in the previous chapter, this probability is the probability that $E(\underline{x},\underline{z})-W(\underline{x},\underline{z})>-(E_U-W_U)$.

there is any systematic relationship between the probability of self-employment and age. Suppose the data we obtain look like the data plotted in Figure 4.1.

As drawn, the plotted points are clustered around an upward sloping straight line. We might view this straight line as representing the "average" relationship between age and the probability of self-employment in the population.[3] The purpose of statistical analysis is to draw a line through these points which fits the data as close as possible in some sense.[4] The mathematical equation for this fitted line is

(4.1) $P=a+bAge$

where a is the point at which the line intercepts the vertical axis and b is the slope of the line measured as the change P divided by the associated change in Age.

The probability of self-employment may depend upon many other variables besides age. For example, it may depend upon whether a person has been in the military. There are several ways military service could affect the relationship between the probability of self-employment and age. First, it might be the case that at every age level the probability that a veteran will be self-employed is higher by a given amount than the probability that a nonveteran is self-employed. Suppose we calculated the fraction of self-employed individuals at each age level separately for veterans and nonveterans. Perhaps the plotted points would look like those in Figure 4.2. The fitted line for nonveterans is

(4.2) $P=a+bAge$

and the fitted line for veterans is

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3. Because many other factors besides age influence self-employment, we would be surprised if the plotted points fell exactly on the straight line.

4. Statisticians have alternative methods for fitting this line to the data. This report uses a method called maximum likelihood estimation, which is a standard statistical technique in wide use among econometricians and statisticians.

Figure 4.1

ESTIMATING THE IMPACT OF AGE ON THE PROBABILITY OF SELF-EMPLOYMENT

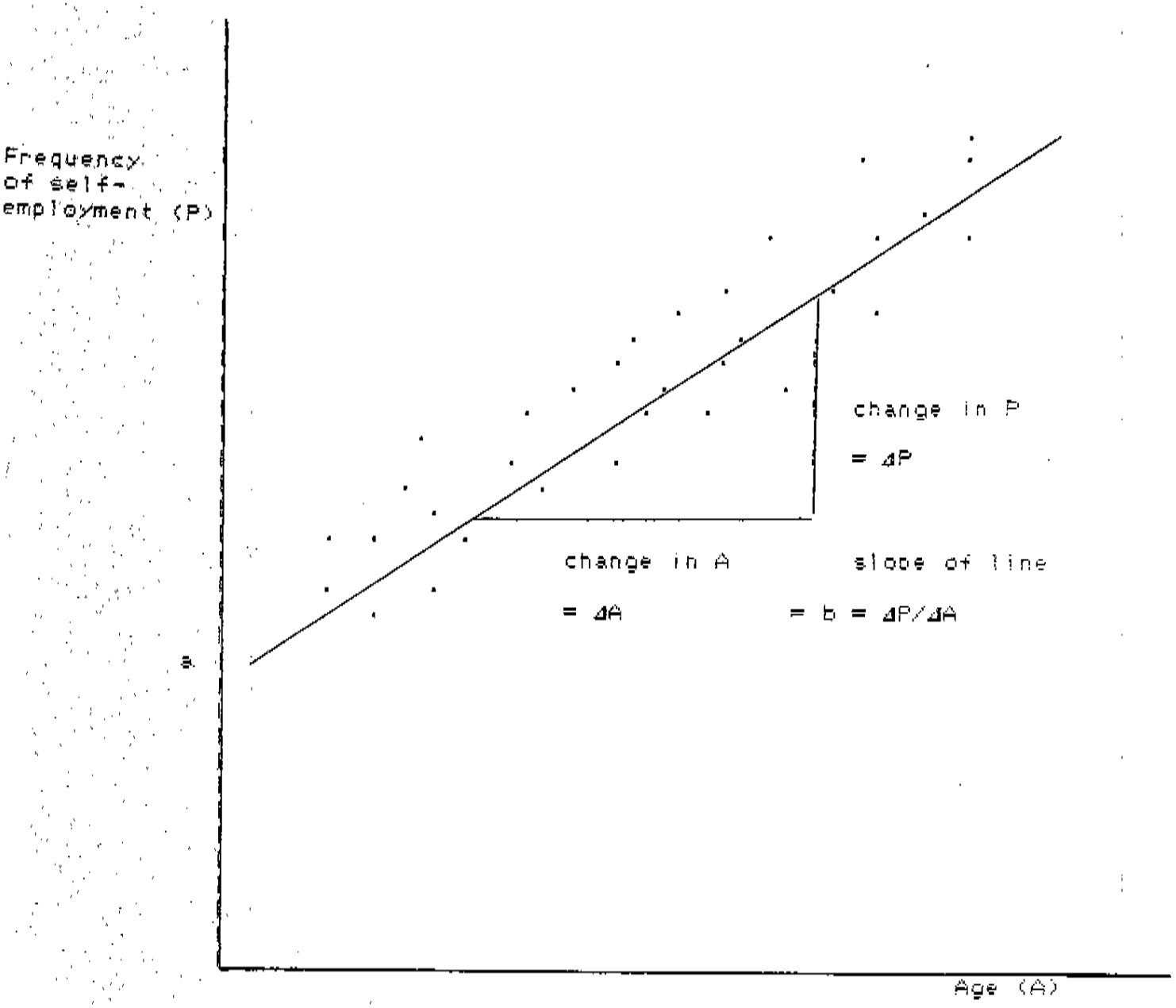


Figure 4.2

ESTIMATING THE IMPACT OF AGE ON THE PROBABILITY OF SELF-EMPLOYMENT FOR VETERANS AND NONVETERANS

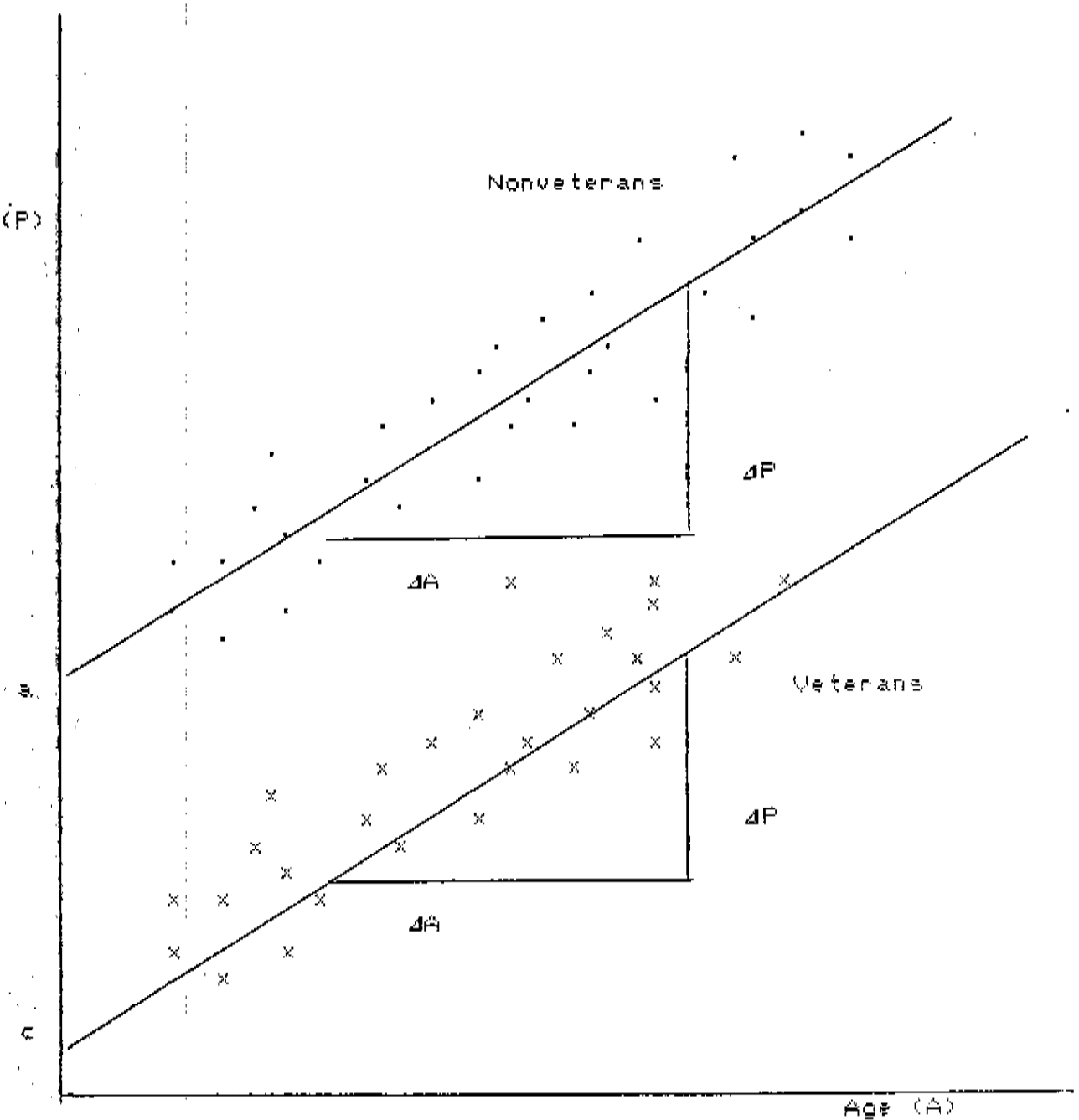
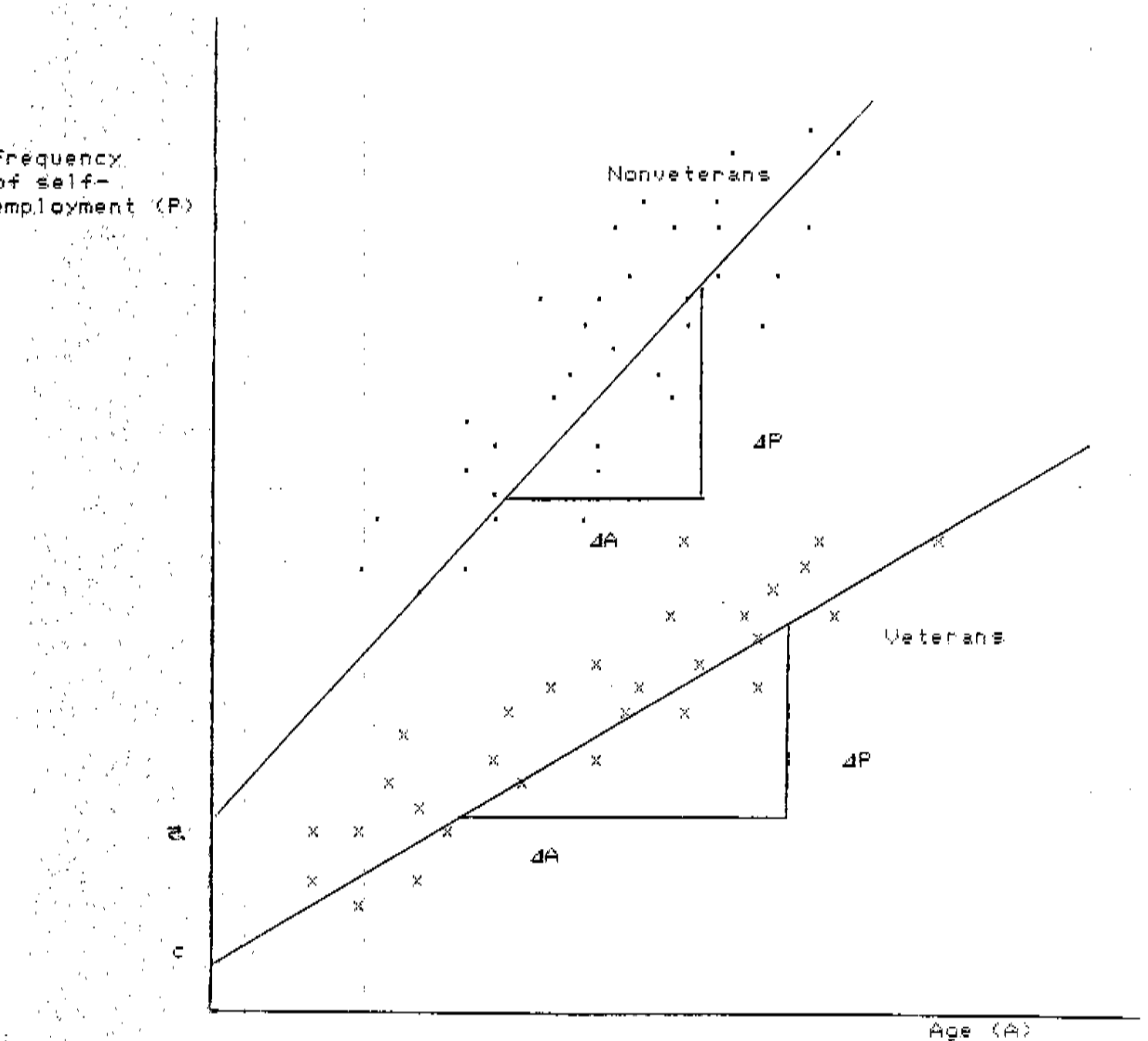


Figure 4.3

ESTIMATING THE IMPACT OF AGE ON THE PROBABILITY OF SELF-EMPLOYMENT FOR VETERANS AND NONVETERANS WITH DIFFERING AGE EFFECTS



(4.3) $P=c+bAge$

These lines have different intercepts but the same slope. We could express (4.2) and (4.3) as one equation through the following device. Let the variable Vet be equal to one if an individual is a veteran and zero if an individual is not a veteran. Then

(4.4) $P=a+(c-a)Vet+bAge$

If Vet=1,

$P=a+c-a+bAge=c+bAge$

If Vet=0,

$P=a+(c-a)0+bAge=a+bAge$

The coefficient of Vet, c-a, measures the difference between the probability that a veteran and a nonveteran of the same ages will be self-employed. A variable that is either zero or one is known as a "dummy" or "dichotomous" variable.

Second, it might be the case the the probability of self-employment changes with age to a different degree for veterans than for nonveterans. Perhaps the plotted points look like those in Figure 4.3. The fitted lines are now

(4.5) $P=a+bAge$ for nonveterans

(4.6) $P=c+dAge$ for veterans

But here too it is possible to express (4.5) and (4.6) as a single equation. Let VetAge equal Age if the individual is a veteran and let VetAge=0 if the individual is not a veteran (thus this variable is simply the product of Vet and Age). Then

(4.7) $P=a+(c-a)Vet+bAge+(b-d)VetAge$

Equation (4.7) reduces to (4.5) or (4.6) depending upon whether Vet=0 or Vet=1. The coefficient of

VetAge, b-d, measures the additional impact of a change in age on the probability of self-employment for veterans.

The purpose of this project was to analyze the influence of a rather large set of variables on the probability of self-employment. Many of these variables are dummy variables like Vet. Several others are continuous variables like Age. Although it is impossible to actually plot these points on a two-dimensional figure, the basic principle for estimating the impact of these variables on the probability of self-employment is the same as in the examples above. The statistical techniques we use choose the values of the coefficients of these variables to be the values that are most consistent with the observed data.[5]

Several further points about the statistical procedures are noteworthy. First, suppose we have obtained the following estimated relationship

(4.8) $P=a+(a-c)Vet+bAge+eEduc$

where Educ is the number of years of education an individual has had. Each of the estimated coefficients measures the impact of a change in the value of a variable to which this coefficient is attached under the assumption that the value of the other variables remains unchanged. The coefficient b measures the impact of a change in age holding education constant and the coefficient e measures the impact of a change in education holding age constant.

Second, compare the cluster of points for veterans and nonveterans in Figure 4.2. The cluster for veterans is much more dispersed than is the cluster for nonveterans. Because of this greater dispersion, we are less confident that the slope of the estimated line for veterans represents the true slope for veterans. There are several alternative lines that could be drawn through the cluster of points for veterans than fit the data almost as well as the line we have

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5. Precisely, the statistical technique chooses those values that maximize the likelihood of realizing the data that we actually observe. See, for example, Kmenta (1971) for further discussion.

drawn. We have little basis for saying that one is better than the other. The statistical procedures we use in this report give us measures of the reliability of the estimates we obtain. This measure of reliability is known as the standard error. Roughly speaking, 95 times out of 100 the true coefficient lies between the estimated coefficient plus or minus two times the standard error. Thus, suppose the estimated coefficient on Vet is .20 with a standard error of .05. Then the chance that the true coefficient of Vet lies between .10 and .30 is 95 percent.

Third, these measures of reliability enable us to perform what is known as hypothesis tests. We are going to be interested in determining whether there is any basis for believing that certain variables actually influence the probability of self-employment. Statisticians reformulate such questions as follows. What is the probability of obtaining a nonzero estimate of a coefficient as a result of chance when the true coefficient is zero. If this probability is remote--say 5 out of 100--then we can be reasonably confident that the true coefficient is not zero. In the language of statisticians, we can reject the null hypothesis that the true coefficient is zero or the estimated coefficient is statistically significantly different from zero at the five percent level of statistical significance.

In the results reported below, the statement that a relationship or a coefficient is "statistically significant" means that there is a less than 1 out of 20 chance that the true coefficient is zero or that there is really no relationship. The statement that evidence is "limited" or that a coefficient is not "statistically significant" means that there is a better than 1 out of 20 chance that the true coefficient is zero or that there really is no relationship.

We now turn to a discussion of the estimates. Further details on our estimation and testing procedure are provided in Appendix C.

4.2--Tests for the Importance of Various Demographic Characteristics

This section reports some tests of the influence of certain demographic characteristics on the probability of self employment. Most of the tests consider several related demographic characteristics jointly. Because certain demographic characteristics are correlated with one another it is possible to find that each of several characteristics is not significantly different from zero but that these characteristics are significantly different from zero when taken together. This paradoxical finding is generally due to the fact that, because various characteristics tend to vary quite closely with one another, it is difficult to distinguish the separate effect of any particular characteristic precisely. It is therefore important to consider the effect of related characteristics jointly.[6]

Marital and Family Status

The first set of variables we examine concern the marital and family status of the household. The marital status of the household may affect the taste for entrepreneurship. People with small children may be less willing to take on the risks associated with entrepreneurship. On the otherhand, women with small children who want to work may find that self-employment is more convenient than wage work. Individuals with older children may have a greater propensity to operate their own business because their children provide a cheap but reliable source of labor.

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6. See Kmenta (1971) for a general discussion.

Women who have had a large number of children may have accumulated fewer marketable skills and might find that self-employment is the best alternative available when they decide to reenter the labor force. Finally, according to Shapero's theory of the entrepreneur as a displaced person, people who have been divorced are more likely to be entrepreneurs.

In order to test these hypotheses we estimated the coefficients of variables that indicate the number of times the individual has been married, whether the individual is currently married, whether the individual has small children (under age 6) living at home, whether the individual has older children (over age 6) living at home, and the total number of children a woman has borne. For both men and women and for both 1970 and 1980, the estimated coefficients of each of these variables is relatively small and imprecise. None is significantly different from zero. Moreover, these variables taken together are not significantly different from zero. These findings indicate that marital and family status have little influence on the probability of self-employment.

A related variable is the amount of money that an individual's spouse earns. The greater the income brought in by an individual's mate perhaps the greater the probability that an individual will take on the risks of self-employment. We tested this hypothesis as well. For men in both 1970 and 1980, spousal income has no significant influence on the probability of self-employment. For women in 1980 but not in 1970, spousal income increases the probability of self-employment.

Education

The second set of variables considered is education. Education may affect the probability of self-employment in two ways. First, the difference between self-employment and wage earnings may vary with educational level. People with relatively low educational attainments may find it difficult to satisfy the hiring criteria of many employers and may therefore find that

self-employment is their best available alternative. Second, the taste for self-employment may vary systematically with educational level.

We tested these hypotheses by including several variables that indicate the individual's educational attainment. We included dummy variables that indicate whether an individual has only an elementary school education, is a high school dropout, a high school graduate, a college dropout, a college graduate, or has done some postgraduate work. We also included the product of age and the number of years of education--this variable allows the impact of education to vary with age--and the product of veteran status (a dummy) and the number of years of education--this variable allows the impact of education to differ between veterans and nonveterans.

The results differ quite markedly between 1970 and 1980. For men and women in 1980, there is no evidence that the probability of self-employment varies with education. For men and women in 1970, there is evidence that the probability of self-employment varies with the number of years of education and that the relationship varies across ages.[7] There is no evidence that the impact of education on the probability of self-employment varies with military service.

Military Service

The third set of variables we consider concern whether and when an individual was in the military. We include dummy variables indicating whether the individual saw military service after the Vietnam War, during the Vietnam War, after the Korean War but before the Vietnam War, during the Korean War, during World War II, or during some other time. We also consider whether the relationship between the probability of self-employment and age and education differs between veterans and nonveterans.

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7. For men and women in both years, the dummy variables for educational attainment are not significantly different from zero either singly or jointly.

We find that men and women who were in the military during or after the era of the Vietnam War are less likely than veterans of other eras or nonveterans to become self-employed.[8] We do not find, however, that the relationship between the probability of self-employment and age or education differs between veterans and nonveterans.

Age

The fourth set of variables we consider concern the age of the individual. We consider age and its square.[9] We also consider the interaction between age and education and age and veteran status.

For men and women in 1970 we find that age is important only through its interaction with education. Older individuals are more likely to become self-employed and even more likely the better educated they are. For men in 1980 we find that the probability of self-employment increases at a diminishing rate with age. This relationship is statistically significant. For women in 1980 we find that the probability of self-employment decreases with age, although this relationship is not statistically significant.

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8. Note that we have no information on female veterans in 1970 and that the statement concerning post-Vietnam era veterans is based only on 1980 data.

9. Including both age and age-squared enables us to test whether the relationship between the probability of self-employment and age is nonlinear.

4.3--Estimates of the Combined Effect of Income-Related and Taste-Related Characteristics of Entrepreneurial Choice

This section reports estimates of the impact of various characteristics on entrepreneurial choice. These estimates were obtained from a two-step procedure. First, some crude statistical techniques were used to test for the inclusion of various subsets of variables. The results of these tests were reported in the previous section. Variables or sets of variables that were clearly not important were then eliminated. Second, more refined statistical techniques were used to estimate the coefficients of the remaining variables. Details of the particular statistical techniques used and the complete results obtained are reported in Appendix C.

Table 4.1 reports the estimated impacts of the characteristics on the probability of self-employment. The estimated impacts depend upon the precise characteristics of the individual being considered. Thus the impact of being black on the probability of self-employment depends upon the particular age and education of the individual. For purposes of comparison, we report the estimated impact of each characteristic for the "average" individual in the population. For example, in order to compare the impact of race on self-employment we in effect compare black and whites with characteristics (other than race) equal to the characteristics of the average individual in the population.

Estimated impacts are reported in either of two ways depending upon whether the variable is dichotomous (a dummy variable) or continuous. For continuous variables we report the percent change in the probability of self-employment due to a one percent change in the value of the variable under consideration. Thus an impact of .20 for age would imply that a 1 percent change in age (e.g., from 50.0 to 50.5 years) will lead to a .2 percent change in the probability of

self-employment (e.g., from .2000 to 0.2004).[10] For dichotomous variables we report the ratio of the difference between the probability of self-employment for individuals with a value of one for that variable and the probability of self-employment for individuals with a value of zero for that variable to the probability of self-employment for individuals with a value of zero for that variable. This ratio gives the percentage difference in the probability of self-employment for people possessing the characteristic measured by the dichotomous variable.

Let us review the results.

1. Black men are 54.4 percent less likely to become entrepreneurs than are otherwise comparable non-black men. This difference is statistically significant. There is no evidence that black women are significantly more likely to become entrepreneurs than are otherwise comparable non-black women.
2. Male veterans of the post-Vietnam era are 54.9 percent less likely to become entrepreneurs and male veterans of the Vietnam-era are 24.9 percent less likely to become entrepreneurs than otherwise comparable veterans of other eras or nonveterans. Female veterans of the Vietnam-era and later are 43.4 percent less likely to become entrepreneurs than are otherwise comparable nonveterans or veterans of earlier eras. Only the difference for male post-Vietnam era veterans is statistically significant. The other differences could be due to chance.
3. Male urban dwellers are 21.9 percent less likely and female urban dwellers are 26.9 percent less likely than otherwise comparable rural dwellers to become self-employed. The difference for men but not for women is statistically significant.
4. Male immigrants are 2.5 percent less likely to become entrepreneurs than are otherwise comparable male non-immigrants. This difference is not statistically significant. Female

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10. Similarly a 10 percent change in age would lead to a 2 (=.20 x 10 percent) percent change in the probability of self-employment from .20 to .204.

immigrants are 67.8 percent more likely to become entrepreneurs than are otherwise comparable female non-immigrants. This difference is not statistically significant either.

5. Among men, the propensity for entrepreneurship increases with age until a man reaches the age of 58 and then decreases with age. For a 42 year old man, the probability of self-employment increases by 15.5 percent per year.[11] This relationship is statistically significant. Among women, the propensity for entrepreneurship decreases with age although the decrease is not statistically significant and may be due to chance.

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11. Thus if the probability that a 42 year old man chooses self-employment is 10 percent, the proability that a 43 year old man chooses self-employment is 11.5 percent (11.5=1.155 X 10.0).

Table 4.1

NET IMPACT OF DEMOGRAPHIC CHARACTERISTICS ON THE PROBABILITY OF SELF-EMPLOYMENT[a]
1980

Characteristic	Percentage Impact	
	Men	Women
Urban	-21.9*	-26.9
Black	-54.4*	-
Immigrants	-2.5	67.8
Post-Vietnam Era Veterans	-54.9*	-
Vietnam Veterans	-24.9*	-
Veterans of Vietnam or Later	-	-43.4
Age[b]	15.5*	-

* There is a less than one out of twenty chance that the true impact is zero.

[a] Calculated from reduced-form probit model estimates reported in Table C.3a-C.3b in Appendix C. A dash indicates that estimates were not obtained for the variable because preliminary analysis indicated that the variable was not an important determinant.

[b] Percentage change in the probability of self-employment per additional year of age, calculated for a 42 year old man.

CHAPTER 5

ENTREPRENEURIAL SUCCESS

The previous chapter examined the influence of various factors on the probability that an individual chooses to work for himself rather than work for someone else. This chapter explores the determinants of entrepreneurial and wage earnings in greater detail. Section 1 reports tests of the influence of several sets of variables on entrepreneurial earnings. Section 2 reports estimates of the impact of various demographic characteristics on entrepreneurial earnings.[1]

In order to obtain valid estimates of the influence of personal attributes on the entrepreneurial earnings that a typical individual might expect it is necessary to address a statistical issue known as "sample selection bias". Entrepreneurial earnings are determined by observable characteristics such as age and education and unobservable characteristics such as entrepreneurial ability. In estimating the impact of observable characteristics on entrepreneurial earnings we assume that unobservable characteristics can be summarized by a random variable that has an average value of zero across the population and is uncorrelated with the observable characteristics.[2] If we could observe entrepreneurial earnings for each individual in the population we could estimate the impact of observable characteristics on entrepreneurial earnings with no problem. But we only observe entrepreneurial earnings for individuals who have chosen to become entrepreneurs. In the language of statistics, we only observe entrepreneurial earnings for individuals who have "self-selected" themselves into our sample. People who have decided to

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1. Earnings are calculated as the total income received by the individual. Thus some self-employed workers may receive some wage income and some wage workers may receive some self-employment income. All workers receive dividend and other income. Our reason for examining all earnings is that the decision to be primarily self-employed or primarily a wage worker affects all of the earnings possibilities available to the worker.

2. This assumption may be criticized as too stringent. But it is the basis for virtually all econometric estimation and is not unique to this study.

become entrepreneurs will generally have different unobservable characteristics than people who have decided to become workers. Such self-selection creates two problems. First, if the average value of the unobservable characteristics is zero for the population there is no reason to believe that the average value will remain zero for the sample of individuals who have self-selected themselves into entrepreneurship. Second, to the extent that the determinants of entrepreneurial choice are correlated with the determinants of entrepreneurial earnings the random variable that measures the influence of unobservable characteristics for entrepreneurs will be correlated with the observable characteristics of entrepreneurs. It turns out that this correlation biases the coefficient estimates so that our estimated coefficients may bear little relationship to the true coefficients.

Fortunately, there are statistical methods available for eliminating these biases and securing reliable estimates of the true coefficients. The method we use in this study is often called the lambda-method.[3] The method involves calculating a variable that reflects the probability that an individual will self-select himself into the sample and including this variable in the equation. This variable is usually called lambda. The estimated coefficient of lambda can be used to determine whether people who have self-selected themselves into the sample have relatively high or relatively low earnings.[4] If lambda is not significantly different from zero we may conclude that entrepreneurs have roughly the same unobservable characteristics as workers. If lambda is significantly different from zero we may conclude that they have different unobservable characteristics and are therefore intrinsically different kinds of people.

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3. The method was devised by James Heckman (1976) and has been used extensively in the labor economics literature to estimate earnings equations for women from samples of women who have self-selected themselves into the labor force.

4. Lambda is calculated from the estimates of the reduced-form probability model reported in the appendix and discussed in the second section of the previous chapter.

5.1--Tests of the Influence of Various Demographic Characteristics on Entrepreneurial Earnings.

The first question we address is whether entrepreneurs have different unobservable characteristics than workers. They do. In 1980, the coefficient of lambda is significantly different from zero for both men and women entrepreneurs. The coefficient for men indicates that the correlation between unobservable characteristics that determine the probability of entrepreneurship and unobservable characteristics that determine entrepreneurial earnings is -0.64, a relatively high correlation.[5] The coefficient for women indicates that the correlation between unobservable characteristics that determine the probability of entrepreneurship and unobservable characteristics that determine entrepreneurial earnings is +0.74, again a relatively high correlation. In 1970, the coefficients of lambda were large but imprecisely estimated and therefore not significantly different from zero. The estimated correlation for men was -0.63 and for women was +0.25.

The second question we address concerns the impact of military service on entrepreneurial earnings. For men in 1970 and women in 1980 there was no significant relationship between military service in any era on entrepreneurial earnings.[6] For men in 1980 there was no significant relationship between military service in the Vietnam War era or the preceding era. For men in 1980 veterans of the post-Vietnam War era earned significantly more at entrepreneurship than did nonveterans or veterans. It turns out, however, that this result is spurious. It is due to what is

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[5] Correlations range from -1 to +1; the degree of correlation is greater the closer the correlation coefficient is to -1 or 1.

[6] Note that there were no data on female veterans in 1970.

known in the labor economics literature as a "cohort effect". When this effect is taken into account, the premium received by post-Vietnam veterans disappears.[7]

5.2--The Impact of Demographic Characteristics on Entrepreneurial Earnings

Table 5.1 reports the impact of various demographic characteristics on entrepreneurial earnings. Two kinds of numbers are reported. For continuous variables we report the percentage change in entrepreneurial earnings due to a percentage change in the variable under consideration (and under the assumption that all the other variables stay the same). Thus a number like 1.5 for age would imply that a 1 percent change in age leads to a 1.5 percent change in entrepreneurial earnings.[8] For dichotomous variables we report the percentage difference in earnings between people who possess the characteristic measured by the variable and people who do not possess the characteristic, but are otherwise comparable. Thus a number like 7.5 for Asians implies that Asians earn 7.5 percent more than non-Asians with the same education, age, and other demographic characteristics.

Several interesting relationships concerning the impact of various personal characteristics

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7. The cohort effect is due to the fact that the regressions do not adequately control for the impact of age. In order to correct for the cohort effect, we must compare individuals who are in the same age cohort, i.e. who are roughly the same age. Regression results for men who turned age 18, and thus became eligibile for the draft, after 1964 are reported in Appendix C.

8. And, equivalently, that a 10 percent change in age leads to a 15 percent change in entrepreneurial earnings.

9. We emphasize that the following discussion we are comparing the self-employment earnings of individuals with different demographic characteristics. We are <u>not</u> comparing self-employment earnings with wage earnings.

on self-employment earnings appear.[9] We first consider men.

1. Relative to nonveterans, veterans of the post-Vietnam era earn 70 percent more, veterans of the Vietnam era earn 10 percent more, veterans of the era between Korea and Vietnam earn 1.2 percent more, veterans of the Korean era earn 2.7 percent less, veterans of World War II earn 3 percent less, and veterans of the pre-World War II era earn 14.8 percent less. All of these differences except that for recent veterans could be due to chance.
2. Blacks earn almost 20 percent more than do otherwise comparable non-blacks. Asians earn almost 6 percent more than do otherwise comparable non-Asians. These differences, however, might be do to chance.[10]
3. An immigrant to this country initially earns about 30 percent less than an otherwise comparable nonimmigrant. But his earnings increase by 1.7 percent for every year he remains in this country. By the time he has been in this country for 21 years he makes as much as otherwise comparable nonimmigrants. Immigrants who have been in this country for more than 21 years earn more than nonimmigrants.
4. Entrepreneurial earnings vary systematically with education.[11] Relative to individuals who have a high school education, men with only an elementary school education earn 18.5 percent less, men who dropped out of high school earn 13.4 percent less, men who dropped out of college earn 9 percent more, men who completed college earn 36.1 percent more, and men who went on to graduate work earn 23 percent more. It is notable that men who have

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10. They are not statistically signficantly different from zero, but given that there are few self-employed blacks and Asians in our sample this lack of statistical significance may simply reflect the lack of data necessary for precise estimates.

11. The calculations reported below are for a 42 year old men. The earnings differences would be smaller for younger men. They incorporate the coefficients on the educational attainment dummies, the coefficient on education times age, and the coefficient on education times veteran status.

Table 5.1

IMPACT OF DEMOGRAPHIC CHARACTERISTICS ON SELF-EMPLOYMENT EARNINGS[a]
1980

Characteristic	Percent Differences	
	Males	Females
Urban	43.73*	-14.22*
Black	19.71	16.72
Asian	5.57	-31.87
Immigrant	-30.42*	29.73
Poor English	-11.49	31.93
Elementary School Education	8.82	-23.88
High School Dropout	-7.75	-16.97
High School Graduate	0.00	0.00
College Dropout	-0.32	-2.72
College Graduate	13.42*	28.34
Postgraduate	-6.31	32.39
Handicapped	-37.54*	-38.50*
Post-Vietnam War Era Veterans	70.47*	-
Vietnam War Era Veterans[c]	10.16	146.97
Pre-Vietnam War Era Veterans	1.18	-

Korean War Era Veterans	-2.69	-
World War II Era Veterans	2.97	-
Other Veterans	-14.75	197.41
Nonveterans	0.00	0.00
Managers	-23.13*	370.06*
Professionals	0.26	6.68
Salesmen	-52.72*	351.35*
Clerical Workers	10.75	7.45
Service Workers	-10.95	211.28*
Craftsmen	-40.25*	95.78*
Operators	0.00	0.00
Percent change in earnings per year of:[b]		
Education	0.71+0.09Age*	-0.04Age
Age	9.04-0.39Age*	9.10-0.66Age*
Residence in this country for immigrant	1.70*	1.04

* Difference is statistically significant.

[a] Calculated from the estimated earnings equations reported in Tables C.4b and C.4d in Appendix C. Entries equal the percentage difference in earnings between people who possess the characteristic and otherwise comparable people who do not possess the characteristic. A dash indicates that estimates were not obtained for the variable because preliminary analysis indicated that the variable was not an important determinant.

[b] The percentage change in earnings due to a change in education or age varies with age level. To find the percentage change at any particular age level insert the relevant value of age (e.g., 42 for the average individual in the sample) for Age in the expression.

[c] Includes Post-Vietnam Era veterans.

done postgraduate work actually earn less than men who stopped at college.[12]

5. Entrepreneurial earnings initially increases and then decreases with age. For men with 12 years of education, a 42 year old man makes 17.7 percent more than a 60 year old man and 3.5 percent less than a 24 year old man. Earnings decline with age for men older than 28 who have 12 years of education. For men with 16 years of education, a 42 year old man makes 10.1 percent more than a 60 year old man and 3.1 percent more than a 24 year old man. Earnings decline with age for men older than 37 who have 16 years of education.

6. Finally, collecting some miscellaneous results, handicapped men earn 47.6 percent less than otherwise comparable non-handicapped men. (This difference is significantly different from zero). Men who speak English poorly earn 11.5 percent less than otherwise comparable men who speak English well. (This difference could be due to chance.) Men who reside in urban areas earn 43.7 percent more than men who reside in rural areas. (This difference is significantly different from zero.)[13]

The first result reported above for veterans of the Vietnam War and post-Vietnam War eras could be spurious. It might result from the partial failure of our statistical analysis to control for the relationship between earnings and age. In order to test for this possibility, we estimated the earnings equations for men who came of draft age during or after the Vietnam War era and who therefore belong to the same age cohort.[14] We found that there were no statistically significant differences (the differences were numerically small) between the earnings of otherwise comparable self-employed veterans and nonveterans.

Let us now consider women. Few of the differences reported below are statistically

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12. In interpreting this result, recall that our sample excludes professionals such as doctors and lawyers.

13. Note than 80 percent of the men in our sample live in urban areas.

14. We considered men who were younger than 34 years in 1979 and therefore 18 or younger in 1964.

significant. The major reason for this lack of statistical significance is that there are relatively few self-employed women with the attributes being considered. For example, of the 833 self-employed women in our 1980 sample only 14 were veterans, only 35 were black, and only 68 were immigrants. Consequently, the differences reported below should be viewed with a good deal of caution.

1. Relative to nonveterans, veterans of the Vietnam-era and later earn 145 percent more than nonveterans and veterans of other eras earn 97 percent more than nonveterans. But these differences are measured with a great deal of imprecision and are not statistically significant.
2. Black women earn 16.7 percent more than do otherwise comparable non-blacks women. Asian women earn 31.9 percent less than do otherwise comparable non-Asian women. These difference are not statistically significant.
3. Immigrants initially earn 29 percent more than do nonimmigrants and earn an additional 1 percent more for each year they remain in this country. Again, these differences are not statistically significant.
4. Entrepreneurial earnings increase with education through college but then decline with further education past college. These differences are not statistically significant and it is possible that education has no influence on entrepreneurial earnings for women.
5. Entrepreneurial earnings increase at at decreasing rate with age. For a 44 year old woman with 12 years of education--the typical women in our sample--entrepreneurial earnings increase by about 6.2 percent per year. This relationship is statistically significant.
6. Finally, collecting some miscellaneous results, handicapped women earn 48.1 percent less than otherwise comparable non-handicapped women. (This result is statistically significant.) Women who speak English poorly earn 32 percent less than otherwise comparable women who speak English well. (This difference is not statistically significant.) Women who live in urban areas earn 14.3 percent less than women who live in

rural areas. (This difference is almost statistically significant.) Relative to women in operator occupations, women in management occupations earn 270.0 percent more, women in sales occupations earn 251.3 percent more, women in service occupations earn 111.8 percent more, women in craft occupations earn 95.7 percent more, women in clerical occupations earn 36.5 percent more, and women in professional occupations earn 6.9 percent less. (These differences are statistically significant for management, sales, and service occupations.)

5.3--Taste, Ability, and Entrepreneurial Choice

With the results reported above it is possible to disentangle the impact of the taste for entrepreneurship from the ability for entrepreneurship. We can use the estimated equations for self-employment and wage earnings to predict the earnings that each individual in our sample can expect, based on his demographic characteristics, to earn in self-employment or in wage work. The relative difference between self-employment and wage earnings captures differences in entrepreneurial ability. We can then examine the impact of demographic characteristics on the propensity of individuals who have the same entrepreneurial ability to choose to become entrepreneurs. We can attribute differences in entrepreneurial choice due to differences in demographic characteristics to differences in taste because we have controlled for differences in entrepreneurial ability.

We completed the analysis on taste and ability only for men in 1980. We find several interesting results.

1. The probability that an individual chooses self-employment over wage work increases with the difference in expected earnings from self-employment and wage work. This result is consistent with Lucas' theory that differences in entrepreneurial ability determine who

become an entrepreneur.

2. For technical reasons that are described more fully in Appendix B, the particular way in which the probability to choose self-employment varies with expected self-employment and wage earnings tells us something about the level and distribution of risk aversion in the sample. We find that individuals are not risk averse--they are in fact neutral towards risk--and the degree of risk aversion does not appear to vary across individuals.

3. The "taste" for entrepreneurship is statistically significantly lower for blacks, urban dwellers, people who speak English poorly, and veterans of all eras and statistically signficantly higher for older people and handicapped people than for otherwise comparable people.

CHAPTER 6

CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This report has developed and estimated a model of entrepreneurial choice and success. It has used the estimated model to test various alternative hypotheses concerning the relationship between various socioeconomic and demographic variables, the propensity to become self-employed, and financial success at self-employment. The results have several implications for existing theories of entrepreneurship.

First, the evidence is consistent with the theory proposed by Lucas (1978) that individuals who are more able at entrepreneurship start businesses and that individuals who are less able at entrepreneurship work for someone else. Individuals whose expected earnings are relatively higher at self-employment than at wage work tend to become self-employed.

Second, the evidence is not consistent with Kihlstrom and Laffont's theory based on relative risk aversion. The evidence suggests that the degree of risk preference is constant across the population and that people are neutral towards risk. These findings are not consistent with the assumptions of Kihlstrom and Laffont's model.

Third, the evidence is not consistent with Shapero's theory that displaced persons tend to become entrepreneurs. Individuals who have been divorced are no more likely to become entrepreneurs than are individuals who have not been divorced. Recent veterans are less likely to become entrepreneurs than are nonveterans.

Fourth, the evidence is not consistent with the various sociological studies that claim that immigrants are more likely to become entrepreneurs.[1]

Fifth, the evidence is consistent with various psychological studies that find that

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1. It is important to note, however, that the census may undersample illegal immigrants and immigrants who speak poor English.

self-employed workers are intrinsically different from wage workers. Men who have relatively low earnings power because of unobservable attributes (such as psychological characteristics) tend to choose self-employment while women who have relatively high earnings power because of unobservable attributes tend to choose self-employment.

This report has developed what we believe to be a promising approach towards the study of self-employed workers, has identified a number of empirical regularities concerning entrepreneurial choice and success, and has discarded some preconceptions--that immigrants are more likely to become self-employed for example--that were based on limited evidence. Although this report has addressed many important questions concerning the determinants of entrepreneurial choice and success, many other questions remain unanswered because of the limited data available on people who work for themselves.

Data on previous work experience (in either self-employment or wage work, in related or unrelated occupations, in family-owned or other business, for example), type of education (vocational training or college major for example), and IQ would be help us gain a better understanding of the impact of individual's "human capital" on entrepreneurial choice and success.[2] Longitudinal data--that is data that track an individual over time--would help us determine when and why people switch between self-employment and wage work and would help us sort out the influence of human capital accumulated in wage work on subsequent self-employment income and vice versa. Further research should be devoted to collecting and analyzing more comprehensive longitudinal data on people who operate their own businesses and people who work for someone else.

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2. Some of these data are available on other datasets--notably the National Longitudinal Surveys which contain information on work experience and vocational training--but these datasets provide information on too few self-employed workers for reliable statistical analysis.

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5.1—Tests of the Influence of Various Demographic Characteristics on Entrepreneurial Earnings.

The first question we address is whether entrepreneurs have different unobservable characteristics than workers. They do. In 1980, the coefficient of lambda is significantly different from zero for both men and women entrepreneurs. The coefficient for men indicates that the correlation between unobservable characteristics that determine the probability of entrepreneurship and unobservable characteristics that determine entrepreneurial earnings is -0.64, a relatively high correlation.[5] The coefficient for women indicates that the correlation between unobservable characteristics that determine the probability of entrepreneurship and unobservable characteristics that determine entrepreneurial earnings is +0.74, again a relatively high correlation. In 1970, the coefficients of lambda were large but imprecisely estimated and therefore not significantly different from zero. The estimated correlation for men was -0.63 and for women was +0.25.

The second question we address concerns the impact of military service on entrepreneurial earnings. For men in 1970 and women in 1980 there was no significant relationship between military service in any era on entrepreneurial earnings.[6] For men in 1980 there was no significant relationship between military service in the Vietnam War era or the preceding era. For men in 1980 veterans of the post-Vietnam War era earned significantly more at entrepreneurship than did nonveterans or veterans. It turns out, however, that this result is spurious. It is due to what is

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5. Correlations range from -1 to +1; the degree of correlation is greater the closer the correlation coefficient is to -1 or 1.

6. Note that there were no data on female veterans in 1970.

known in the labor economics literature as a "cohort effect". When this effect is taken into account, the premium received by post-Vietnam veterans disappears.[7]

5.2--The Impact of Demographic Characteristics on Entrepreneurial Earnings

Table 5.1 reports the impact of various demographic characteristics on entrepreneurial earnings. Two kinds of numbers are reported. For continuous variables we report the percentage change in entrepreneurial earnings due to a percentage change in the variable under consideration (and under the assumption that all the other variables stay the same). Thus a number like 1.5 for age would imply that a 1 percent change in age leads to a 1.5 percent change in entrepreneurial earnings.[8] For dichotomous variables we report the percentage difference in earnings between people who possess the characteristic measured by the variable and people who do not possess the characteristic, but are otherwise comparable. Thus a number like 7.5 for Asians implies that Asians earn 7.5 percent more than non-Asians with the same education, age, and other demographic characteristics.

Several interesting relationships concerning the impact of various personal characteristics

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7. The cohort effect is due to the fact that the regressions do not adequately control for the impact of age. In order to correct for the cohort effect, we must compare individuals who are in the same age cohort, i.e. who are roughly the same age. Regression results for men who turned age 18, and thus became eligibile for the draft, after 1964 are reported in Appendix C.

8. And, equivalently, that a 10 percent change in age leads to a 15 percent change in entrepreneurial earnings.

9. We emphasize that the following discussion we are comparing the self-employment earnings of individuals with different demographic characteristics. We are <u>not</u> comparing self-employment earnings with wage earnings.

on self-employment earnings appear.[9] We first consider men.

1. Relative to nonveterans, veterans of the post-Vietnam era earn 70 percent more, veterans of the Vietnam era earn 10 percent more, veterans of the era between Korea and Vietnam earn 1.2 percent more, veterans of the Korean era earn 2.7 percent less, veterans of World War II earn 3 percent less, and veterans of the pre-World War II era earn 14.8 percent less. All of these differences except that for recent veterans could be due to chance.
2. Blacks earn almost 20 percent more than do otherwise comparable non-blacks. Asians earn almost 6 percent more than do otherwise comparable non-Asians. These differences, however, might be do to chance.[10]
3. An immigrant to this country initially earns about 30 percent less than an otherwise comparable nonimmigrant. But his earnings increase by 1.7 percent for every year he remains in this country. By the time he has been in this country for 21 years he makes as much as otherwise comparable nonimmigrants. Immigrants who have been in this country for more than 21 years earn more than nonimmigrants.
4. Entrepreneurial earnings vary systematically with education.[11] Relative to individuals who have a high school education, men with only an elementary school education earn 18.5 percent less, men who dropped out of high school earn 13.4 percent less, men who dropped out of college earn 9 percent more, men who completed college earn 36.1 percent more, and men who went on to graduate work earn 23 percent more. It is notable that men who have

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10. They are not statistically signficantly different from zero, but given that there are few self-employed blacks and Asians in our sample this lack of statistical significance may simply reflect the lack of data necessary for precise estimates.

11. The calculations reported below are for a 42 year old men. The earnings differences would be smaller for younger men. They incorporate the coefficients on the educational attainment dummies, the coefficient on education times age, and the coefficient on education times veteran status.

Table 5.1

IMPACT OF DEMOGRAPHIC CHARACTERISTICS ON SELF-EMPLOYMENT EARNINGS[a]
1980

Characteristic	Percent Differences: Males	Females
Urban	43.73*	-14.22*
Black	19.71	16.72
Asian	5.57	-31.87
Immigrant	-30.42*	29.73
Poor English	-11.49	31.93
Elementary School Education	8.82	-23.88
High School Dropout	-7.75	-16.97
High School Graduate	0.00	0.00
College Dropout	-0.32	-2.72
College Graduate	13.42*	28.34
Postgraduate	-6.31	32.39
Handicapped	-37.54*	-38.50*
Post-Vietnam War Era Veterans	70.47*	-
Vietnam War Era Veterans[c]	10.16	146.97
Pre-Vietnam War Era Veterans	1.18	-

Korean War Era Veterans	-2.69	-
World War II Era Veterans	2.97	-
Other Veterans	-14.75	197.41
Nonveterans	0.00	0.00
Managers	-23.13*	370.06*
Professionals	0.26	6.68
Salesmen	-52.72*	351.35*
Clerical Workers	10.75	7.45
Service Workers	-10.95	211.28*
Craftsmen	-40.25*	95.78*
Operators	0.00	0.00
Percent change in earnings per year of:[b]		
Education	0.71+0.09Age*	-0.04Age
Age	9.04-0.39Age*	9.10-0.66Age*
Residence in this country for immigrant	1.70*	1.04

* Difference is statistically significant.

[a] Calculated from the estimated earnings equations reported in Tables C.4b and C.4d in Appendix C. Entries equal the percentage difference in earnings between people who possess the characteristic and otherwise comparable people who do not possess the characteristic. A dash indicates that estimates were not obtained for the variable because preliminary analysis indicated that the variable was not an important determinant.

[b] The percentage change in earnings due to a change in education or age varies with age level. To find the percentage change at any particular age level insert the relevant value of age (e.g., 42 for the average individual in the sample) for Age in the expression.

[c] Includes Post-Vietnam Era veterans.

done postgraduate work actually earn less than men who stopped at college.[12]

5. Entrepreneurial earnings initially increases and then decreases with age. For men with 12 years of education, a 42 year old man makes 17.7 percent more than a 60 year old man and 3.5 percent less than a 24 year old man. Earnings decline with age for men older than 28 who have 12 years of education. For men with 16 years of education, a 42 year old man makes 10.1 percent more than a 60 year old man and 3.1 percent more than a 24 year old man. Earnings decline with age for men older than 37 who have 16 years of education.

6. Finally, collecting some miscellaneous results, handicapped men earn 47.6 percent less than otherwise comparable non-handicapped men. (This difference is significantly different from zero). Men who speak English poorly earn 11.5 percent less than otherwise comparable men who speak English well. (This difference could be due to chance.) Men who reside in urban areas earn 43.7 percent more than men who reside in rural areas. (This difference is significantly different from zero.)[13]

The first result reported above for veterans of the Vietnam War and post-Vietnam War eras could be spurious. It might result from the partial failure of our statistical analysis to control for the relationship between earnings and age. In order to test for this possibility, we estimated the earnings equations for men who came of draft age during or after the Vietnam War era and who therefore belong to the same age cohort.[14] We found that there were no statistically significant differences (the differences were numerically small) between the earnings of otherwise comparable self-employed veterans and nonveterans.

Let us now consider women. Few of the differences reported below are statistically

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12. In interpreting this result, recall that our sample excludes professionals such as doctors and lawyers.

13. Note than 80 percent of the men in our sample live in urban areas.

14. We considered men who were younger than 34 years in 1979 and therefore 18 or younger in 1964.

significant. The major reason for this lack of statistical significance is that there are relatively few self-employed women with the attributes being considered. For example, of the 833 self-employed women in our 1980 sample only 14 were veterans, only 35 were black, and only 68 were immigrants. Consequently, the differences reported below should be viewed with a good deal of caution.

1. Relative to nonveterans, veterans of the Vietnam-era and later earn 145 percent more than nonveterans and veterans of other eras earn 97 percent more than nonveterans. But these differences are measured with a great deal of imprecision and are not statistically significant.
2. Black women earn 16.7 percent more than do otherwise comparable non-blacks women. Asian women earn 31.9 percent less than do otherwise comparable non-Asian women. These difference are not statistically significant.
3. Immigrants initially earn 29 percent more than do nonimmigrants and earn an additional 1 percent more for each year they remain in this country. Again, these differences are not statistically significant.
4. Entrepreneurial earnings increase with education through college but then decline with further education past college. These differences are not statistically significant and it is possible that education has no influence on entrepreneurial earnings for women.
5. Entrepreneurial earnings increase at at decreasing rate with age. For a 44 year old woman with 12 years of education--the typical women in our sample--entrepreneurial earnings increase by about 6.2 percent per year. This relationship is statistically significant.
6. Finally, collecting some miscellaneous results, handicapped women earn 48.1 percent less than otherwise comparable non-handicapped women. (This result is statistically significant.) Women who speak English poorly earn 32 percent less than otherwise comparable women who speak English well. (This difference is not statistically significant.) Women who live in urban areas earn 14.3 percent less than women who live in

rural areas. (This difference is almost statistically significant.) Relative to women in operator occupations, women in management occupations earn 270.0 percent more, women in sales occupations earn 251.3 percent more, women in service occupations earn 111.8 percent more, women in craft occupations earn 95.7 percent more, women in clerical occupations earn 36.5 percent more, and women in professional occupations earn 6.9 percent less. (These differences are statistically significant for management, sales, and service occupations.)

5.3--Taste, Ability, and Entrepreneurial Choice

With the results reported above it is possible to disentangle the impact of the taste for entrepreneurship from the ability for entrepreneurship. We can use the estimated equations for self-employment and wage earnings to predict the earnings that each individual in our sample can expect, based on his demographic characteristics, to earn in self-employment or in wage work. The relative difference between self-employment and wage earnings captures differences in entrepreneurial ability. We can then examine the impact of demographic characteristics on the propensity of individuals who have the same entrepreneurial ability to choose to become entrepreneurs. We can attribute differences in entrepreneurial choice due to differences in demographic characteristics to differences in taste because we have controlled for differences in entrepreneurial ability.

We completed the analysis on taste and ability only for men in 1980. We find several interesting results.

1. The probability that an individual chooses self-employment over wage work increases with the difference in expected earnings from self-employment and wage work. This result is consistent with Lucas' theory that differences in entrepreneurial ability determine who

become an entrepreneur.

2. For technical reasons that are described more fully in Appendix B, the particular way in which the probability to choose self-employment varies with expected self-employment and wage earnings tells us something about the level and distribution of risk aversion in the sample. We find that individuals are not risk averse--they are in fact neutral towards risk--and the degree of risk aversion does not appear to vary across individuals.

3. The "taste" for entrepreneurship is statistically significantly lower for blacks, urban dwellers, people who speak English poorly, and veterans of all eras and statistically significantly higher for older people and handicapped people than for otherwise comparable people.

CHAPTER 6

CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This report has developed and estimated a model of entrepreneurial choice and success. It has used the estimated model to test various alternative hypotheses concerning the relationship between various socioeconomic and demographic variables, the propensity to become self-employed, and financial success at self-employment. The results have several implications for existing theories of entrepreneurship.

First, the evidence is consistent with the theory proposed by Lucas (1978) that individuals who are more able at entrepreneurship start businesses and that individuals who are less able at entrepreneurship work for someone else. Individuals whose expected earnings are relatively higher at self-employment than at wage work tend to become self-employed.

Second, the evidence is not consistent with Kihlstrom and Laffont's theory based on relative risk aversion. The evidence suggests that the degree of risk preference is constant across the population and that people are neutral towards risk. These findings are not consistent with the assumptions of Kihlstrom and Laffont's model.

Third, the evidence is not consistent with Shapero's theory that displaced persons tend to become entrepreneurs. Individuals who have been divorced are no more likely to become entrepreneurs than are individuals who have not been divorced. Recent veterans are less likely to become entrepreneurs than are nonveterans.

Fourth, the evidence is not consistent with the various sociological studies that claim that immigrants are more likely to become entrepreneurs.[1]

Fifth, the evidence is consistent with various psychological studies that find that

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1. It is important to note, however, that the census may undersample illegal immigrants and immigrants who speak poor English.

self-employed workers are intrinsically different from wage workers. Men who have relatively low earnings power because of unobservable attributes (such as psychological characteristics) tend to choose self-employment while women who have relatively high earnings power because of unobservable attributes tend to choose self-employment.

This report has developed what we believe to be a promising approach towards the study of self-employed workers, has identified a number of empirical regularities concerning entrepreneurial choice and success, and has discarded some preconceptions--that immigrants are more likely to become self-employed for example--that were based on limited evidence. Although this report has addressed many important questions concerning the determinants of entrepreneurial choice and success, many other questions remain unanswered because of the limited data available on people who work for themselves.

Data on previous work experience (in either self-employment or wage work, in related or unrelated occupations, in family-owned or other business, for example), type of education (vocational training or college major for example), and IQ would be help us gain a better understanding of the impact of individual's "human capital" on entrepreneurial choice and success.[2] Longitudinal data--that is data that track an individual over time--would help us determine when and why people switch between self-employment and wage work and would help us sort out the influence of human capital accumulated in wage work on subsequent self-employment income and vice versa. Further research should be devoted to collecting and analyzing more comprehensive longitudinal data on people who operate their own businesses and people who work for someone else.

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2. Some of these data are available on other datasets--notably the National Longitudinal Surveys which contain information on work experience and vocational training--but these datasets provide information on too few self-employed workers for reliable statistical analysis.

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APPENDIX A

ECONOMIC THEORIES OF THE ENTREPRENEUR

The following theories highlight different aspects of business behavior. The Lucas theory views the differing levels of business acumen among individuals as the major determinant of business formations, dissolutions, and growth. The Kihlstrom and Laffont theory views the differing tastes for risk among individuals as the major determinant of business formations, dissolutions, and growth.

A.1--Lucas Model

Lucas (1978) explores the implications of the assumption that individuals have differing endowments of what might be called business acumen or managerial ability. He considers an economy in which there are N individuals and K units of capital. Each individual is indexed by his managerial ability a. The distribution of managerial ability across the population is G(a).[1] Each firm consists of a single manager and the labor and capital he controls.

A firm run by manager a can produce

(A.1) $q = x f(l,K)$

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1. Lucas assumes that managerial ability is exogenously given. Individuals cannot invest in acquiring managerial ability. We discuss this assumption later in this section.

units of output where f(l,K) exhibits diminishing returns to scale.[2]

The production function (A.1) implies cost functions of the form xc(q;r,w) where r is the rental rate of capital, w is the wage rate, x=1/a denotes the manager's inefficiency level, and where c(q;r,w) exhibits decreasing returns to scale. The average and marginal cost curves that correspond to q=f(l,K) for given factor prices r and w are drawn in Figure A.1 for three different managerial inefficiency levels. Assuming there are a sufficient number of firms for perfect competition to arise, each firm produces at the point where price equals marginal cost. More efficient managers (lower x's and higher a's) produce more output (and employ more labor and capital) than less efficient managers (higher x's and lower a's). The best manager cannot achieve a monopoly because he has decreasing returns to scale.[3] For example, Figure A.1 shows that the best manager x_1 has higher marginal costs for producing units greater than q_1 than has the poorest manager x_3 for producing units smaller than q_3. When industry price is p, the best manager will never expand past q_3 because poorer managers can always produce these units at a lower cost.

The equilibrium for this economy is characterized by an allocation of individuals across managing and working. This allocation is feasible if the demand for workers equals the supply of workers and the demand for capital equals the supply of capital. Let l(a) represent the demand for labor and K(a) represent the demand for capital by a firm managed by individual a. Then if individuals with $0 < a < \underline{a}$ work and individuals with $\underline{a} \leq a < \infty$ manage,

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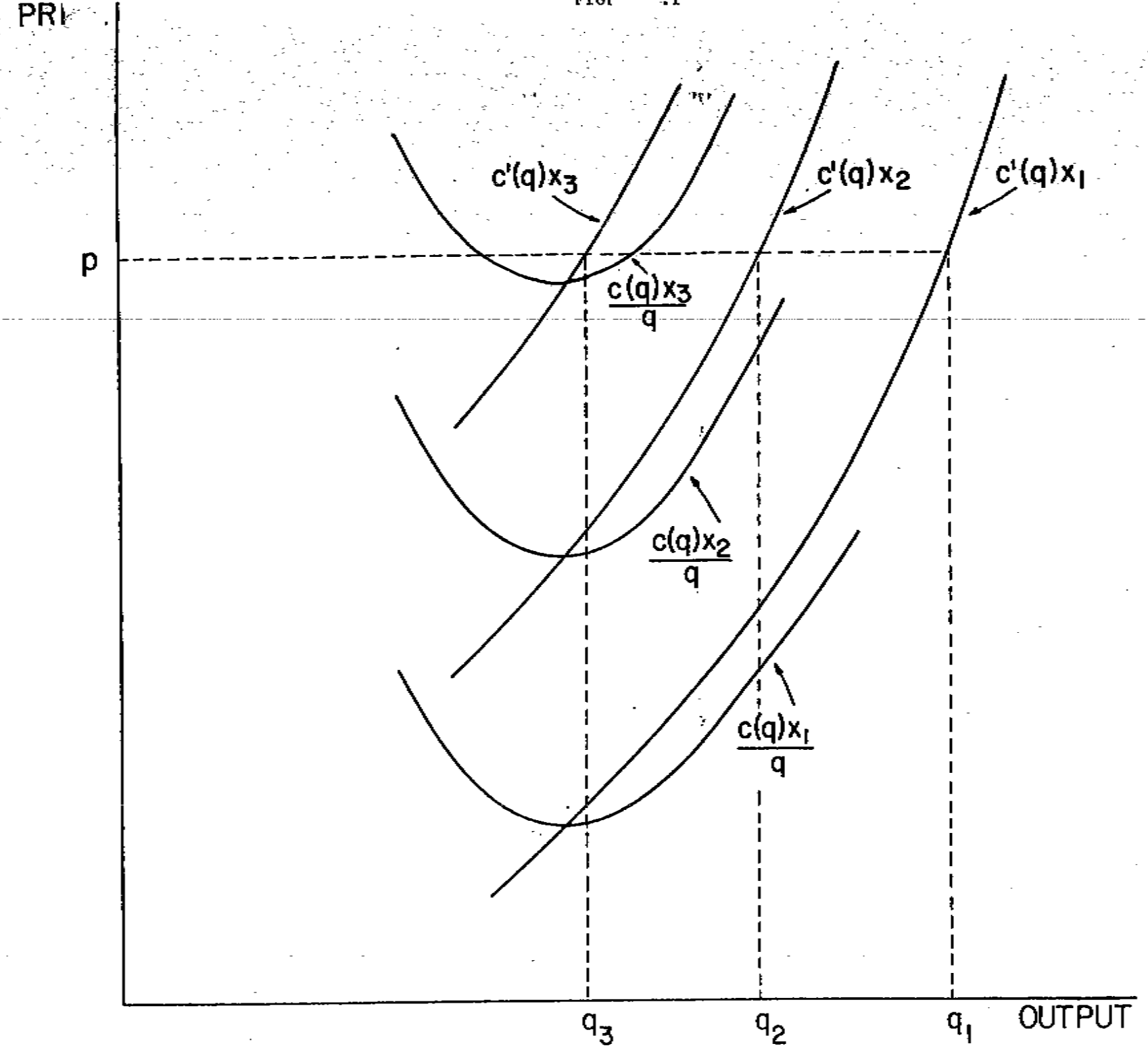
2. Lucas assumes that individuals have access to a common constant-returns-to-scale production technology with which the "typical" manager can produce h(l,K) units of output. Individuals have differing managerial technologies that are characterized by diminishing returns to scale (or decreasing "span of control"). The production-cum-managerial technology is described by q=ag[f(l,K)] where a is the ability level of the manager and g exhibits diminishing returns to scale. In our notation, h(l,K)=g[h(l,K)].

3. This statement assumes, of course, that market demand is large at a price equal to the minimum average cost of the best manager.


PRI
p
c'(q)x3
c'(q)x2
c'(q)x1
c(q)x3
q
c(q)x2
q
c(q)x1
q
q3
q2
q1
OUTPUT

$$(A.2) \qquad \int_{\underline{a}}^{\infty} l(a)dG(x)=NG(\underline{a})$$

is the condition that the aggregate demand for labor equals the aggregate supply of labor and[4]

$$(A.3) \qquad \int_{\underline{a}}^{\infty} k(a)dG(x)=K$$

is the condition that the aggregate demand for capital equals the aggregate supply of capital. This allocation of individuals across working and managing is efficient if it maximizes the output produced by firms. Therefore $\underline{a}$ must solve

$$(A.4) \qquad \underset{\underline{a}}{Max}\left\{\int_{\underline{a}}^{\infty} af(l,k)dG(x)\right.$$

subject to (A.2) and (A.3).

In order to ensure that there exists a unique allocation of individuals across managing and working that is both feasible and efficient, Lucas invokes Gibrat's Law discussed earlier in this chapter.[5] He shows that when the growth rates of the capital and labor employed by a firm are independent of its size the production function f(l,k) must have a particular form.[6] He then shows that when the production function has this particular form there is a unique $\underline{a}$ that solves the maximization problem (A.4).

This simple model of the size distribution of firms has an interesting implication for the

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4. $G(\underline{a})$ is by definition the fraction of individuals with $0<a<\underline{a}$.

5. See Lucas(1978, pp. 514-517) for detailed discussion. Note that Evans (1984) finds that Gibrat's Law did not hold for manufacturing firms between 1976 and 1982.

6. In terms of footnote 2, Gibrat's Law implies that g() has the Cobb-Douglas form $A[h(l,k)]^{\beta}$ where $0<\beta<1$. If h(l,k) is a constant returns to scale Cobb-Douglas function, then the fact that g() is Cobb-Douglas with decreasing returns to scale implies that f(l,k) is a decreasing returns to scale production function.

average firm size over time. When the elasticity of substitution between capital and labor is less than unity, average firm size is an increasing function of the wealth of the economy.[7] The reason for this relationship is that when the elasticity of substitution is less than unity, an increase in the capital stock increases the returns from working and decreases the returns from managing. Marginal managers find they can make more money working so they close down their firms. Since fewer firms employ more workers average firm size decreases.

Lucas tested this implication of his theory by regressing employees per firm (as a proxy for average firm size) against per capita gross national product (as a proxy for the per capita capital stock). He found a statistically significant positive relationship between average firm size and the capital stock. He estimated that a one percent increase in gross national product causes an approximately one percent increase in employees per firms.[8]

This relationship may explain the secular decline in the share of small businesses. As our economy becomes wealthier, each worker has greater capital to work with, becomes more productive, and receives a higher wage. The gains from working fall relative to managing. Fewer individuals become entrepreneurs but those who do form bigger firms.[9]

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[7] For evidence that the elasticity of substitution is less than unity see Robert E. Lucas (1969). When the elasticity of substitution is greater than unity, average firm size is a decreasing function of the wealth of the economy.

[8] Lucas used three alternative definitions of firms: Dun and Bradstreet concerns for 1900-1970; establishments of the Census firms for 1929-1963; and Bureau of the Census manufacturing firms for 1947-1963. Depending upon the series he used the estimated elasticity ranged from 0.8 to 1.0 (see Lucas (1978), Tables 1 and 2, for further details.

[9] In reality, the Lucas model is much too abstract and depends upon too many questionable assumptions for us to place much faith in this explanation. For example, the evidence in support of Gibrat's Law and in support of the elasticity of substitution between capital and labor being less than unity is much less solid than Lucas suggests.

A.2--Kihlstrom and Laffont Model

There is no uncertainty in Lucas' model discussed above. Individuals are sure about demand and cost conditions as well as about their ability to run a business. They weigh a certain profit from running their own business against a certain wage from working for someone else. If the former is larger (smaller) than the latter they become entrepreneurs (workers). Therefore, these individuals bear no risk.

Bearing risk, however, is an unavoidable aspect of running a business. Entrepreneurs are unsure of their own abilities, uncertain about the demand for their perhaps innovative product, and inexperienced at estimating production costs. The model we discuss in this section focuses on the implications of the fact that entrepreneurs bear more risk than workers.[10]

Individuals have access to the same technology for producing a product.[11] The technology is described by the production function

$$q = f(l,v) \qquad (A.11)$$

where q is output, l is labor from workers hired by the entrepreneurs, and v is a random variable that varies from zero to ∞. This technology is risky. Entrepreneurs who draw a high value of v will produce more than entrepreneurs who draw a low value of v for any given input of labor l. All

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10. Workers bear risk over their life cycle as well. An individual beginning his career is uncertain about how quickly he will advance and thus about the income stream he will receive in the future. But casual observation suggests that this risk is less severe than that for an entrepreneur. Moreover, the worker is certain of the wage he will receive for an hour of labor whereas the entrepreneur is uncertain of the profit he will retain from an hour of entrepreneurship.

11. This model was developed by Kihlstrom and Laffont (1979).

individuals face the same distribution of the random variable v which may be correlated across firms, in which case all firms tend to get a good or bad draw at the same time.

Individuals maximize expected utility. Utility is given by

(A.12) $U=U(I,\rho)$

where I is the income they receive from either working or managing and ρ is an index of how risk averse the individual is.[12] More risk averse individuals have higher ρ's.[13] All individuals are either indifferent to risk or averse to risk. The assumption that individuals are never risk preferrers may seem contrary to the popular view of the entrepreneur as a gambler. But most entrepreneurs take calculated risks rather than outright gambles.[14]

Individuals can either work and earn a certain competitive wage of w or entrepreneur and earn a risky profit of

(A.13) $\pi(l,v)=f(l,v)-wl$

An individual whose becomes an entrepreneur will employ $l^*(w,\rho)$ workers where $l^*(w,\rho)$ maximizes expected utility[15]

(A.15) $\text{Max}E[U(A+q(l,v)-wl,\rho)]$

An entrepreneur who hires l^* workers earns risky profits equal to $\pi^*=\pi(\overset{*}{l},v)$. He will entrepreneur if the expected utility from running a business exceeds the certain wage he will

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12. U_I and U_{II} exist and are continuous. Marginal utility is positive and increasing so that $U_{II}\geq 0$.

13. Formally, the absolute risk aversion measure $r(I,\rho)=-U_{II}/U_I$ is nondecreasing in ρ.

14. See the discussion in Section 2.1 of Chapter 2.

15. In order to prevent the possibility of bankruptcy, Kihlstrom and Laffont assume that individuals begin with A units of income and are constrained to hire fewer than A/w workers.

receive as a worker

(A.16) $$E[U(A+\pi^{*}(w,\rho),\rho)] \geq U(A+w,\rho)$$

and work otherwise.

The equilibrium division of individuals between laborers and entrepreneurs occurs at that wage rate where the labor demanded by individuals who become entrepreneurs equals the labor supplied by individuals who become workers. Kihlstrom and Laffont show that a unique equilibrium exists. They then study the properties of this equilibrium which we now summarize.

More risk averse entrepreneurs run smaller firms. This result holds when the random variable v affects the marginal product of labor in the same way. For example, a lucky draw of v makes the marginal worker more productive and increases output. This relationship holds when output is multiplicative in the random variable, $f(l,v)=vh(l)$.

When all individuals become more risk averse, the equilibrium wage falls.[16] An economy-wide increase in risk aversion increases the supply of workers because more individuals prefer a riskless wage and decreases the demand for workers because entrepreneurs hire fewer workers in order to decrease their risk. The increase in the supply of workers together with the decrease in the demand for workers depresses the wage rate.[17]

The equilibrium allocation of individuals across working and entrepreneuring is inefficient.[18] There are several sources of inefficiency. First, more less risk averse firms

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16. See Kihlstrom and Laffont (1979) Theorem 4, p. 730 for the precise conditions under which this result holds.

17. The decrease in the demand for workers holds only when the previous proposition holds.

18. The equilibrium is inefficient in the sense that a benevolent social dictator could select an allocation of individuals and a distribution of income under which at least one individual would be better off and no individual would be worse off than under the equilibrium allocation.

produce less output than more risk averse firms. But if all firms have access to the same technology society would like all firms to produce the same level of output. To see this, suppose firm A produced more than firm B. Because there are diminishing returns to scale, firm A has higher marginal costs of production than firm B. Society could produce the combined output of these firms at a lower cost by shifting production from the high cost firm A to the low cost firm B until the marginal costs of these two firms are equalized. The desire by less risk averse individuals to run larger firms therefore decreases social welfare. Second, only entrepreneurs bear risk in equilibrium. It is socially more efficient to diversify these risks across all individuals in the economy.[19] Third, in general there will be either too few or too many entrepreneurs. On the one hand, the fact that people are risk averse causes too few individual to become entrepreneurs. On the other hand, the fact that risk-averse entrepreneurs hire too few workers depresses the wage rate and encourages too many individuals to become entrepreneurs. These offsetting effects would cancel each other out and lead to the correct number of entrepreneurs only under the most fortuitous circumstances.[20]

Given the maldistribution of risk across individuals, the equilibrium is efficient. The maldistribution of risk discussed above causes too many or too few firms to form and leads these firms to hire too few workers. The maldistribution of risk in this model is due to the lack of a mechanism like a stock market for sharing risks. If we accept this institutional lacuna as given, then it is not possible to improve social welfare by reassigning workers and entrepreneurs.

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19. This inefficiency would not arise if all individuals were indifferent to risk.

20. Kihlstrom and Laffont consider several special cases. When all individuals have the same degree of risk aversion it is possible to show that there are too many entrepreneurs in equilibrium. A special case where this occurs is when the production technology exhibits constant returns to scale. In this case it is optimal to have only one firm. But the desire of individuals to avoid risk will lead to the creation of more than one firms. When all individuals are indifferent to risk it is possible to show that there will be the correct number of entrepreneurs in equilibrium. See Kihlstrom and Laffont (1979, pp. 740-743).

If we allow entrepreneurs to diversify risk through a stock market, then the resulting equilibrium is efficient. Kihlstrom and Laffont show that a stock market is required to achieve an efficient equilibrium if there is a fixed cost of setting up a firm and there is uncertainty and a large number of entrepreneurs are risk averse.[21] A stock market is not needed to achieve an efficient equilibrium if any of these features are absent. An important implication of the existence of a stock market is that entrepreneurship is no longer restricted to risk averse individuals. An efficient stock market permits individuals to diversify their risk away. Consequently, an entrepreneur need not bear any more risk than a worker.[22]

---

21. In the model discussed above the fixed cost is the w that the entrepreneur must forego when he entrepreneurs instead of works.

22. In reality stock markets are not entirely efficient because entrepreneurs differ in their abilities and because investors do not have perfect information concerning these abilities. Moreover, because there are substantial fixed costs in floating stock it is difficult for entrepreneurs running small firms to diversify their risk through a stock sale.

APPENDIX B

THEORETICAL FRAMEWORK

This appendix presents a model of entrepreneurial choice patterned after Robert E. Lucas (1978), S. Kanbur (1979), and Richard Kihlstrom and Jean-Jacques Laffont (1979). The model is also consistent with many of the psychological and sociological theories on entrepreneurship discussed in the previous appendix.

Following Kihlstrom and Laffont (1979) individuals maximize expected utility. Utility is given by

(B.1) $U(I(x|s),z,a|\beta,s)$

where I is wage (s=0) or entrepreneurial (s=1) earnings, x, z, and a are characteristic vectors that vary across individuals, and $\beta\alpha$ is a vector of parameters that measure risk aversion. [1] The vector x measures observable characteristics of individuals that affect their expected income from working or entrepreneuring. These characteristics include the usual demographic and human capital indicators. The vectors z and a summarize, respectively, observable and unobservable

---

1. This formulation is similar in spirit but not identical to Kihlstrom and Laffont. Kihlstrom and Laffont assume that the risk aversion parameters are distributed across the population but that expected income is the same for all individuals in the population. We assume that the risk aversion parameters are constant across the population but that expected income varies across the population. Both assumptions lead to a distribution of relative risk aversion across the population since the degree of risk aversion depends upon expected income.

characteristics of individuals that affect the utility they derive from income.[2] Observable characteristics include the individual's family status such as whether a person has been divorced and other demographic attributes such as a person's race. Unobservable characteristics include psychological differences across individuals that affect their relative enjoyment of entrepreneurship (following McClelland and Winter who find that entrepreneurs like to be in charge).

In order to obtain an estimable model it is necessary to place more structure on the utility function given by (B.1). First, it is useful to assume that utility is separable in income, observable taste characteristics, and unobservable [C characteristics

$$U(I(x|s),z,a|\rho)=U(I(x|s),\rho)v(z|s)u(a|s) \tag{B.2}$$

Second, it is useful to assume that the income component of utility is given by the following translog approximation

$$U(I(x|s),\rho)=\exp[\gamma \ln I(x)+\tfrac{1}{2}\beta(\ln I(x))^2] \tag{B.3}$$

where $\rho=(\gamma,\beta)$. This approximation allows the degree of risk aversion to vary across income levels and includes constant relative risk aversion as a special case. The properties of this utility function are explored below.

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2. The vectors x and z may have elements in common. Education, for example, may affect the "taste" for entrepreneurship as well as the entrepreneurial and wage earnings.

Entrepreneurial and wage earnings are given by

(B.4) $\ln I(x|s=1)=\ln e(x)+\epsilon_e$

(B.5) $\ln I(x|s=0)=\ln w(x)+\epsilon_w$

where ϵ_e is normally distributed with mean zero and variance σ_{ee} and ϵ_w is normally distributed with mean zero and variance σ_{ww}. Thus entrepreneurial earnings and wage earnings are both uncertain from the standpoint of the individual choosing between these alternative pursuits.[3] The degree of uncertainty is proportional to expected earnings.

An individual chooses to entrepreneur (s=1) if the expected utility from entrepreneurship exceeds the expected utility from working

(B.6) $E(U(I(x|s=1),z,a|\rho,s=1))>E(U(I(x|s=0),z,a|\rho,s=0))$

and chooses to work (s=0) if ">" in (6) is replaced by "<". Substituting from (B.2) into (B.6) yields

$$E(U(I(x|s=1),\rho)v(z|s=1)u(a|s=1))$$
$$>E(U(I(x|s=0),\rho)v(z|s=0)u(a|s=0) \Longrightarrow$$
(B.7) $$v(z|s=1)u(a|s=1)E(U(I(x|s=1),\rho))$$
$$>v(z|s=0)u(a|s=1)E(U(I(x|s=0),\rho))$$

It is shown at the end of this appendix that

$$E(U(I(x|s=1))$$

---

3. The random disturbances in (B.4) and (B.5) are not necessarily the same random disturbances observed by the econometrician.

$$=E(\exp[\gamma \ln I(x|s=1)+\tfrac{1}{2}\beta(\ln I(x|s=1))^2])$$

$$=E(\exp[\gamma(\ln e(x)+\epsilon_e)+\tfrac{1}{2}\beta(\ln e(x)+\epsilon_e)^2])$$

(B.8) $$=\exp(c_{e0}+c_{e1}\ln e(x)+c_{e2}[\ln e(x)]^2)$$

where

(B.9) $$c_{e1}=\gamma+(\gamma\beta/[(1/\sigma_{\epsilon\epsilon})-\beta\sigma_{\epsilon\epsilon}])$$

(B.10) $$c_{e2}=\tfrac{1}{2}\beta+(\beta^2/2[(1/\sigma_{\epsilon\epsilon})-\beta\sigma_{\epsilon\epsilon}]$$

and c_{e0} is a function of γ, β, and σ_{ee}. Similarly

$$E(U(I(x|s=0))$$

(B.11) $$=\exp(c_{w0}+c_{w1}\ln w(x)+c_{w2}[\ln w(x)]^2)$$

where

(B.12) $$c_{w1}=\gamma+(\gamma\beta/[(1/\sigma_{\omega\omega})-\beta\sigma_{\omega\omega}])$$

(B.13) $$c_{w2}=\tfrac{1}{2}\beta+(\beta^2/2[(1/\sigma_{\omega\omega})-\beta\sigma_{\omega\omega}]$$

and c_{w0} is a function of γ, β, and $\sigma_{\omega\omega}$.

The event s=1 implies (B.6) which implies that

$$\ln E(U(I(x|s=1),z,a|\beta,s=1))>\ln E(U(I(x|s=0),z,a|\beta,s=0))$$

$$\Longrightarrow$$

(B.14) $$\ln v(z|s=1)+\ln u(a|s=1)+\ln E(U(I(x|s=1),\beta))$$
$$>\ln v(z|s=0)+\ln u(a|s=1)+\ln E(U(I(x|s=0),\beta))$$

Substitution of (B.8) and (B.11) into (B.14) yields

(B.15)
$$[c_{e0}-c_{w0}]$$
$$+\ [c_{e1}\ln e(x)-c_{w1}\ln w(x)]$$
$$+\ [c_{e2}[\ln e(x)]^2-c_{w2}[\ln w(x)]^2]$$
$$+\ [\ln v(z|s=1)-\ln v(z|s=0)]$$
$$>\ -[\ln u(a|s=1)-\ln u(a|s=0)]$$

Denote the left-hand side of (B.15) by

(B.16) $$V = [c_{e0}-c_{w0}] + [c_{e1}\ln e(x)-c_{w1}\ln w(x)] + [c_{e2}[\ln e(x)]^2-c_{w2}[\ln w(x)]^2] + [\ln v(z|s=1)-\ln v(z|s=0)]$$

Assume that the unobservable quantity

(B.17) $$\nu_{\tilde{p}}=[\ln u(a|s=1)-\ln u(a|s=0)]$$

is distributed normally with mean 0 and variance $\sigma_{\tilde{p}\tilde{p}}$ where $\sigma_{\tilde{p}\tilde{p}}$ is constant across individuals.

The probability that an individual with characteristics x and z will choose entrepreneurship is therefore given by

(B.18) $$P(s=1|x,z,\sigma)=P(\nu_{\tilde{p}}>-V/\sigma_{\tilde{p}\tilde{p}})=F(V/\sigma_{\tilde{p}\tilde{p}})$$

where P denotes the probability of an event and F is the cumulative normal distribution with mean 0 and variance 1.

The estimation framework is completed by postulating explicit forms for $\ln e(x)$, $\ln w(x)$, and $[\ln v(z|s=1)-\ln v(z|s=0)]$

(B.19) $$[\ln v(z|s=1)-\ln v(z|s=0)]=\tau' z$$

(B.20) $$\ln e(x)=b_e' x$$

(B.21) $$\ln w(x)=b_w' x$$

Note that with an appropriate specification of the random disturbance as seen by the analyst and using one of the available methods for correcting sample selection bias it may be possible

obtain consistent estimates of lne(x) and lnw(x).[4]

Substitution of (B.19)-(B.21) into (B.16) yields

$$
\begin{aligned}
V &= [c_{e0}-c_{w0}] \\
&+ [c_{e1}b_e'x-c_{w1}b_w'x] \\
&+ [c_{e2}[b_e'x]^2-c_{w2}[b_w'x]^2] \\
&+ \tau'z
\end{aligned}
\tag{B.22}
$$

It is clear from inspection of (B.22) that the reduced-form of V in the x's and z's is given by

$$V = d_0 + d_1'x + d_2'z^* + d_3'y \tag{B.23}$$

where z^* consists of the elements of z not contained in x, y consists of the squares and cross-products of the x's, and the d's are functions of the structural parameters of the model. This reduced-form equation will prove useful for performing specification tests and for obtaining consistent estimates of lne(x) and lnw(x) in the face of self-selection into the alternative occupations.[5]

It is now useful to explore the properties of the utility

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4. Note that we are assuming that the expected value of log earnings is the same from the standpoint of the individual as it is from the standpoint of the analyst although the variance of log earnings may be different for the individual than for the analyst.

5. The structural parameters of the general model given by (B.9)-(B.13) and (B.22) are in general not identified. But the general model and the reduced form equations it implies nevertheless provide a useful framework for testing alternative specifications that are identified.

function given by (B.3). Marginal utility is given by

(B.24) $$U_I=[\gamma+\beta\ln I](U/I)$$

which is positive when

(B.25) $$\beta/\gamma=-1/\ln I \qquad \gamma\neq 0$$
$$\beta<0 \qquad \gamma=0$$

U_{II} is given by

(B.26) $$U_{II}=[(\gamma+\beta\ln I)^2-(\gamma+\beta\ln I)+\beta][U/I^2]$$

Expanding (26), collecting terms in $\ln I$ and $(\ln I)^2$, and solving for the roots yields

(B.27) $$r_l, r_u=((1-\gamma)\pm\beta(1-4\beta)^{1/2})/2\beta$$

which implies

(B.28) $$U_{II}<0 \text{ for } r_l<\ln I<r_u$$
$$U_{II}>0 \text{ for } \ln I<r_l,\ \ln I>r_u$$

Thus depending upon the values of γ and β individuals may be risk preferrers at low and high values of income. The Arrow-Pratt measure of risk aversion $R=-U_{II}/U_I$ also varies across income levels.

The utility function (B.3) allows risk behavior to vary in a complicated way across income levels. It includes several simpler utility functions as special cases. When $\beta=0$ we have the case of constant relative risk aversion

(B.29) $$R=-(\gamma-1)/I$$

with $0<\gamma<1$ for risk aversion, $\gamma=1$ for risk neutrality, and $1<\gamma$ for risk preferring. When $\gamma=1$, $\beta=0$ we have

$$\beta>-1/\ln I \text{ for } U_I>0 \text{ and}$$

(B.30)

$$-(1-4\beta)/2\beta<\ln I<+(1-4\beta)/2\beta \text{ for } U_{II}<0$$

with constant relative risk neutrality when $\beta=0$.

Several aspects of this estimation framework are noteworthy. First, it is possible to obtain consistent estimates of expected log earnings $\ln e(x)$ and $\ln w(x)$ from log-earnings regressions for self-employed and wage and salary workers respectively using the reduced-form equation (B.23) to correct for selection bias.

Second, the structural equation given by (B.22) is nonlinear in the risk-aversion parameters γ and β and the earnings variances σ_{ee} and σ_{ww}. Securing estimates of such a nonlinear system is generally a difficult task. Moreover, the structural parameters are not necessarily identified without further restrictions on these parameters or on the error process generating the disturbances.[6]

Third, equation (B.22) is linear in the c's after substitution of consistent estimates of $b_e'x$ and $b_w'x$. It is

---

6. For example, if $\sigma_{\beta\beta}$ is constant across individuals the c's are identified only up to a constant of proportionality. Thus the four c's give us four nonlinear equations in the four structural parameters plus the proportionality constant. It is not possible to identify the structural coefficients of the model under such circumstances.

possible to test alternative specifications of the utility function within this linear framework. In particular, it is clear from inspection of the definition of the c's that the hypothesis that $\beta=0$ is equivalent to the hypothesis that $c_{e1}=c_{w1}=\gamma$ and $c_{e2}=c_{w2}=0$. Before attempting to estimate the structural parameters of (B.22) it will prove useful to test whether a simpler specification based on constant relative risk aversion ($\beta=0$, $0<\gamma<1$) is consistent with the data. It is also possible to test for the inclusion of subsets of z within this linear framework.

We now work out the expectation

(B.31) $$E(U(I(x|s),\sigma))=E(\exp[\gamma \ln I(x|s)+\tfrac{1}{2}\beta(\ln I(x|s))^2])$$

for I(x|s=1) and I(x|s=0). For notational simplicity we calculate this expectation for

(B.32) $$\ln I(x|s)=\ln I+\epsilon$$

where ϵ has variance σ and make the appropriate substitution for s=1 or s=0 at the end. Substitute (B.32) into the right-hand side of (A1), expand, and collect terms to obtain

(B.33) $$=E(\exp[(\gamma \ln I+\tfrac{1}{2}\beta(\ln I)^2)+(\gamma+\beta \ln I)\epsilon+\tfrac{1}{2}\beta\epsilon^2])$$
$$=E(\exp[(\gamma+\beta \ln I)\epsilon+\tfrac{1}{2}\beta\epsilon^2])\exp(\gamma \ln I+\tfrac{1}{2}\beta(\ln I)^2)$$

Denote

(B.34) $$E(A) = E(\exp[(\gamma+\beta \ln I)\epsilon+\tfrac{1}{2}\beta\epsilon^2])$$

and define

(B.35) $$\mu_1=(\gamma+\beta \ln I)$$

(B.36) $\mu_2 = \frac{1}{2}\beta$

Substitute (B.35) and (B.36) into (B.34) to obtain

(B.37) $E(A) = E(\exp[\mu_1\epsilon + \mu_2\epsilon^2])$

$= \int \exp[\mu_1\epsilon + \mu_2\epsilon^2] \exp[-\epsilon^2/2\sigma]/(2\pi\sigma)^{1/2} d\epsilon$

(B.38) $= (2\pi\sigma)^{-1/2} \int \exp[2\sigma\mu_1\epsilon + 2\sigma\mu_2\epsilon^2 - \epsilon^2)/2\sigma]$

Denote the bracketed term after the exponential operator in (B.38) by Z. This term can be written as

(B.39) $Z = \mu_1\epsilon - [(1-2\sigma\mu_2)/2\sigma]\epsilon^2$

Let

(B.40) $\mu_3 = (1-2\sigma\mu_2)/2\sigma$

Then

(B.41) $Z = \mu_1\epsilon - \mu_3\epsilon^2$

$= -([\sqrt{\mu_3}\epsilon - \mu_1/2\sqrt{\mu_3}]^2 + \mu_1^2/4\mu_3$

Therefore

$E(A) = (2\pi\sigma)^{-1/2} \int \exp -([\sqrt{\mu_3}\epsilon - \mu_1/2\sqrt{\mu_3}]^2] \exp[\mu_1^2/4\mu_3]$

$= (2\pi\sigma)^{-1/2} \exp[\mu_1^2/4\mu_3] \times$

$\int \exp -([\sqrt{\mu_3}\epsilon - \mu_1/2\sqrt{\mu_3}]^2] d\epsilon$

(B.42) $= (2\pi\sigma)^{-2} \exp[\mu_1^2/4\mu_3] \times$

$\int \exp(-[(\epsilon - \mu_1/2\mu_3)/(1/\sqrt{\mu_3}]^2 d\epsilon$

$= (2\pi\sigma)^{-2} \exp[\mu_1^2/4\mu_3] \times (2\pi/\mu_3)^{-1/2}$

Substituting for μ_1, μ_3, and μ_2 yields

(B.43) $$E(A)=(2\pi\sigma\mu_3)^{-\frac{1}{2}}\exp([(\gamma+\beta\ln I)^2/(2[(\sigma)^{-1}-\epsilon\sigma])$$

Now substitute (B.43) into (B3) to obtain

(B.44) $$E(U(I(x|s),\rho))=(\exp(\gamma\ln I+\tfrac{1}{2}\beta(\ln I)^2)$$
$$\times(\sigma\mu_3\exp([(\gamma+\beta\ln I)^2/(2[\sigma^{-1}-\sigma\beta])$$

Take logs of both sides to obtain

(B.45) $$\ln E(U(I(x|s),\rho))=$$
$$\gamma\ln I+\tfrac{1}{2}\beta(\ln I)^2$$
$$+(\sigma\mu_3$$
$$+[(\gamma+\beta\ln I)^2/(2[[\sigma^{-1}-\sigma\beta])$$

Let

(B.46) $$\kappa=2[\sigma^{-1}-\sigma\beta]$$

and expand the third term after the equality sign in (B.44) to obtain

(B.47) $$[(\gamma+\beta\ln I)^2/([[\sigma^{-1}-\sigma\beta])=$$
$$((\gamma^2+2\gamma\beta\ln I+\beta^2[\ln I]^2)/\kappa$$

Substituting (B.46) into (B.44) and collecting terms in $\ln I$ and $[\ln I]^2$ yields

$$\ln E(U(I(x|s),\rho))=$$
$$((\sigma\mu_3+\gamma^2/))$$
$$+(\gamma+[2\gamma\beta/)])\ln I$$
$$+(\tfrac{1}{2}\beta+[\beta^2[\ln I]^2/)])(\ln I)^2$$
$$=c_0+c_1\ln I+c_2[\ln I]^2$$

where

$$c_0 = ((\sigma\mu_{\ln I} + \gamma^2/\kappa)$$

$$c_1 = (\gamma + [2\gamma\beta/\kappa])$$

$$c_2 = (\tfrac{1}{2}\beta + [\beta^2 \cdot [\ln I]^2/\kappa])$$

Substitution of $\ln\pi$ for $\ln I$ and σ_{ee} for σ yields $\ln E[U(I|s=1)]$ and substitution of $\ln w$ for $\ln I$ and σ_{ww} for σ yields $\ln E[U(I|s=0)]$.

APPENDIX C

STATISTICAL PROCEDURES AND RESULTS

This appendix describes the statistical procedures we followed in this project and details the estimates we obtained. It is divided into three sections. The first section describes our estimation of the reduced-form probit model given by equation (B.23) in the previous appendix. The second section describes our estimation of the earnings equations given by (B.20) and (B.21) in the previous appendix. The third section describes our estimation of the structural probit model given by equation (B.15) in the previous appendix.

C.1--Reduced-Form Probit Results

This section analyzes the determinants of the probability that an individual will become self-employed rather than become a wage earner. We approach this problem in two steps. In the first step we examine the influence of a large set of potential explanatory variables on the probability of self-employment using the linear probability model.[1] The linear probability model is convenient because it can be estimated with simple regression techniques. It provides a

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[1] For a discussion of the linear probability model see, for example, Kmenta (1971) or Goldberger (1964). As is well-known, the simple linear probability model has heteroskedastic errors so that the test statistics from standard regression programs are invalid. We correct the heteroskedasticity using the generalized least squares method discussed in Kmenta and Goldberger.

relatively inexpensive method for estimating and testing alternative models.[2] Unfortunately, the linear probability model is not appropriate with a choice based sample. We therefore estimated this model with a random (non-choice-based) sample.[3]

In the second step we estimate the reduced-form estimates of the probit model of self-employment choice given by (B.23). Aside from the fact the theory presented in Section 2 suggests its use, the probit model has two practical advantages. First, estimates from the probit model enable us to test for selectivity bias in the earnings equations (B.20) and (B.21). We discuss this issue in more detail in the next section. Second, the probit model unlike the linear probability model enables us to obtain valid estimates with a choice-based sample. A choice-based sample, which in our case involves oversampling self-employed individuals, yields more precise estimates.[4] As shown by Charles Manski and Stephen Lerman (1977) and Charles Manski and Daniel McFadden (1981), special care must be taken to obtain consistent estimates with choice-based samples. The estimates reported in this paper are based on the the weighted exogenous sampling maximum likelihood estimator (WESML) proposed by Manski and Lerman. The WESML yields consistent and asymptotically normal estimates. Although it is inefficient relative to true maximum likelihood estimators, it is computationally much simpler than other available alternative estimators.[5] Estimates are reported separately for males and females for 1970 and 1980.

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2. Our additional motivation for using the linear probability model for preliminary analysis is that it is difficult to achieve convergence of the likelihood function for the probit model when there are many insignificant parameters. Thus we use the linear probability model to eliminate clearly unimportant variables from the model.

3. The sample was constructed by taking all the wage earners from the sample and a random sample of all self-employed workers, where the sampling proportion for self-employed workers reflects the true representation of self-employed workers in the population.

4. A choice-based sample is one stratified on an endogenous variable, in this case whether the person is self-employed or not.

5. For discussion and comparison of alternative estimators see Manski and McFadden and Stephen Coslett (B.1981).

TABLE C.7

PROBABILITY OF SELF-EMPLOYMENT[a]
Structural Probit Model Estimates
Males 1980

Variable	Coefficient (Standard Error)
SELF-WORK	0.9337*** (0.0137)
HISPAN	-0.2580*** (0.0586)
BLACK	-0.5402*** (0.1128)
IMMIG	-0.0188 (0.0929)
HANDICAP	0.2456** (0.0919)
SCHENG	-0.5602* (0.2180)
AGE	0.6678*** (0.1484)
AGESQ	-0.0545+(**) (0.0169)
VIETVET	-0.7501* (0.1931)
OTHVET	-0.1756* (0.0700)
KORVET	-0.1272* (0.0578)
CONSTANT	-2.633*** (0.3071)

Summary Statistics	
Observations	6194
Log-Likelihood Function	-2019.5
Exogenous Variables	11

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

[a] Weighted maximum likelihood estimates of probit model. Asymptotic standard errors in parentheses.

in 1970 but not in 1980. In 1980 both EDAGE and COLGRAD are statistically significantly different from zero (and HSDROP is marginally statistically significant). For males it is possible to reject the hypothesis that age influences self-employment earnings in 1970 but not in 1980. In 1980 COLGRAD and EDAGE are both highly significant. Finally, for males it is possible to reject the hypothesis that citizen status is an important determinant of self-employment earnings in 1970 but not in 1980. In 1980 earnings increase by about 1.7 percent for each year since an individual entered this country. Noncitizens earn substantially less--approximately 44 percent less--than citizens holding all other variables constant.

There are several notable differences between the determinants of earnings for self-employed workers and for wage workers. Blacks earn statistically significantly less than comparable non-blacks in wage employment while blacks earn more (although the difference is not statistically significant) than comparable non-blacks in self-employment. Recent veterans (NEWVET) receive an earnings premium in self-employment but an earnings penalty in wage employment--both differences are highly statistically significant.

Turning now to females, we find that military service does not influence self-employment earnings in 1980 and that education does not influence self-employment earnings in either 1970 or 1980. Age is an important determinant of self-employment earnings for 1980 but not 1970--older women earn more than younger women.

It is clear from inspection of Tables C.4a-C.4d, and to a lesser extent Tables C.1a-C.1b and C.2a-C.2b that we have obtained much sharper results for 1980 than for 1970 $\bar{R}^2$'s are higher for males than for 1970 and the results appear to make more sense. The same statement applies to females versus females. But we obtain better results for males largely because we have more observations.

C.3--Probability of Self-Employment and Earnings Expectations

We used the earnings equations reported above to calculate consistent estimates of self-employment and wage and salary earnings. We then used these estimates as variables in the structural model for self-employment choice given by (B.15). We were unable to reject the hypothesis that $c_{1ee}=c_{1ww}$ and $c_{2ee}=c_{2ww}=0$.[11] The restricted estimates are reported in Table C.7.[12]

The estimated risk-preference parameter γ is .93 which is not statistically significantly different from 1.00.[13] Therefore, we cannot reject the hypothesis that the individuals in this sample are neutral towards risk. The probability of self-employment, as one would expect, increases with the difference between expected self-employment and wage earnings. The estimates of the other taste variables are consistent with the reduced-form estimates reported earlier.

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11. The unrestricted log-likelihood function was 2016.8. The log-likelihood function with the three restrictions on the c's was 2019.5. The likelihood ratio statistic is therefore 5.4 which is distributed as a chi-square with three degrees of freedom. The critical level of the test statistic at the five-percent level of statistical significance is 7.8.

12. Sets of variables that were jointly insignificant have been excluded here. The variables that were insignificant in the reduced-form estimation were insignificant in the structural estimation as well. The occupation dummies are excluded from the estimates reported in Table C.7 because these variables presumably belong to the vector of income-determining variables.

13. Note that the estimate reported in Table 5 must be multiplied by its mean value to get the estimate of the structural parameter.

Table C.8
PROBABILITY OF SELF-EMPLOYMENT FOR YOUNG MEN[a]
Reduced Form Probit Model Estimates
1980

Variable	Coefficient (Standard Error)
URBAN	-0.0436 (0.1175)
BLACK	-0.6559* (0.2787)
HANDICAP	0.1092 (0.2365)
AGE	0.3927** (0.1478)
EDVET	-0.0310 (0.0442)
VETAGE	0.1056 (0.2533)
NEWVET	-0.3749 (0.3909)
VIETVET	-0.1087 (0.5324)
SALES	0.6537*** (0.1445)
CRAFT	0.5102*** (0.1164)
MANAGE	0.3472** (0.1401)
CONSTANT	-2.7508*** (0.4227)

C.4--Entrepreneurial Choice and Success for Young Men

In order to test whether differences between entrepreneurial choice and success for men who served in the military during or after the start of the Vietnam War and for men who did not serve or who served in other eras is due to a failure to fully control for the impact of age on entrepreneurial choice and success, we estimated a reduced form probit equation and earnings equations for men who turned draft age during or after the start of the Vietnam War. The results for the probit equation are reported in Table C.8. The coefficient estimates of NEWVET and VIETVET for young men have the same sign and roughly the same magnitude as the coefficient estimates for all men. But whereas these coefficients were statistically significant for all men, they are not statistically significant for young men. Therefore it is possible that the lower propensity of recent veterans to become self-employed may be due to chance. The results for the earnings equations are reported in Table C.9. The coefficient estimates of NEWVET and VIETVET do not indicate earnings premiums for recent veterans; nor are these estimates statistically significantly different from zero. Thus, once we fully control for the impact of age on entrepreneurial earnings young veterans appear to do just as well as young nonveterans.

	(0.2914)	(0.1489)
MARRIAGE	0.1922 (0.5383)	-0.0620 (0.0642)
UNION	-0.0258 (0.1198)	-0.1817*** (0.0710)
SALES	-0.0420 (0.9849)	-0.1310 (0.0741)
CLERIC	0.0815 (0.2865)	-0.1544 (0.0792)
SERVICE	-0.1982 (0.1536)	-0.1750* (0.0769)
CRAFT	-0.0826 (0.7790)	0.0632 (0.0530)
AGE	0.0576 (1.3382)	2.4707*** (0.6802)
AGESQ	-0.0273 (0.2293)	-0.3979*** (0.1273)
EDAGE	0.0148 (0.0115)	0.0116 (0.0072)
MILVET	0.0063 (0.0348)	-0.0109 (0.0170)
LAMBDA	-0.3082 (1.7906)	-0.0000 (0.0000)
CONSTANT	9.5820 (5.4714)	5.4108*** (0.9155)

Summary Statistics	Self-Employment	Wage
Observations	868	890
R^2	0.0748	0.2381
Standard Error	0.7725	0.5312
F-Statistic	2.7266	10.3737

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

VIETVET	0.0968	0.0585
	(0.0725)	(0.0441)
PREVIET	0.0117	-0.0152
	(0.0582)	(0.0441)
KORVET	-0.0278	-0.0499
	(0.0614)	(0.0510)
WWIIVET	-0.0302	-0.1177
	(0.0818)	(0.0733)
OLDVET	-0.1596	0.0595
	(0.1773)	(0.1475)
MANAGE	-0.2681***	0.0944*
	(0.0409)	(0.0450)
PROF	0.0026	-0.0257
	(0.0634)	(0.0439)
SALES	-0.7491***	-0.0033
	(0.1892)	(0.0520)
CLERIC	0.1021	-0.0742
	(0.1215)	(0.0489)
SERVICE	-0.1160	-0.1490**
	(0.0725)	(0.0468)
CRAFT	-0.5150***	0.0569
	(0.1076)	(0.0381)
AGE[c]	-	0.5679***
		(0.0902)
AGESQ	-0.0197***	-0.0627***
	(0.0041)	(0.0100)
EDAGE	0.0092***	0.0087***
	(0.0027)	(0.0022)
VETAGE	-0.0278	0.0611**
	(0.0264)	(0.0232)
EDVET	0.0127	-0.0192**
	(0.0079)	(0.0065)
LAMBDA	-1.2993***	-0.0013
	(0.0240)	(0.0017)
CONSTANT	11.9592***	8.0421***
	(0.5344)	(0.1749)

Summary Statistics	Self-Employment	Wage
Observations	3751	2386
R^2	0.1507	0.2486
Standard Error	0.7762	0.5398
F-Statistic	22.7784	25.9733

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

c Variable could not be included because of high collinearity with EDAGE.

CRAFT	-	0.5351* (0.2588)
MANAGE	1.1645*** (0.1442)	0.7831*** (0.1415)
CONSTANT	-2.5122*** (0.1796)	-3.1676*** (0.06485)

Summary Statistics	1970	1980
Observations	2474	2237
Likelihood Function	-356.13	-370.35
Exogenous Variables	10	12

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

a Weighted maximum likelihood estimates of probit model. Asymptotic standard errors in parentheses.

dwellers and in 1970 but not in 1980 males with poor command of English were more likely to choose self-employment than males with good command of English.

C.2--Earnings for Self-Employed and Wage Workers

The samples used for estimating self-employment earnings equation (B.20) and the wage earnings equation (B.21) are censored.[9] Individuals sort themselves into either the self-employment sample or the wage sample using rule (B.11). Individuals with a relatively high (low) taste for entrepreneurship or relatively high (low) entrepreneurial ability will select themselves into the self-employment (wage) sample. As is well known, ordinary regression estimates of the parameters of equations based on such censored samples may yield inconsistent (see, e.g., James Heckman (1979)) estimates of the true population parameters. In order to correct for selectivity bias, we use the generalized least squares method developed by Heckman (1979). The method involves including the so-called Mill's ratio, obtained from probit estimates of the probability of sample inclusion, as a regressor in the earnings equation, using the residuals to form weights, and using weighted least squares to obtain consistent estimates of the coefficients of the earnings equation. The coefficient on the Mill's Ratio measures the degree of self-selection into the sample. It is possible to test the hypothesis of selection bias by testing whether this coefficient is statistically significantly different from zero.

Tables C.4a and C.4b report generalized least squares estimates of the earnings equations (B.20) and (B.21) for males for 1970 and 1980 respectively. Tables C.4c and C.4d report generalized least squares estimates of the earnings equations (B.20) and (B.21) for females for 1970 and 1980

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9. Censored means that we lack data on a nonrandom subsample of the population to which the equations are meant to apply.

Table C.2b
F-TESTS OF SUBSETS OF VARIABLES[a]
Based on Linear Probability Model Estimates
Females

Hypothesis	1970 F-Statistic	1970 Statistical Significance (percent)	1980 F-Statistic	1980 Statistical Significance (percent)
=MAR2=LITKID= KID=MARHLD=KIDS=0	0.9975	41.77	0.6691	64.64
=AGESQ=EDAGE= TAGE=0	3.1717	4.21	2.6839	8.03
ET=VIETVET= ET=0	-	-	1.1659	32.16
=HSDROP=COLDROP= GRAD=POSTGRAD= =0	-	-	1.1676	32.12
ET=VETAGE=0	-	-	1.7098	18.14

[a] Percent level of statistical significance gives the probability of obtaining reported coefficient estimates when true coefficients are given by the hypothesis in the first column. We reject the hypothesis when the level of statistical significance is less or equal to 5 percent.

to zero for 1980. Vietnam era and post-Vietnam era male veterans are therefore less likely to choose self-employment than are male nonveterans. We cannot reject the hypothesis that veteran status has no influence on a woman's propensity to choose self-employment for 1980.[7]

Tables C.3a and C.3b report reduced-form probit model estimates of the probability of self-employment for males and females respectively. All the variables that were statistically significantly different from zero at the 10 percent level or better in the linear probability model (and which were not rejected in an F-test of several variables) were included as exogenous variables. We used the WESML suggested by Manski and Lerman to obtain the estimates.

For males, we find that for both 1970 and 1980 blacks are statistically significantly less likely to choose self-employment than are other ethnic group, that Vietnam-era veterans are statistically significantly less likely to choose self-employment than are nonveterans or pre-Vietnam era veterans,[8] and that individuals in sales, craft, and management occupations are statistically significantly more likely to choose self-employment. Several other similarities are apparent when the result of Table C.1 and C.3 are considered jointly. Immigrants are not statistically significantly more likely to choose self-employment than are other individuals. The amount of money earned by an individual's spouse also plays no statistically significant influence in the self-employment decision. There are, however, several notable differences between these two years for males. In 1980, education has no influence while age has a strong influence on an individual's propensity to choose self-employment. In 1970, education has a strong influence on an individual's propensity to choose self-employment--ELEM, POSTGRAD, and EDAGE are all highly statistically significant--while age has an influence on an individual's propensity to choose self-employment only through the interaction of age with education. Finally, in 1980 but not in 1970 male urban dwellers were less likely to choose self-employment than male non-urban

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7. We do not have data on female veterans in 1970.

8. The coefficient of the Vietnam-era veteran variable is almost statistically significantly different from zero at the five percent level.

Tables C.1a and C.1b reports linear probability model estimates of the probability of self-employment for 1970 and 1980 for males and females respectively. The estimates were obtained by regressing a dummy variable equal to 1 if an individual is self-employed and 0 if an individual is a wage earner against the variables listed.[6] The included variables are the standard human capital and demographic variables and require little discussion.

Before proceeding it is necessary to decide upon a level of statistical significance for performing tests. Since one of our purposes in estimating the linear probability model is to isolate variables that should be included in the probit model and since the probit model is likely to yield more precise estimates than is the linear probability model, it would be unwise to discard too many variables at this stage. Consequently, we will assume that coefficients are zero only if we cannot reject this hypothesis at the 10 percent level or higher.

Tables C.2a and C.2b reports F tests for the inclusion of several subsets of variables for males and females respectively. The first subset concerns the family status of the individual. We cannot reject the hypothesis that these variables are jointly zero for either 1970 or 1980 for either males or females. Thus, an individual's marital history, the ages of the children in the individual's household, and the number of children a woman has had do not appear to influence an individual's propensity to become self-employed.

The second subset concerns the veteran status of the individual. We can reject the hypothesis that these variables are jointly zero for males in 1970 an 1980. We cannot, however, reject the hypothesis that the coefficients of both WWIIVET and KORVET are jointly equal to zero for 1970 or that the coefficients of WWIIVET, KORVET, PREVIET, and OTHVET are jointly equal

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6. In order to correct for heteroskedasticity, the following generalized least squares method was used. Using estimates of the simple linear probability model with no adjustment for heteroskedasticity, we calculated the probability of self-employment P. Since the variance of the disturbance term is P(B.1-P)--see Kmenta--we then performed weighted least squares by dividing both sides of the regression equation by the square root of P(B.1-P). We deleted observations when the estimated P was outside the range (0,1). The percent of deleted observations ranged from around 10 percent for men to around 25 percent for women.

Table C.1a
PROBABILITY OF SELF-EMPLOYMENT[a]
Linear Probability Model Estimates
Random Sample
Males

Variable	1970 Coefficient (Standard Error)	1980 Coefficient (Standard Error)
URBAN	-0.0083 (0.0087)	-0.0289* (0.0146)
LITKID	0.0022 (0.0091)	0.0142 (0.0153)
OLDKID	-0.0123 (0.0081)	-0.0068 (0.0150)
BLACK	-0.0856* (0.0146)	-0.0565* (0.02133)
ASIAN	-0.0296 (0.0350)	0.0810 (0.0545)
HISPANIC	0.0413 (0.0280)	-
IMMIG	-0.0016 (0.0163)	-0.0871* (0.0397)
YRSIMG	-	-0.0020 (0.0014)
BADENG	0.0209* (0.0101)	-0.0365 (0.0460)
ELEM	0.4140* (0.0179)	0.0262 (0.0383)
HSDROP	0.0114 (0.0111)	0.0248 (0.0205)
COLDROP	-0.0191 (0.0121)	0.0356 (0.0180)

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

[a] Weighted maximum likelihood estimates of probit model. Asymptotic standard errors in parentheses.

Table C.3b
PROBABILITY OF SELF-EMPLOYMENT[a]
Reduced Form Probit Model Estimates
Females

Variable	1970 Coefficient (Standard Error)	1980 Coefficient (Standard Error)
URBAN	-	-0.1511 (0.1267)
BLACK	-0.5938** (0.02298)	-
BADENG	-0.00952 (0.1155)	-0.4262 (0.4387)
IMMIG	-	0.2561 (0.2009)
POSTGRAD	-0.4212 (0.3102)	-
AGE	-	-0.3977 (0.3190)
AGESQ	-	-0.0271 (0.0370)
EDAGE	0.0970** (0.0031)	-
EDVET	-	0.0064 (0.0340)
SPSEINC	-	0.0062* (0.0030)
NEWVET	-	-0.2558 (0.0895)
SALES	0.6734*** (0.1628)	0.8680*** (0.1384)
SERVICE	0.6308*** (0.1328)	0.6863*** (0.1366)

Table C.3a
PROBABILITY OF SELF-EMPLOYMENT[a]
Reduced Form Probit Model Estimates
Males

Variable	1970 Coefficient (Standard Error)	1980 Coefficient (Standard Error)
URBAN	-	-0.1510** (0.0565)
BLACK	-0.2125* (0.1088)	-0.4275*** (0.1162)
BADENG	0.1484** (0.0487)	-
IMMIG	-	-0.0148 (0.0902)
HANDICAP	-	0.2255** (0.0971)
ELEM	0.3495*** (0.0667)	-
COLGRAD	0.2368 (0.3018)	-
POSTGRAD	-0.4217*** (0.0980)	-
AGE	-	0.5503*** (0.0153)
AGESQ	-	-0.0475** (0.0178)
EDAGE	0.0785*** (0.0148)	-
EDVET	-	-0.0005 (0.0104)
VETAGE	-	-0.0159 (0.0291)

SPSEINC	-0.0094 (0.0606)	-
NEWVET	-	-0.4237* (0.0191)
VIETVET	-0.4163*** (0.1191)	-0.1656 (0.0869)
OTHVET	-0.1240 (0.0803)	
SALES	0.8173*** (0.0809)	0.9270*** (0.0680)
SERVICE	0.2759** (0.0951)	-
CRAFT	0.3682*** (0.0650)	0.4728*** (0.0572)
PROF	0.2548** (0.0866)	-
MANAGE	0.7891*** (0.0802)	0.5889*** (0.0621)
CONSTANT	-2.1642*** (0.0927)	-2.8167*** (0.3177)
Summary Statistics	1970	1980
Observations	7286	6205
Likelihood Function	-2019.1	-1939.9
Exogenous Variables	15	14

COLGRAD	0.1592*	0.0123
	(0.0780)	(0.0263)
POSTGRAD	-0.0617**	-0.0359
	(0.0202)	(0.0352)
HANDICAP	-	0.0460+
		(0.0269)
MAR0	-0.0058	0.0038
	(0.0178)	(0.0235)
MAR2	-0.0155	0.0226
	(0.0182)	(0.0157)
MARHLD	0.1390	0.0151
	(0.5291)	(0.0269)
NEWVET	-	-0.0654*
		(0.0338)
VIETVET	-0.0564***	-0.0545**
	(0.0182)	(0.0205)
PREVIET	-	-0.0313
		(0.0215)
KORVET	-0.0049	-0.0290
	(0.0174)	(0.0250)
WWIIVET	0.0229	-0.0364
	(0.0215)	(0.0369)
OTHVET	-0.0339*	-0.0894
	(0.0179)	(0.0649)
MANAGE	0.1341***	0.1000***
	(0.0168)	(0.0196)
PROF	0.0387**	0.0167
	(0.0145)	(0.0199)
SALES	0.1102***	0.2015***
	(0.0184)	(0.0247)
CLERIC	-0.0119	-0.0359
	(0.0150)	(0.0228)
SERVICE	0.0442**	0.0170
	(0.0154)	(0.0210)

CRAFT	0.0203*	0.0598***
	(0.0102)	(0.0156)
YRSIMG	-	-0.0011
		(0.0014)
AGE	-0.1581	0.0822+
	(0.4652)	(0.0445)
AGESQ	0.0001	-0.0085+
	(0.0001)	(0.0051)
EDAGE	0.0089+	0.0001
	(0.0054)	(0.0011)
VETAGE	-0.0075	0.0250*
	(0.0057)	(0.0117)
EDVET	0.0157	-0.0045
	(0.0139)	(0.0032)
SPSEINC	-0.0030**	-0.0005
	(0.0011)	(0.0005)
CONSTANT	0.0242	-0.1243
	(0.0203)	(0.0798)

Summary Statistics	1970	1980
Observations	4521	2420
Exogenous Variables	31	35
R^2	0.1245	0.1436
Standard Error	0.2467	0.2546
F-Statistic	20.5984	11.4518

+ Statistically significantly different from zero at the ten percent level.

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

a Estimates based on linear probability model with correction for heteroskedasticity.

Table C.1b
PROBABILITY OF SELF-EMPLOYMENT[a]
Linear Probability Model Estimates
Random Sample
Females

Variable	1970 Coefficient (Standard Error)	1980 Coefficient (Standard Error)
URBAN	-0.0183* (0.0073)	-0.0421** (0.0139)
LITKID	0.0062 (0.0084)	0.0084 (0.0170)
OLDKID	0.0388 (0.0068)	0.0056 (0.0144)
KIDS	-0.0027 (0.0020)	-0.0021 (0.0039)
BLACK	-0.0425*** (0.0118)	-0.0109 (0.0168)
ASIAN	0.1414*** (0.0353)	0.0334 (0.0440)
HISPANIC	-0.4738 (0.0484)	-
IMMIG	0.0466 (0.0117)	-0.0717* (0.0383)
YRSIMG	-	-0.0012 (0.0016)
SADENG	-0.0179** (0.0062)	-0.1173* (0.0503)
ELEM	0.0133 (0.0136)	0.0441 (0.0470)
HSDROP	-0.0009 (0.0088)	0.0064 (0.0210)
COLDROP	-0.0022 (0.0077)	0.0040 (0.0158)

COLGRAD	-0.1553 (0.1653)	-0.0215 (0.0259)
POSTGRAD	-0.0723*** (0.0221)	-0.0686+ (0.0391)
HANDICAP	-	0.0540 (0.0360)
MAR0	-0.0004 (0.0090)	0.0023 (0.0206)
MAR2	-0.0112 (0.0078)	0.0241+ (0.0139)
NEWVET	-	-0.9486+ (0.5210)
VIETVET	-	-1.3506+ (0.8017)
REMVET	-	-0.9622 (0.6930)
MANAGE	0.1299*** (0.0198)	0.0870*** (0.0260)
PROF	0.0425 (0.0116)	0.0304 (0.0230)
SALES	0.0425** (0.0150)	0.0884*** (0.0256)
CLERIC	-0.0110 (0.0081)	0.0123 (0.0192)
SERVICE	0.0372*** (0.0107)	0.0603** (0.0225)
CRAFT	0.0448* (0.0232)	0.0773* (0.0375)
AGE	0.7496 (0.0316)	-0.0584 (0.0385)
AGESQ	-0.0000 (0.0005)	0.0082* (0.0042)
EDAGE	0.0044 (0.0037)	0.0005 (0.0012)
VETAGE	-	0.0292 (0.0959)

EDVET	-	0.0656[+]
		(0.0356)
SPSEINC	0.0004	0.0011[**]
	(0.0005)	(0.0003)
CONSTANT	0.0207	0.0801
	(0.0146)	(0.0652)

Summary Statistics	1970	1980
Observations	1706	1090
Exogenous Variables	26	33
R^2	0.0655	0.0915
Standard Error	0.1426	0.1650
F-Statistic	5.3773	3.2595

[+] Statistically significantly different from zero at the ten percent level.

[*] Statistically significantly different from zero at five percent level.

[**] Statistically significantly different from zero at one percent level.

[***] Statistically significantly different from zero at 0.1 percent level.

[a] Estimates based on linear probability model with correction for heteroskedasticity.

Table C.2a
F-TESTS OF SUBSETS OF VARIABLES[a]
Based on Linear Probability Model Estimates
Males

Hypothesis	1970 F-Statistic	1970 Statistical Significance (percent)	1980 F-Statistic	1980 Statistic Significan (percent)
WWIIVET=KORVET= OTHVET=VIETVET= NEWVET=0	5.4380	0.02	2.1069	4.94
WWIIVET=KORVET=0	1.8007	16.54	-	-
WWIIVET=KORVET= PREVIET=OTHVET=0	-	-	1.0815	36.39
MAR0=MAR2=LITKID= OLDKID=MARHLD=0	0.6655	61.59	0.9774	41.24
AGE=AGESQ=VETAGE=0	0.8890	41.12	-	-
VETAGE=EDVET=0	-	-	2.8589	5
ELEM=HSDROP=COLDROP= POSTGRAD=EDAGE=0	-	-	0.7438	61.42

[a] Percent level of statistical significance gives the probability of obtaining reported coefficient estimates when true coefficients are given by the hypothesis in the first column. We reject the hypothesis when the level of statistical significance is less or equal to 5 percent.

VIETVET	0.9041 (1.6697)	1.28727 (0.8170)
REMVET	0.6801 (1.9702)	1.0613 (1.1141)
MANAGE	1.3085*** (0.2603)	0.3048*** (0.0669)
PROF	-0.0691 (0.1916)	0.0874 (0.0583)
SALES	1.2566*** (0.2760)	0.0097 (0.0656)
CLERIC	0.3116 (0.1856)	0.0719 (0.0477)
SERVICE	0.7480*** (0.0245)	-0.1474 (0.0599)
CRAFT	0.6718** (0.02596)	0.1119 (0.0912)
AGE	0.9580*** (0.2659)	0.4786*** (0.1040)
AGESQ	-0.0667 (0.0256)	-0.0571*** (0.0110)
EDAGE	-0.0040 (0.0064)	0.0077** (0.0027)
VETAGE	-0.1401 (0.2746)	-0.0848 (0.1626)
EDVET	0.0096 (0.0960)	-0.0578 (0.0412)
LAMBDA	1.6620*** (0.2896)	-0.0005** (0.0001)
CONSTANT	2.5717* (1.1425)	7.6899*** (0.2119)

Summary Statistics	Self-Employment	Wage
Observations	1098	1357
R	0.1077	0.2193
Standard Error	0.9408	0.4924
F-Statistic	3.7845	13.8267

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

Table C.4a
SELF-EMPLOYMENT AND WAGE EARNINGS EQUATIONS
Males-1970

Variable	Self-Employment Coefficient (Standard Error)	Wage Coefficient (Standard Error)
URBAN	0.1579**	0.1078***
	(0.0584)	(0.0222)
BLACK	-0.1014	-0.2918***
	(0.2190)	(0.0721)
ASIAN	-0.1496	-0.2379**
	(0.2774)	(0.0984)
HISPANIC	-0.5945**	-0.1638
	(0.2304)	(0.0713)
IMMIG	-0.1071	0.0138
	(0.1081)	(0.0414)
IMMIG	-	-
BADENG	-0.0557	0.0240
	(0.1176)	(0.0465)
ELEM	-0.5555*	-0.0652
	(0.2730)	(0.1083)
HSDROP	-0.0937	-0.0489
	(0.0858)	0.0306
COLDROP	-0.0004	0.0916**
	(0.0856)	(0.0320)
COLGRAD	-0.5648	0.2360
	(0.3485)	(0.1775)
POSTGRAD	0.4136	0.1547
	(0.3281)	(0.1258)
HANDICAP	-	-
NEWVET	-	-
VIETVET	0.2574	-0.0118
	(0.3606)	(0.1266)

PREVIET	-	-
KORVET	0.0871 (0.1377)	0.0921 (0.0446)
WWIIVET	-0.0285 (0.1754)	0.0718 (0.0563)
OTHVET	0.1405 (0.1766)	0.0879 (0.0580)
MANAGE	-1.0997* (0.5451)	0.2482 (0.2107)
PROF	0.2889 (0.2202)	0.1418 (0.0796)
SALES	-0.4677 (0.5775)	0.2883 (0.2229)
CLERIC	0.4153* (0.1801)	-0.0076 (0.0384)
SERVICE	-0.3039 (0.2354)	-0.1353 (0.0852)
CRAFT	-0.1414 (0.2823)	0.1700 (0.1052)
YRSIMG	-	-
AGE	0.1199 (0.2347)	0.6770*** (0.0756)
AGESQ	0.0186 (0.0252)	-0.0777*** (0.0083)
EDAGE	-0.0324 (0.0668)	0.0690** (0.0268)
VETAGE	-0.0244 (0.0488)	-0.0269 (0.0170)
VETED	0.1958 (0.1382)	0.0289 (0.0491)
LAMBDA	-1.4954 (0.8398)	0.1429 (0.3215)
CONSTANT	11.7629*** (2.1632)	6.8546*** (0.0825)

mary tistics	Self-Employment	Wage
servations	3032	4243
	0.0605	0.1947
ndard Error	1.4130	0.6139
tatistic	7.1994	37.7594

Statistically significantly different from zero at five rcent level.

Statistically significantly different from zero at one rcent level.

Statistically significantly different from zero at 0.1 ncent level.

Table C.4b
SELF-EMPLOYMENT AND WAGE EARNINGS EQUATIONS
Males-1980

Variable	Self-Employment Coefficient (Standard Error)	Wage Coefficient (Standard Error)
URBAN	0.3630***	0.0580*
	(0.0432)	(0.0301)
BLACK	0.1799	-0.2614***
	(0.1143)	(0.0508)
ASIAN	0.0542	-0.1309
	(0.1183)	(0.1077)
YRSIMG	0.0170***	-0.0020
	(0.0030)	(0.0028)
IMMIG	-0.3627***	-0.0013
	(0.0902)	(0.0751)
BADENG	-0.1220	-0.3468***
	(0.1440)	(0.0924)
ELEM	0.0845	-0.0474
	(0.0868)	(0.0752)
HSDROP	-0.0807	-0.0802
	(0.0490)	(0.0418)
COLDROP	-0.0032	0.0999**
	(0.0409)	(0.0352)
COLGRAD	0.1259*	0.2305***
	(0.0615)	(0.0539)
POSTGRAD	-0.0652	0.2254**
	(0.0824)	(0.0682)
HANDICAP	-0.4707***	-0.1031*
	(0.0664)	(0.0535)
NEWVET	0.5334**	-0.2499***
	(0.1639)	(0.0741)

Table C.4c
SELF-EMPLOYMENT AND WAGE EARNINGS EQUATIONS
Females-1970

Variable	Self-Employment Coefficient (Standard Error)	Wage Coefficient (Standard Error)
URBAN	0.5177* (0.2550)	0.1529** (0.0555)
BLACK	-8.9826 (7.8862)	-0.1854* (0.0781)
ASIAN	-1.0994 (1.3309)	-0.3138 (0.2506)
HISPANIC	-0.7307 (1.0834)	0.7820 (0.2391)
IMMIG	-0.1468 (0.5207)	0.5173 (0.1013)
BADENG	0.1787 (0.3031)	-0.0641 (0.0543)
ELEM	-0.3170 (0.7242)	-0.3261* (0.1401)
HSDROP	-0.0544 (0.3874)	-0.2418** (0.0776)
COLDROP	0.6344 (0.4100)	0.0002 (0.0725)
COLGRAD	2.3150 (2.5997)	-1.3015 (0.4434)**
POSTGRAD	-5.4924 (5.6274)	0.4275** (0.1673)
HANDICAP	-	-
MANAGE	16.7286 (14.9632)	0.0320 (0.2531)
PROF	1.7293**	0.2406**

	(0.5697)	(0.0944)
SALES	10.2194	-0.1836
	(8.9739)	(0.1190)
CLERIC	0.4111	0.0033
	(0.4997)	(0.0684)
SERVICE	10.3159	-0.3997***
	(8.4311)	(0.0877)
CRAFT	1.1972	0.0507
	(0.6701)	(0.1587)
YRSIMG	–	–
AGE	-1.1054	0.1597
	(0.8875)	(0.1460)
AGESQ	0.1548	-0.0085
	(0.0905)	(0.0155)
EDAGE	1.3788	-0.0236
	(1.3084)	(0.0465)
LAMBDA	17.5101	-0.1229
	(15.3196)	(0.1041)
CONSTANT	-41.1044	8.1857***
	(43.3166)	(0.3088)

Summary Statistics	Self-Employment	Wage
Observations	548	1925
R^2	0.0568	0.0880
Standard Error	2.6312	0.9699
F-Statistic	2.5721	8.7490

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

Table C.4d
SELF-EMPLOYMENT AND WAGE EARNINGS EQUATIONS
Females-1980

Variable	Self-Employment Coefficient (Standard Error)	Wage Coefficient (Standard Error)
URBAN	-0.1534 (0.0809)	0.0981** (0.0386)
BLACK	0.1546 (0.1428)	-0.0935* (0.0422)
ASIAN	-0.3837 (0.2154)	-0.0019 (0.1158)
YRSIMG	0.0104 (0.0061)	-0.0049 (0.0039)
IMMIG	0.2603 (0.1936)	-0.0663 (0.0977)
BADENG	-0.3846 (0.3100)	-0.1943 (0.1242)
ELEM	-0.2729 (0.2202)	0.0582 (0.1119)
HSDROP	-0.1860 (0.1120)	-0.1154* (0.0529)
COLDROP	-0.0276 (0.0869)	0.0408 (0.0405)
COLGRAD	0.2495 (0.1490)	0.1146 (0.0650)
POSTGRAD	0.2798 (0.2013)	0.1337 (0.0877)
HANDICAP	-0.4862*** (0.1330)	-0.2284** (0.0852)
NEWJET[c]	-	0.8731 (0.7750)

Summary Statistics	
Observations	1771
Likelihood Function	-418.11
Exogenous Variables	13

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

[a] Weighted maximum likelihood estimates of probit model. Asymptotic standard errors in parentheses.

Table C.9
SELF-EMPLOYMENT AND WAGE EARNINGS EQUATIONS FOR YOUNG MALES
1980

Variable	Self-Employment Coefficient (Standard Error)	Wage Coefficient (Standard Error)
URBAN	0.1288 (0.0925)	0.0503 (0.0463)
BLACK	0.1019 (1.0852)	-0.2751*** (0.0693)
ASIAN	-0.2173 (0.3806)	-0.1950 (0.2053)
YRSIMG	0.0250 (0.0143)	0.0041 (0.0084)
IMMIG	-0.5670* (0.2410)	-0.0758 (0.1273)
BADENG	0.5261 (0.3264)	-0.5168*** (0.1409)
ELEM	-0.0006 (0.2401)	0.0168 (0.1621)
HSDROP	-0.1354 (0.1231)	-0.0965 (0.1123)
COLDROP	-0.0510 (0.0922)	0.0649 (0.0619)
COLGRAD	-0.0050 (0.1570)	0.1419 (0.1035)
POSTGRAD	-0.1269 (0.2281)	0.1568 (0.1424)
HANDICAP	-0.2010 (0.2098)	-0.0302 (0.0893)
NEWVET	0.0746 (0.5554)	-0.0965 (0.1123)
VIETVET	-0.0499	0.0497

Table C.4a
SELF-EMPLOYMENT AND WAGE EARNINGS EQUATIONS
Males-1970

riable	Self-Employment Coefficient (Standard Error)	Wage Coefficient (Standard Error)
AN	0.1579**	0.1078***
	(0.0584)	(0.0222)
CK	-0.1014	-0.2918***
	(0.2190)	(0.0721)
AN	-0.1496	-0.2879**
	(0.2774)	(0.0934)
PANIC	-0.5945**	-0.1638
	(0.2304)	(0.0713)
IG	-0.1071	0.0138
	(0.1081)	(0.0414)
IG	-	-
ENG	-0.0557	0.0240
	(0.1176)	(0.0465)
M	-0.5555*	-0.0652
	(0.2730)	(0.1083)
ROP	-0.0937	-0.0489
	(0.0858)	0.0306
ROP	-0.0004	0.0918**
	(0.0856)	(0.0320)
RAD	-0.5648	0.2360
	(0.3485)	(0.1775)
TGRAD	0.4136	0.1547
	(0.3281)	(0.1258)
ICAP	-	-
ET	-	-
TVET	0.2574	-0.0118
	(0.3606)	(0.1266)

PREVIET	-	-
KORVET	0.0871 (0.1377)	0.0921 (0.0446)
WWIIVET	-0.0285 (0.1754)	0.0718 (0.0563)
OTHVET	0.1405 (0.1766)	0.0878 (0.0580)
MANAGE	-1.0997* (0.5451)	0.2482 (0.2107)
PROF	0.2889 (0.2202)	0.1418 (0.0796)
SALES	-0.4677 (0.5775)	0.2883 (0.2229)
CLERIC	0.4153* (0.1801)	-0.0076 (0.0384)
SERVICE	-0.3039 (0.2354)	-0.1353 (0.0852)
CRAFT	-0.1414 (0.2823)	0.1700 (0.1052)
YRSIMG	-	-
AGE	0.1199 (0.2347)	0.8770*** (0.0756)
AGESQ	0.0186 (0.0252)	-0.0777*** (0.0083)
EDAGE	-0.0324 (0.0668)	0.0690** (0.0268)
VETAGE	-0.0244 (0.0488)	-0.0269 (0.0170)
VETED	0.1958 (0.1382)	0.0289 (0.0491)
LAMBDA	-1.4954 (0.8399)	0.1429 (0.3215)
CONSTANT	11.7629*** (2.1632)	6.8546*** (0.0825)

Summary Statistics	Self-Employment	Wage
Observations	3032	4243
R	0.0605	0.1947
Standard Error	1.4130	0.6139
F-Statistic	7.1994	37.7594

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

Table C.4b
SELF-EMPLOYMENT AND WAGE EARNINGS EQUATIONS
Males-1980

Variable	Self-Employment Coefficient (Standard Error)	Wage Coefficient (Standard Error)
URBAN	0.3630***	0.0580*
	(0.0432)	(0.0301)
BLACK	0.1799	-0.2614***
	(0.1143)	(0.0508)
ASIAN	0.0542	-0.1309
	(0.1183)	(0.1077)
YRSIMG	0.0170***	-0.0020
	(0.0030)	(0.0028)
IMMIG	-0.3627***	-0.0018
	(0.0902)	(0.0751)
BADENG	-0.1220	-0.3463***
	(0.1440)	(0.0924)
ELEM	0.0845	-0.0474
	(0.0863)	(0.0752)
HSDROP	-0.0807	-0.0802
	(0.0490)	(0.0418)
COLDROP	-0.0032	0.0939**
	(0.0409)	(0.0352)
COLGRAD	0.1259*	0.2305***
	(0.0613)	(0.0539)
POSTGRAD	-0.0652	0.2254**
	(0.0824)	(0.0682)
HANDICAP	-0.4707***	-0.1031*
	(0.0664)	(0.0535)
NEWVET	0.5334**	-0.2499***
	(0.1639)	(0.0761)

Table C.4c
SELF-EMPLOYMENT AND WAGE EARNINGS EQUATIONS
Females-1970

Variable	Self-Employment Coefficient (Standard Error)	Wage Coefficient (Standard Error)
URBAN	0.5177* (0.2550)	0.1529** (0.0555)
BLACK	-8.9826 (7.8862)	-0.1854* (0.0781)
ASIAN	-1.0994 (1.3309)	-0.3138 (0.2506)
HISPANIC	-0.7307 (1.0834)	0.7820 (0.2391)
IMMIG	-0.1468 (0.5207)	0.5173 (0.1013)
BADENG	0.1787 (0.3031)	-0.0641 (0.0543)
ELEM	-0.3170 (0.7242)	-0.3261* (0.1401)
HSDROP	-0.0544 (0.3874)	-0.2418** (0.0776)
COLDROP	0.6344 (0.4100)	0.0002 (0.0725)
COLGRAD	2.3150 (2.5997)	-1.3015 (0.4434)**
POSTGRAD	-5.4924 (5.6274)	0.4275** (0.1673)
HANDICAP	-	-
MANAGE	16.7286 (14.9632)	0.0320 (0.2591)
PROF	1.7293**	0.2406**

	(0.5697)	(0.0944)
SALES	10.2194	-0.1836
	(8.9739)	(0.1190)
CLERIC	0.4111	0.0033
	(0.4997)	(0.0684)
SERVICE	10.3159	-0.3997***
	(8.4311)	(0.0877)
CRAFT	1.1972	0.0507
	(0.6701)	(0.1587)
YRSIMG	-	-
AGE	-1.1054	0.1597
	(0.8875)	(0.1460)
AGESQ	0.1543	-0.0085
	(0.0905)	(0.0155)
EDAGE	1.3788	-0.0236
	(1.3084)	(0.0465)
LAMBDA	17.5101	-0.1229
	(15.3196)	(0.1041)
CONSTANT	-41.1044	8.1857***
	(43.3166)	(0.3088)

Summary Statistics	Self-Employment	Wage
Observations	548	1925
R^2	0.0568	0.0880
Standard Error	2.6312	0.9699
F-Statistic	2.5721	8.7490

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

Table C.4d
SELF-EMPLOYMENT AND WAGE EARNINGS EQUATIONS
Females-1980

Variable	Self-Employment Coefficient (Standard Error)	Wage Coefficient (Standard Error)
URBAN	-0.1534 (0.0809)	0.0981** (0.0386)
BLACK	0.1546 (0.1428)	-0.0935* (0.0422)
ASIAN	-0.3837 (0.2154)	-0.0019 (0.1158)
YRSIMG	0.0104 (0.0061)	-0.0049 (0.0039)
IMMIG	0.2603 (0.1936)	-0.0663 (0.0977)
BADENG	-0.3846 (0.3100)	-0.1943 (0.1242)
ELEM	-0.2729 (0.2202)	0.0582 (0.1119)
HSDROP	-0.1860 (0.1120)	-0.1154* (0.0529)
COLDROP	-0.0276 (0.0869)	0.0408 (0.0405)
COLGRAD	0.2495 (0.1490)	0.1146 (0.0650)
POSTGRAD	0.2798 (0.2013)	0.1337 (0.0877)
HANDICAP	-0.4862*** (0.1330)	-0.2284** (0.0852)
NEWJET[c]	-	0.8731 (0.7750)

Summary
Statistics

Observations	1771
Likelihood Function	-418.11
Exogenous Variables	13

* Statistically significantly different from zero at five percent level.

** Statistically significantly different from zero at one percent level.

*** Statistically significantly different from zero at 0.1 percent level.

[a] Weighted maximum likelihood estimates of probit model. Asymptotic standard errors in parentheses.

Table C.9
SELF-EMPLOYMENT AND WAGE EARNINGS EQUATIONS FOR YOUNG MALES
1980

Variable	Self-Employment Coefficient (Standard Error)	Wage Coefficient (Standard Error)
URBAN	0.1288 (0.0925)	0.0503 (0.0463)
BLACK	0.1019 (1.0352)	-0.2751*** (0.0693)
ASIAN	-0.2173 (0.3306)	-0.1950 (0.2053)
YRSIMG	0.0250 (0.0143)	0.0041 (0.0084)
IMMIG	-0.5670* (0.2410)	-0.0758 (0.1273)
BADENG	0.5261 (0.3264)	-0.5168*** (0.1409)
ELEM	-0.0006 (0.2401)	0.0168 (0.1621)
HSDROP	-0.1354 (0.1231)	-0.0965 (0.1123)
COLDROP	-0.0510 (0.0922)	0.0649 (0.0619)
COLGRAD	-0.0050 (0.1570)	0.1419 (0.1035)
POSTGRAD	-0.1269 (0.2281)	0.1568 (0.1424)
HANDICAP	-0.2010 (0.2098)	-0.0302 (0.0893)
NEWVET	0.0746 (0.5554)	-0.0965 (0.1123)
VIETVET	-0.0499	0.0497

respectively. LAMBDA denotes the Mill's Ratio. The coefficient of LAMBDA is marginally significant for the self-employment earnings equation and highly insignificant for the wage earnings equation for males and females in 1970. This coefficient is highly significant for the self-employment earnings equation for both males and females in 1980, is highly significant for the wage earnings equation for females in 1980, and is highly insignificant for the wage-earnings equation for males in 1980. The estimated coefficient of Lambda indicates a high degree of self-selection into self employment. The degree of self-selection can be measured by the correlation between the disturbance term in the probit equation for self-employment and the disturbance term in the self-employment earnings equation. The estimated correlations are reported in Table C.5.[10] The correlation coefficient for the self-employment earnings equation is negative for males. This negative coefficient indicates that males with relatively low earnings power (due to the influence of unobservable characteristics) tend to choose self-employment. The correlation coefficient for the self-employment earnings equation is positive for females. This positive coefficient indicates that females with relatively high earnings power (again due to the influence of unobservable characteristics) tend to choose self-employment.

Table C.6a and C.6b reports F-tests for the inclusion of various subsets of variables in the self-employment earnings equation for males and females respectively. For males it is possible to reject the hypothesis that military service influences self-employment earnings for 1970 and it is possible to reject the hypothesis that military service in the Vietnam-era or earlier influences self-employment earnings for 1980. It is not possible to reject the hypothesis that military service in the post Vietnam-era influences self-employment earnings for 1980. Post-Vietnam-era veterans appear to earn a substantial self-employment earnings premium--equal to approximately 73 percent--holding all other factors constant.

For males it is possible to reject the hypothesis that education influences self-employment

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10. The correlation is calculated by dividing the coefficient on Lambda by the estimated mean square error of the regression.

Table C.5
ESTIMATED CORRELATION BETWEEN PROBIT EQUATION AND EARNINGS EQUATIONS

	Males		Females	
Earnings	1970	1980	1970	1980
Self-Employment	-0.6265	-.6447	+0.2496	+0.7369
Wage and Salary	+0.6190	+.0003	+0.3615	+0.0004

[a] Based on generalized least squares estimates of earnings equations and quasi-maximum likelihood estimates of probit equation.

Table C.6a
F-TESTS OF SUBSETS OF VARIABLES[a]
Based on Earnings Equations Corrected for Selectivity Bias
Males

Hypothesis	1970 F-Statistic	1970 Statistical Significance (percent)	1980 F-Statistic	1980 Statistical Significance (percent)
WWIIVET=KORVET=OTHVET=VIETVET=NEWVET=PREVIET=0	0.5715	68.33	2.1364	4.62
WWIIVET=KORVET=OTHVET=PREVIET	-	-	0.2943	69.18
AGE=AGESQ=EDAGE=VETAGE=0	0.8362	50.20	9.1908	0.00
ELEM=HSDROP=COLDROP=COLGRAD=POSTGRAD=0	1.3108	25.64	4.7212	0.03
IMMIG=BADENG=ASIAN=0	0.6231	60.00	-	-
BADENG=ASIAN=0	-	-	0.4587	63.21

[a] Percent level of statistical significance gives the probability of obtaining reported coefficient estimates when true coefficients are given by the hypothesis in the first column. We reject the hypothesis when the level of statistical significance is less than or equal to 5 percent.

Table C.6b
F-TESTS OF SUBSETS OF VARIABLES[a]
Based on Earnings Equations Corrected for Selectivity Bias
Females

Hypothesis	1970 F-Statistic	1970 Statistical Significance (percent)	1980 F-Statistic	1980 Statistic Significar (percent)
NEWVET=VIETVET= REMVET=0	-	-	0.2266	79.72
ELEM=HSDROP=COLDROP= COLGRAD=POSTGRAD=0	0.8824	49.25	1.4258	21.23
IMMIG=BADENG=ASIAN=0	0.3031	82.32	-	-
BADENG=ASIAN=0	-	-	3.6429	2.67

[a] Percent level of statistical significance gives the probability of obtaining reported coefficient estimates when true coefficients are given by the hypothesis in the first column. We reject the hypothesis when the level of statistical significance is less or equal to 5 percent.