

Educational Attainment and Other Characteristics of the Self-Employed: An Examination Using Data from the Panel Study of Income Dynamics

A Working Paper by Dr. Chad Moutray
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by Chad Moutray, Office of Advocacy, U.S. Small Business Administration. 2007. 31 pages

Purpose

It was once assumed that college graduates would graduate and then go to work for a Fortune 500 firm; that is still true for many people. What is also true, though, is that more students today see entrepreneurship as a viable option for their careers.

This study examines the relationship between education and the choice to become an entrepreneur. In doing so, it builds on previous research linking entrepreneurial activity with educational attainment. Weaver, Dickson, and Solomon (2006), for example, survey the literature on this topic, and find that individuals with more education are more likely to be self-employed and successful. Brush and Manolova (2004) write that “human capital is the starting point for obtaining and developing other types of resources when a new venture is founded and directly influences its start-up process, survival, performance, and strategic direction.”

Using the Panel Study of Income Dynamics (PSID), this paper examines such linkages by analyzing the characteristics of the self-employed compared with individuals employed by others. An examination of differences between these two populations, both through univariate statistical comparisons and multivariate logit modeling, will provide information about various determinants of the self-employed, including educational attainment and non-educational factors.

Note that heads of households can be either male or female. For those who are male, this analysis examines the employment decisions of their wives. The PSID’s lack of information about male

spouses of female heads of household or about same-sex partners is a statistical artifact of the panel study’s 1968 origins.

Overall Findings

This study finds that educational attainment is an important determinant of self-employment. Individuals with more schooling are more likely to start their own business, particularly in certain industries. Heads of household with post-baccalaureate experience are up to 8.3 percent more likely to be their own boss rather than work for someone else.

Wealth (as defined by home ownership or the value of one’s home) and prior military service also significantly increase the likelihood of self-employment

Highlights

- Obtaining more education increases the probability of self-employment. For instance, a head of household with some college (but less than a bachelor’s degree) is 3.3 percent more likely to be self-employed than not. That figure rises to 4.4 percent for those with a baccalaureate degree and to 8.3 percent for those with graduate experience. The same holds true for wives; however, the impacts are smaller and sometimes statistically insignificant.

- Individuals with military experience are 9.4 to 11 percent more likely to be self-employed than to work for someone else, all else equal. The presence of military experience is the strongest predictor of self-employment in the model.

- The ability to start a business is often tied to financial assets, and the PSID data have two proxies

for measuring this – the value of a home and whether or not the household has a mortgage. Those respondents who work for someone else had a greater likelihood of being a nonhomeowner or having a less valuable home than their self-employed counterparts.

- The homeownership variable is one of the better indicators of self-employment, with homeowners being around 7 percent more likely than nonhomeowners to be self-employed. Moreover, for every \$100,000 increase in the value of an individual's house, the probability of self-employment increases by 2 percent.

- For heads of household, the self-employed are more likely to be older, married, white, military veterans, Internet savvy, and rural. For wives, the self-employed are more likely to be older than 30 years of age, white, and military veterans; they are also more prone to be employed in the service sector and have greater relative wealth (as measured by the value of their home).

- Goods-producing entrepreneurs tend to be in construction. In the service-producing industries more of the self-employed are in the “soft” service sectors. The “soft” service sector would be industries that are more “white collar” in nature, and not coincidentally, they would also be the ones that would require more college education as preparation.

- Heads of households in the service sector are 1.4 percent less likely to be self-employed. However, heads of household employed in the nongovernmental “soft” service sector are 2.9 percent more likely to be self-employed.

Scope and Methodology

This study utilizes PSID data from 2003, although there is also a comparison made in one of the tables with data from 1990. The PSID data set is unique in that it tracks families over time, beginning in 1968. As children marry and start their own families, for instance, the PSID survey will continue to follow them.

The PSID contains information on the employment status of its respondents. It asks the head of household and, when applicable, the wife if they were self-employed or worked for someone else in a given year, allowing examination of self-employment in this sample. Examinations of the differences between the self-employed and the non-self-employed, both through univariate statistical comparisons and multivariate logit modeling, provide useful information about the various determinants of self-employment.

The PSID study and this analysis refer to “wives” and not women. It is possible that a woman could be the head of household; however, the head of household is male at least 76 percent of the time.

Nongovernment “soft” service sector industries used in this analysis of PSID data include the following two-digit NAICS major industries: retail trade; information; finance and insurance; real estate and rental and leasing; professional, scientific, and technical services; management, administrative and support, and waste management services; educational services; health care and social assistance; accommodation and food services; and other services.

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EDUCATIONAL ATTAINMENT AND OTHER CHARACTERISTICS OF THE SELF-EMPLOYED: AN EXAMINATION USING DATA FROM THE PANEL STUDY OF INCOME DYNAMICS

A Working Paper by Chad Moutray¹

Introduction

Education opens many doors, and in doing so, it breeds success. Acquiring more schooling and/or learning a new skill provides opportunities for professional advancement. For those who have experienced the benefits of education, this conventional wisdom is more than just a cliché. Moreover, a solid educational background can be useful both for those who wish to work for someone else or for those who opt to become small business owners. It was once assumed that college graduates would graduate and then go to work for a Fortune 500 firm; that is still true for many people. What is also true, though, is that more students today see entrepreneurship as a viable option for their careers.²

This study examines the relationship between education and the choice to become an entrepreneur. In doing so, it builds on previous research linking entrepreneurial activity with educational attainment. Weaver, Dickson, and Solomon (2006), for example, survey the literature on this topic, and find that individuals with more education are more likely to be self-employed and successful. Brush and Manolova (2004) write that “human capital is the starting point for obtaining and developing other types of resources when a new venture is founded and directly influences its start-up process, survival, performance, and strategic direction.”³

Using the Panel Study of Income Dynamics (PSID), this paper examines such linkages by analyzing the characteristics of the self-employed compared with individuals employed by others. An examination of differences between these two populations, both through univariate statistical comparisons and multivariate logit modeling, will provide information about various

¹ Chad Moutray is the Chief Economist and Director of Research for the Office of Advocacy of the U.S. Small Business Administration (SBA). The opinions expressed in this article are those of the author and do not necessarily reflect the views of the Office of Advocacy, the SBA, or the U.S. government. Thanks to Joseph Johnson, Jules Lichtenstein, Shawne McGibbon, Charles Ou, Radwan Saade, and Kathy Tobias for their helpful comments.

² A number of surveys show that teens and college students want to “be their own boss” at some point in their careers. For example, a Junior Achievement poll of teenagers in 2004 found that 64 percent of teenagers wanted to become entrepreneurs and 88 percent recognized that a college education was essential to reaching that goal. See http://www.ja.org/about/about_newsitem.asp?StoryID=207 for more information.

³ Brush and Manolova, 2004, p. 78; also see Vesper, 1990; and Cooper, Gimeno-Gascon, and Woo, 1994.

determinants of the self-employed.⁴ In exploring the impact of increased education on self-employment decisions, this paper will also examine and discuss other characteristics. While educational attainment might be a strong predictor of self-employment, other factors – such as demographic information or wealth – may be even stronger predictors.

The rest of this paper is organized as follows. First, a thorough examination of the literature on educational attainment and entrepreneurship will be presented. Second, a series of tables will parse the data, looking at various aspects of the individuals answering the PSID survey, such as their college education, age, marital status, race, prior military service, home ownership, geography, and industry. For each of these variables, the responses of the self-employed will be compared with those of individuals who work for someone else. Such comparisons can provide insight into the characteristics of each group, and will be utilized in formulating the multivariate logit model that follows. The last section presents and discusses the results of a series of logit regression models that examine self-employment by various levels of educational attainment and other characteristics.

Literature Review

Education, by and large, is seen as a net positive for entrepreneurial activity. The pioneering work of Schultz (1961), Becker (1975), and Jacobs (1984), for example, documents the benefits of greater human capital to entrepreneurs and their communities, and various other studies have shown that regions with greater levels of educational attainment have increased entrepreneurship and economic development.

Glaeser (1998) finds that human capital accumulation is essential for economic development. In particular, regions can benefit from the clustering of human capital, as individuals and businesses gain from increased networking opportunities and labor pools. Florida (2002) builds on this idea further by stressing the importance of the “creative class,” which emphasizes young, creative professionals based in knowledge-intensive occupations. Communities that attract these individuals tend to thrive, whereas others tend to stagnate. Florida writes that “places with greater numbers of highly educated people grew faster and were

⁴ The PSID data discuss the respondent’s current employment situation. The respondents have three possible choices: they work for someone else, they work for themselves (self-employment), or both. This paper analyzes the differences between the first two groups, ignoring the self-employed who work for others at the same time. The survey choices do not allow for distinguishing between incorporated versus unincorporated self-employment.

better able to attract more talent.”⁵ In addition, Lee, Florida, and Acs (2004) note that “regions that are open and creative and attract human capital enjoy more dynamic entrepreneurship.”⁶

While the focus of this paper is human capital, any discussion of the “knowledge economy” implicitly focuses on technology transfer and the commercialization of university-derived research. Kirchoff and Armington (2002) demonstrate a significant increase in the number of new firm formations resulting from university research and development expenditures. Shane (2004) examines the positive contributions of university spin-offs to the economy, and CHI Research (2003) and Baumol (2005) address the important role that small firms play in innovation.

Other studies tend to reinforce the assertion that greater educational attainment leads to more economic growth. Georgellis and Wall (2000) find that human capital plays a significant role in explaining regional entrepreneurial activity in Britain, and Camp (2005) reaches a similar conclusion in evaluating metropolitan growth in the United States.

Some form of human capital is seen as a positive for small business success. For example, entrepreneurs, including the self-employed, are more likely to be better educated.⁷ Bates (1997) observes that the “level of education is the most important factor in identifying those starting skilled-services businesses.”⁸ Crosa, Aldrich, and Keister (2002) detect that those with a high school diploma or less are only half as likely as those with more education to become nascent entrepreneurs. Reynolds et al. (2004) find that educational attainment has a greater effect for minority groups when identifying emerging entrepreneurs. Also, Karoly and Zissimopoulos (2007) find that the self-employed are more likely to be male, older, and college-educated.⁹

Researchers have also found that business owners are more likely to be successful when their education or past experiences match those required in their business start-ups. Van der Sluis et al. (2004) conclude that “the higher the schooling level or the more years of education

⁵ Florida, 2002, p. 222. In this quote, the author is referring to research by Glendon, 1998, which examines city growth over the twentieth century.

⁶ Lee, Florida, and Acs, 2004, p. 14.

⁷ In addition to the studies mentioned, see also Arenius and DeClercq, 2005; Borjas, 1986; Davidsson and Honig, 2003; Delmar and Davidsson, 2000; Evans and Leighton, 1989; Lee and Wong, 2004; and Uhlaner, Thurik, and Hutjes, 2002.

⁸ Bates, 1997, p. 35.

⁹ They reach a similar conclusion in their earlier work, Zissimopoulos and Karoly, 2004. Both studies, which were completed for the Public Policy Institute of AARP, examined self-employment among those 50 years of age or older.

that have been pursued, the higher are the chances that performance is good.”¹⁰ Those with more education make higher profits, according to Bosma et al. (2002). Gimeno et al. (1997) concur with this finding, noting that entrepreneurs with more education tend to have stronger outcomes; however, they also reveal that these individuals do not survive more frequently than those with less education.

Along those lines, some researchers have tied success to the entrepreneur’s educational background. For instance, Cooper and Gimeno-Gascon (1992) find that business and engineering degrees were more helpful in determining a new firm’s growth, but there is a caveat. They caution that having too many business courses can also hamper a firm’s growth. This finding speaks for the need for small business owners to have a “broad exposure” in their academic training, as suggested by Brush and Manolova (2004). Lazear (2004) explains that “... entrepreneurs must be jacks-of-all-trades to some extent. Although they need not be an expert in any single skill, they must be sufficiently good at a wide variety to make sure that the business does not fail.”¹¹

In addition to educational background, past work experiences can also significantly increase the likelihood of success for an entrepreneur. Iyigun and Owen (1998) suggest that “entrepreneurial skills are honed by investing time working in an entrepreneurial venture.”¹² In particular, those who have managed before in some capacity have better outcomes, writes Bosma et al. (2002), Davidsson and Honig (2003), and Lee and Wong (2004). Cooper et al. (1994) and Gartner and Liao (2007) state that small business owners with previous industry experience perform better, with the latter study also suggesting that those individuals with prior start-up experience are also more successful. Shane (2000) notices that people who take advantage of entrepreneurial opportunities are those who are able to recognize the potential of such an opportunity based on their prior knowledge and expertise. Other authors cite the “tacit knowledge” acquired in past jobs. For instance, Fairlie and Robb (2004) argue that these experiences outstrip success associated with having another self-employed family member, suggesting that business know-how is a learned skill and not something that can be automatically passed down from one generation to the next.

¹⁰ Van der Sluis, et al., 2004, p. 17.

¹¹ Lazear, 2004, p. 208.

¹² Iyigun and Owen, 1998, p. 455.

Failure from past start-up experiences can be beneficial and not a hindrance in starting a new venture. Vesper (1990) writes that those entrepreneurs who have failed in previous attempts do not see this as a barrier to starting another firm. In addition, Sullivan, Warren, and Westbrook (1999) noted that a number of bankruptcy filers went on to start another business (or had plans to do so) at some point. Indeed, there is an entire literature that discusses how our bankruptcy laws allow for second chances, without the stigma of failure, by not discouraging self-employment after a bankruptcy filing; other nations are not so lenient, and do not allow their entrepreneurs to learn from their mistakes.¹³

Education can provide the tools necessary for many underserved populations to advance in society by starting businesses. Bates (1997) writes of the role that human capital plays in allowing minorities to achieve the “American dream” through entrepreneurship, and Rupasingha and Goetz (2007) discuss how regions with higher levels of education tend to have reduced poverty.¹⁴ Lofstrom and Wang (2006) examine the self-employment differences between Hispanics and non-Hispanic Whites, for instance, and they note that educational and financial differences explain why more Whites are engaged in self-employment than Hispanics. Moreover, education also plays a role in what businesses each group chooses to enter. Addressing the issue of potential, the authors discover that “after controlling for differences in educational attainment across groups, Hispanics are as likely to enter self-employment as whites.”¹⁵ Last, Reynolds et al. (2002) describe how Hispanics and African Americans with additional schooling are more likely to become nascent entrepreneurs, especially men in these two groups.

Despite these studies, having more education is not always correlated with more small business activity. Acs and Armington (2005), for instance, find no relationship between a region’s level of collegiate education and entrepreneurial activity. Instead, they note a stronger relationship with high school education. The authors surmise that a region’s overall level of education, as measured by the number of high school graduates, is more important. In other

¹³ For a more in-depth look at the effects of bankruptcy and entrepreneurial activity, see Fan and White, 2003; Armour and Cumming, 2005; and Mathur, 2005. Note that much of this analysis pre-dates major changes to the U.S. bankruptcy law which took effect on October 17, 2005. This new law is widely perceived to have tightened the ability of bankruptcy filers to “walk away” from their debts; yet, the comparison above is still true. Many other nations, particularly in Western Europe, continue to be less tolerant of business failure.

¹⁴ This article does not specifically mention self-employment, but it is alluded to. A companion article by Goetz, 2006, is more explicit in discussing the role that education plays in promoting self-employment.

¹⁵ Lofstrom and Wang, 2006, p. 7.

words, small business owners need to hire from a skilled work force. Along those lines, Weaver, Dickson, and Solomon (2006) observe that “education beyond a baccalaureate degree has generally not been found to be positively linked to entrepreneurship,” a finding echoed in Goetz (2006). Meanwhile, Block and Wagner (2006) find that education is more important for entrepreneurs exploiting an opportunity than for those who choose self-employment based on necessity.

Rissman (2003) notes that education can also reduce an individual’s willingness to choose self-employment. Those with advanced degrees have so many opportunities – some of which can be lucrative – that self-employment is a less attractive option. In other words, the opportunity cost of leaving a high-paying job (especially one with generous benefits) to be one’s own boss is simply too high. Rissman finds that self-employment is more likely to be present among populations that experience limited labor market options. Indeed, Hipple (2004) observes that individuals with advanced degrees are three times more likely to be among the incorporated self-employed than those with less than a high school diploma.¹⁶ This finding stems from the fact that workers with advanced degrees are more likely to be in occupations where incorporated self-employment is prevalent. At the other end of the spectrum, Bates (1997) writes that, unlike in the service industry, construction businesses are more likely to be started by non-college graduates.

Examining the Data

This study utilizes the Panel Study of Income Dynamics (PSID), which is a longitudinal database originating in 1968 and administered by the University of Michigan’s Institute for Social Research. Its original intent was to explore the impact of the “War on Poverty” programs began under the Johnson Administration, and it is unique in that it tracks families over time. As children marry and start their own families, for instance, the PSID survey will continue to follow them and their children. This data set has been utilized in numerous studies, especially in the

¹⁶ Hipple, 2004, also notes that self-employment occurs for all populations regardless of educational achievement. He writes, “Among workers age 25 or older, those with either an advanced degree or with less than a high school diploma had relatively high self-employment rates – 9.2 percent. The probability of being a business owner was somewhat lower for workers with an associate degree, high school graduates with no college, and workers with some college but no degree.”

social sciences, and it has one distinct advantage over many others: it is free and publicly accessible.¹⁷

The PSID has been designed to be a representative sample of the United States population, and given that it was not designed to evaluate self-employment, it does a reasonable job with some caveats that must be taken into account when interpreting the analysis. The analysis in this paper uses 2003 PSID data. In that year, 14 percent of the heads of household and 9.4 percent of wives were self-employed. Fairlie (2004) notes that nonagricultural self-employment rates in 2003 for men and women were 12.4 and 6.8 percent, respectively, of the labor force. The PSID rate of self-employment was higher, but it included farmers, which might partly explain the differences. Moreover, the comparison with all women might not be appropriate since the PSID data under examination include only wives. (Note that heads of households can be either male or female. For those who are male, this analysis examines the employment decisions of their wives.)¹⁸

One deviation from the overall population occurs in the racial makeup of the population. While there have been attempts to add other racial groups to the PSID, particularly in the 1990s, the racial breakdowns are clearly skewed towards Whites and Blacks.¹⁹ Therefore, the shares of other races or ethnicities, such as Asians or Hispanics, are not proportionate with their shares of the 2003 labor force. If anything, Blacks are oversampled. Fairlie (2004) finds that African Americans accounted for around 4 percent of the self-employed population in 2003; the PSID data analyzed here had nearly 21 percent of the self-employed heads of household and about 13 percent of the wives as Black.

Another area in which the PSID sampling is somewhat skewed was the industrial breakdown. Employment in the service-producing industries, according to the Bureau of Labor

¹⁷ Note that the University of Michigan does provide weights that would allow the data to be more representative of the population. This analysis, however, has not incorporated those weights. For more information on the Panel Study of Income Dynamics, see <http://psidonline.isr.umich.edu/>. This link also contains a bibliography to research that has utilized the PSID data.

¹⁸ The head of household is usually male, but that is not always the case. In Table 1, the head of household is male 86.2 percent of the time for the self-employed population. Among those who work for someone else, the head of household is a male 76.2 percent of the time. For those who are currently married, Table 1 includes information about the wife. Notice that if the head of household is female, there is no information on the (male) spouse; moreover, there is no option in the data for same-sex marriage.

¹⁹ One dilemma in using this dataset is the need to use 1968 identifiers, particularly for cross-year analysis. These more than likely impact the overall racial and ethnic breakdowns.

Statistics, was around 17 percent of total employment. Adding together the total employment of the heads of household and their spouses in the PSID data, this figure is closer to 24 percent.

To point out these differences is not to disparage the data set or to discount the analysis presented below, but to recognize the biases that exist within the data. This data set was intended to measure the impact of anti-poverty programs. It is reasonable then to assume that certain segments of the population would be examined more thoroughly than others. This paper is primarily interested in the relationship between self-employment and educational attainment. The rates of self-employment are a reasonable approximation, even if they are slightly higher than found using the Current Population Survey, and thus, if education (or any other characteristic) is important to one's ability to start a firm, analysis of that relationship should be possible using this data set.

Exploring Trends in the Data

The PSID contains information on the employment status of its respondents. The survey asks the head of household and the spouse if they were self-employed or worked for someone else in a given year, allowing examination of self-employment in this sample. With this knowledge, it is possible to differentiate various characteristics between the self-employed and those who opt to work for someone else, assuming other factors are held constant.

Table 1 shows some of these comparisons for both the head of household and wife (for those who had one) for data year 2003. In educational attainment, a significantly larger proportion of heads of households who were self-employed had completed four years or more of college than those who worked for someone else. In contrast, heads of households with no college education constituted a greater percentage of the non-self-employed. Wives with no college education were more likely to work for someone else, and those with five or more years of college education were more likely to be self-employed.

The demographic differences are also interesting. The population of non-self-employed workers, both heads of households and their wives, was younger than their self-employed peers. Looking at the two end points of the population, individuals younger than 30 or 40 years old were more likely to work for someone else, whereas respondents over 60 years old were more likely to be self-employed. From this, we might ascertain that entrepreneurs might start their businesses later and keep them going well beyond what might be considered the normal

retirement age for the wage-and-salary population. In fact, 9.2 percent of the self-employed population is over 60 years of age versus 4.2 percent of the non-self-employed individuals.

The self-employed were more likely to be married, although both populations had a marriage rate of at least 60 percent. Whites had a greater proportion of self-employment and Blacks had a larger proportion working for someone else. Other racial or ethnic groups reflected few significant differences. Military service and, for the most part, geography also were not factors in differentiating the self-employed heads of households. Geographic variables were more relevant for women entrepreneurs, with greater relative proportions in the northeastern and western states and in towns with less than 20,000 population.

The ability to start a business is often tied to financial assets, and the PSID data had two proxies for measuring this – the value of a home and whether or not the household has a mortgage. Those respondents who work for someone else had a greater likelihood of being a nonhomeowner or having a less valuable home than their self-employed counterparts. In fact, more than 86 percent of the non-self-employed heads of households had a home worth less than \$250,000 or did not own a home at all; this number was 70 percent for the self-employed. An interesting twist on this, though, was found between men and women. Of those individuals with a home valued at more than \$1 million, the heads of household (usually men) were more likely to be self-employed (3.8 percent versus 1.5 percent), whereas their wives were more likely to work for someone else (1.3 percent to 0.1 percent).

Finally, there were significant differences in the industries self-employed individuals pursued compared with their employed counterparts.²⁰ In goods-producing industries, the largest differences were in construction and manufacturing, with the self-employed being construction entrepreneurs more often than not and the manufacturing labor force more likely working for someone else. Service-producing industries with greater proportions of head-of-household self-employment were real estate, rental, and leasing; professional, scientific, and technical services; management, administrative and support, and waste management services; arts, entertainment, and recreation; and other services. The list for wives is similar, but also includes retail trade. Interestingly, there was no significant difference in the proportion of self-employed or non-self-

²⁰ The PSID industrial breakdown utilizes two-digit NAICS codes. See <http://www.bls.gov/ces/cessuper.htm> for NAICS code equivalents for each sector.

employed for the health care and social services sector, one of the faster-growing segments in the economy.

The next step in the analysis is to explore the linkages of each of these characteristics in more detail relative to educational attainment (Table 2). The table further subdivides the self-employed and those working for someone else into their years of college education. For simplicity, only the heads of household were analyzed.

If there is a link between self-employment and education, for instance, it would be expected that the proportions of self-employed individuals reflected in each characteristic should increase (or in some cases decrease) with more years of college, all else equal.²¹ For those individuals who work for someone else, this proportional increase is often the case, especially building from no college to four years of college; that relationship is less prevalent among the self-employed. For example, look at the service-producing industry for the non-self-employed. Almost 63 percent of those with no college work in the service sector, rising to nearly 84 percent for those with five years of college or more work in the service sector. Clearly, with more education, individuals who work for others are more likely to opt for the service sector; conversely, they are less likely to work in the goods-producing sector. This phenomenon is largely a function of the industries that constitute the service sector – professional, scientific, and technical services; educational services; health care and social services; and public administration and active duty military – which often require additional schooling. Those industries are sometimes referred to as “soft services.”

The differences in the proportions of individuals engaged in a specific industry between those with no college and those with a bachelor’s degree for the non-self-employed are significant in all but two industries (utilities, and arts, entertainment, and recreation). In some cases, more education signifies an increased presence of respondents in that industry, such as in finance and insurance or educational services; in other instances, the respondents tend to have less education, such as in construction, manufacturing, mining, or retail trade. In contrast, for the self-employed only four industries reflect a significant difference in the proportions of those with no college and those with a bachelor’s degree. Among the self-employed, a higher percentage of

²¹ Educational attainment is measured by the number of years of college. This analysis assumes that a baccalaureate college graduate would have four years of college, and a post-baccalaureate student or graduate would have five years of college or more. This ignores the fact that college students may take longer to complete a bachelor’s degree, but it is probably consistent with how a respondent would complete a survey on the topic.

college graduates than those with no college work in real estate, rental, and leasing, and in professional, scientific, and technical services. In contrast, more self-employed non-college graduates were in the management, administrative and support, and waste management services, and in health care and social services.

Looking at general trends, those individuals with a baccalaureate degree who work in agriculture, construction, real estate, professional and scientific services, or other services (except public administration) are significantly more likely to be self-employed than not. Likewise, bachelor's degree graduates are significantly more likely to work for someone else if they are employed in the following industries: manufacturing, mining, utilities, wholesale trade, information, finance and insurance, education, or public administration and active duty military. The top industries for self-employment among those without any college are construction, other services, and health care and social services; non-self-employed individuals with no college are more likely to work in manufacturing, construction, retail trade, and health care and social services.

Obviously, there is some overlap in this analysis. These major industry sectors, especially in services, are broad. For instance, by lumping together health care and social services, one might suspect that differing educational requirements would be required for "health care" versus "social" services. Similar findings might be expected in some of the other industrial categories. It would be interesting to analyze the educational attainment differences for the self-employed and non-self-employed using more detailed industrial breakdowns, such as three- or four-digit North American Industrial Classification System (NAICS) codes. The PSID does not have such breakdowns.

It would be useful to be able to examine trends in the data through some form of dynamic analysis of self-employment and education. Ideally, because this data set is longitudinal, we could assess the relationship between these two factors over time for a number of years. That was the original intent of selecting the PSID. However, for whatever reason, variables on educational attainment, including the number of years of schooling and the highest year of college completed, cannot be found in the PSID data from 1994 to 2001. According to the comparability notes in the data, questions regarding education were not brought forward, and the question was not asked. This limits our ability to assess the dynamic impacts of choosing self-

employment one year versus the next, and indeed, it would be interesting to look at forthcoming PSID data to determine a stronger relationship between these two variables.

In the absence of newer data, however, we will look at some head-of-household comparisons for 1990 and 2003. Over this time frame, some individuals remained self-employed or continued to work for others, while other respondents switched from self-employment to not self-employed or visa versa. Table 3 shows some analysis relative to college attainment and industrial responses for 2003.²² Note that we can learn nothing from this analysis about business survival in general, as someone who remained self-employed may or may not be with the same firm.

One of the more intriguing findings in Table 3 is the examination of those who completed either a bachelor's degree or an advanced degree post-1990. For those individuals who stated that they were self-employed in 1990, the completion of a baccalaureate degree resulted in every respondent in the survey going to work for someone else. Moreover, while the difference was not statistically significant, those who completed five years or more of college were also more likely to find employment elsewhere over working for themselves. This contrasts with those individuals who worked for someone else in 1990 and went on to complete a post-baccalaureate degree; they were significantly more likely to become self-employed. Hence, while completion of a bachelor's degree did not result in more self-employment in this sample, finishing an advanced degree did.

Of the industries where individuals remained self-employed between 1990 and 2003, a few reveal no surprises. Those employed in agriculture; construction; professional, scientific, and technical services; and other services (except public administration) had a higher proportion in self-employment in both years. Those who switched from working for others to working for themselves were more likely to be in the construction; finance and insurance; real estate, rental, and leasing; professional, scientific, and technical services; management, administrative and support, and waste management services; and other services professions. Those industries where the workers responded that they worked for someone else in both years include manufacturing,

²² Because of the change from Standard Industrial Classification (SIC) codes to NAICS codes in the late 1990s, comparing respondents' industries between 1990 and 2003 is somewhat difficult, especially for the service sector. To simplify the analysis and to allow for greater detail, only the 2003 industrial response is shown in Table 3, which follows NAICS codes. While not a perfect indicator of dynamic measurement, it does show the industries that these individuals either stayed employed in or switched into between 1990 and 2003.

mining, utilities, wholesale trade, transportation and warehousing, information, education, and public administration.

So what have we learned from Tables 1 through 3? First, those with a baccalaureate education are more likely to be self-employed than to work for someone else, but this finding varies by industry, with some sectors more likely to stress a college education than others. More often than not, these conclusions confirm conventional wisdom in this area. Second, there are significant differences between the populations of the self-employed and non-self-employed in terms of demographics and home ownership (a proxy for wealth); there were few differences between the two groups, however, in terms of prior military service or geography. Finally, the attainment of a bachelor's degree is associated with individuals who switched from self-employment to working for others, whereas the attainment of an advanced degree by those who had worked for someone else in the past increased the likelihood of self-employment later.

Model Results

Each of these lessons can now be applied to our overall model using the PSID, which will further measure the relationship between education and self-employment. Using multivariate logit analysis, the dependent variable is whether or not an individual is self-employed. The independent variables are essentially attempts to model the characteristics of the self-employed. They are the variables mentioned earlier in Tables 1 through 3, including variables for educational attainment, demographics, home ownership/wealth, geography, and industry.

Table 4 discusses logit analysis predicting self-employment for either the head of household or his wife.²³ In each case, two regressions are being performed – one which has a dummy variable for workers in the service sector, and another for those who work in the nongovernmental “soft” service sector. The reason for the latter logit regressions will be discussed later. In this analysis, there are three independent variables representing the highest level of educational attainment for either the head of household or the wife, respectively. Those individuals who cited one to three years of college education are shown as “some college, but

²³ Note that the author conducted a number of different analyses using different combinations of independent variables. The tables included in this write-up are limited to those with the best fit; however, the overall results, especially pertaining to educational attainment, were similar throughout. The models for head of household and wives presented here are not the same. The data are different enough to warrant dissimilar explanatory models resulting in the best fit.

less than a bachelor's degree." Those with a bachelor's degree (four years of college) and post-graduate experience (five or more years of college) are also shown.

One might hypothesize that the probability of being self-employed increases with greater educational attainment. The logit results support that hypothesis. Of importance in these results is the "marginal effects after logit," which is essentially the approximate elasticity for each independent variable. In essence, it measures the effect of a change in the dependent variables on the independent variable (the likelihood of being self-employed). For instance, looking at Table 4, we know that a head of household with some college is 3.3 percent more likely to be self-employed than not.²⁴ That figure rises to 4.4 percent for those with a bachelor's degree and to 8.3 percent for those with graduate education. Each of these results is highly significant. Thus, there is a positive relationship between levels of education and a head of household's inclination to become self-employed.

The same holds true for wives; however, the impacts of education are smaller and sometimes statistically insignificant, mirroring the comparison findings of Table 1. Those wives with some college are 0.5 percent more likely to be self-employed – a result that is insignificant – and that figure rises to 2.6 percent for those with post-baccalaureate experience.

The noneducation variables also provide some interesting findings. For heads of household, the self-employed are likely to be older, married, White, military veterans, Internet-savvy, and rural. They would also be more likely to own their own home. Note that in our earlier analysis, there was little difference in the military veteran community between the self-employed and those who worked for someone else. The logit analysis, however, finds that military service has the largest impact of any variable, with the probability of self-employment increasing around 11 percent for that group.²⁵

An examination of the marginal effects variable for house value could be somewhat deceiving. A \$1,000 increase in home ownership would increase the probability of self-employment by 0.02 percent for heads of household. That might not sound like much, but that is

²⁴ Unless otherwise specified, the results explained in the text refer to the multivariate logit regressions where the service sector is the only variable representing the industry of the worker. Those who work in the service sector are coded as a one, and those who are not have a zero code.

²⁵ Many might be surprised to find that military experience would be such a strong predictor of self-employment participation. However, this finding is consistent with a Waldman Associates 2004 survey, which indicated that military service "provided a significant proportion of both new veteran entrepreneurs and current veteran business owners with necessary business skills" to start their own ventures. Fairlie, 2004, found that male veteran self-employment rates between 1979 and 2003 were higher than those of nonveterans.

only because of the size of the increase. A home that is \$100,000 greater in value would increase the probability of self-employment by 2 percent, and one that is \$200,000 greater would increase it by 4 percent, and so on. Along those lines, the homeownership variable is also one of the strongest predictors, with homeowners being around 7 percent more likely than nonhomeowners to be self-employed. Thus, as with previous studies on this topic, home ownership and the value of one's home, both of which are often used as a proxy for wealth, are important predictors for self-employment.

The industrial analysis is enlightening. Self-employed heads of household are less likely to be employed in the service sector, according to Table 4. In fact, those in the service sector are 1.4 percent less likely to be self-employed. This would suggest that they are more likely to be self-employed in the goods-producing sector, showing the influence of the agricultural and construction sectors in the analysis (see Table 1). But that is only part of the story. The table also tells us that heads of household employed in nongovernmental "soft" service sector industries are 2.9 percent more likely to be self-employed. The "soft" service sector would be industries that are more "white collar" in nature, and not coincidentally, they would also be the ones that would require more college education as preparation.²⁶

The two largest differences for the self-employment models for wives are in age and industry. The only age variable of significance is for wives under the age of thirty; they are roughly five percent less likely to be self-employed than to work for someone else. These findings are not surprising given that many women (and men) wait until they are older to become entrepreneurs. Indeed, they confirm the findings of Table 1, which shows that wives are slightly more likely to become entrepreneurs after 40 years of age.

Wives are also more likely to be self-employed in the service sector, regardless of whether the service industry is "soft" or not. For spouses, a service sector employee is 4.3 percent more likely to be self-employed; whereas, a private sector "soft" service sector employee is 6.6 percent more likely.

²⁶ Nongovernment "soft" service sector industries used in this analysis of PSID data include the following two-digit NAICS major industries: retail trade; information; finance and insurance; real estate and rental and leasing; professional, scientific, and technical services; management, administrative and support, and waste management services; educational services; health care and social assistance; accommodation and food services; and other services.

In summary, for wives, the self-employed are more likely to be older than 30 years of age, White, and military veterans; they are also more prone to be employed in the service sector and have greater relative wealth (as measured by the value of their home). As with their husbands, being a military veteran has a large impact in determining self-employment, with military service increasing the chances of self-employment by 9.4 to 10.8 percent, depending on the service sector model.

Tables 5 through 8 represent final steps in this analysis and a check on the robustness of the results. For each table, three regressions are performed, with each model the same except for the level of educational attainment variable. Unlike Table 4, education is now being measured cumulatively; hence, there is a need for three separate logit regressions. Those with “some college” would include any education at the collegiate level, even one year. If the individual has four or more years of college, he or she would be coded as having a “baccalaureate and/or graduate education,” and “post-baccalaureate experience” is for those with five or more years of college.

Overall, the findings mirror those found in Table 4. In particular, the probability of a respondent being self-employed increases with more college education, and the other independent variables reveal similar results. The variables with the largest influence include military experience, home ownership and/or the value of one’s house, race, education, and age.

Conclusion and Discussion

Conventional wisdom holds that human capital is an essential ingredient to one’s future success, regardless of the endeavor an individual pursues. This study finds that educational attainment is an important determinant of self-employment. Individuals with more schooling are more likely to start their own business, particularly in certain industries. Goods-producing entrepreneurs tend to be in construction, and the service-producing industries with a greater presence of the self-employed are in the “soft” service sectors. Along those lines, multivariate logit regressions show that heads of household with post-baccalaureate experience are up to 8.3 percent more likely to be their own boss rather than work for someone else.

One aspect that deserves greater attention is the impact on employment after completing a college degree. This analysis shows that the completion of a post-baccalaureate education matters only for those who did work for someone else; a significantly greater percentage of them

became self-employed after the graduate degree. The completion of a bachelor's degree is correlated with a greater likelihood of working for someone else post-graduation. Yet, given the limitations of the data set, particularly the difficulties with comparability of educational attainment variables from year to year in the PSID, further examination in this area should probably be with a different data set.

Beyond educational attainment, several other important characteristics that affect self-employment levels are observed in the PSID data. Many of the relationships are supported by findings in previous research; it is always nice to see confirmations of existing concepts. For instance, wealth (as defined by home ownership or the value of one's home) and prior military service significantly increase the likelihood of self-employment. In fact, both of these factors are stronger predictors of self-employment trends than educational attainment. Other important characteristics for heads of household related to self-employment are age, marital status, race (in this case, primarily White versus Black), Internet usage, and population size.

Future research should focus on more in-depth analysis of the relationship between education and entrepreneurial tendencies. While there are positives to more schooling, are there particular aspects of such human capital that matter for some entrepreneurs and not others? Lazear (2004) states that the self-employed tend to be "jacks-of-all-trades" and need a more general education than do their peers who work for others, who tend to be more specialized. Is this true for all industries or just specific ones, and is it true beyond the Stanford business school alumni used in his sample? Moreover, do the specific educational experiences of the student matter? Does it matter, for example, if a student's degree is in business or in some other discipline? Lastly, given that many individuals start their firms later in life, their human capital experiences go beyond formal educational training. Many work in the private sector for a number of years, gaining valuable experiences, and then pursue their dream of becoming their own boss. How do these insights enter into the equation?

Unfortunately, the Panel Study of Income Dynamics is not the ideal data set to address many of these issues. Perhaps a large, longitudinal data set such as the U.S. Department of Education's Baccalaureate and Beyond series could be helpful with such an analysis, and this author hopes to use that source for future papers on the topic.

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Table 1: Panel Study of Income Dynamics, 2003 Data
Comparison of Self-employed and Non-self-employed for Head of Household and Spouse (percent except as noted)

	Head of household		Wife	
	Self-employed	Work for someone else	Self-employed	Work for someone else
Observations (number)	2,330	16,625	747	7,911
College education				
No college (includes nonresponses)	48.3	55.4 *	45.9	49.4 ***
Completed three years or less	23.7	23.8	26.6	27.3
Completed four years	15.6	13.5 *	16.7	15.1
Completed five or more years	12.4	7.3 *	10.8	8.2 **
Age				
Less than 30 years old	7.8	19.5 *	9.1	20.2 *
30 to 39 years old	23.6	28.2 *	37.9	29.8 *
40 to 49 years old	35.5	31.6 *	33.7	33.6
50 to 59 years old	23.8	16.5 *	17.4	14.8 ***
60 years of age or older	9.2	4.2 *	1.7	1.6
Sex (head of household)				
Male	86.2	76.2 *	100	100
Marital status				
Married	75.2	61.6 *	95.4	91.2 *
Race (first mention)				
White	67.1	53.3 *	72.6	62.3 *
Black	20.6	34.0 *	13.1	24.9 *
Asian or Pacific Islander	1.5	1.9	2.5	2.0
Latino origin or descent	5.8	6.4	7.0	5.8
Other (includes nonresponses)	5.0	4.4	4.8	5.0
Military service				
Yes	15.9	16.2	2.5	2.5
House value				
Not a homeowner	20.0	37.2 *	17.9	22.7 *
Less than \$100,000	18.0	23.0 *	12.3	25.6 *
\$100,000 to \$249,999	32.1	26.2 *	46.2	34.2 *
\$250,000 to \$999,999	26.1	12.1 *	23.0	16.2 *
\$1 million or more	3.8	1.5 *	0.1	1.3 *
Have a mortgage?				
Yes	64.3	53.0 *	75.4	69.0 *
Geography				
Metropolitan areas with 250,000 population or greater	74.3	75.0	67.5	66.8
Urban population of 20,000 to 249,999, whether adjacent to a metropolitan area or not	6.5	6.7	16.1	14.6
Urban or rural population with a population or less than 20,000	19.0	17.8	15.0	18.4 **
Northeastern states	14.8	13.8	18.6	15.1 *
Southern states	38.4	42.4 *	30.8	39.3 *
Midwestern states	25.2	24.5	24.8	23.4
Western states	21.5	22.6	24.4	19.2 *

	Head of household		Wife	
	Self-employed	Work for someone else	Self-employed	Work for someone else
Observations (number)	2,330	16,625	747	7,911
Main industry				
<i>Goods producing industries</i>	33.2	29.1 *	6.7	12.3 *
Agriculture, forestry, fishing, and hunting	6.3	2.7 *	0.8	1.4
Construction	21.4	7.5 *	1.1	1.0
Manufacturing	5.4	18.2 *	4.8	9.7 *
Mining	0.2	0.6 **	0	0.1
<i>Service-producing industries</i>	66.6	69.9 *	93.0	87.0 *
Utilities	0.1	1.4 *	0.5	0.5
Wholesale trade	2.4	4.0 *	0	2.4 *
Retail trade	7.3	8.9 *	13.8	9.6 *
Transportation and warehousing	5.2	6.7 *	0.4	2.9 *
Information	1.4	2.8 *	1.7	2.4
Finance and insurance	3.7	3.6	1.1	7.1 *
Real estate, rental, and leasing	3.8	1.4 *	4.8	1.3 *
Professional, scientific, and technical services	8.7	3.3 *	6.8	3.9 *
Management, administrative and support, and waste management services	6.1	4.2 *	7.5	2.5 *
Educational services	1.2	6.1 *	6.2	14.8 *
Health care and social services	8.4	8.9	22.4	22.3
Arts, entertainment, and recreation	2.1	1.4 *	4.6	1.3 *
Accommodation and food services	3.3	5.3 *	2.7	5.8 *
Other services (except public administration)	12.4	3.7 *	19.7	3.8 *
Public administration and active duty military	0.3	8.3 *	0.9	6.3 *
Computer usage				
Connected to the Internet at home	28.3	24.9 *	27.8	26.6

Notes: Individuals responding to the PSID have the option of stating that they are both self-employed and work for someone else simultaneously. This analysis includes only those who are only self-employed or only working for someone else. Those who are “not married” include individuals who have never married or are widowed, divorced, or separated. Rounding error and/or nonresponses might prevent some columns from adding to 100 percent.

Geographical designation does not include those individuals who did not respond or those who live in a foreign country. States in geographic regions follow the definitions used by the U.S. Bureau of Labor Statistics. These designations are Northeast – Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; South – Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; Midwest – Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; West – Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Internet usage contains a large number of observations where the response was “inappropriate,” meaning that there was either no computer or the question was not asked of the participant.

* Differences between the **self-employed** and **non-self-employed** figures are significant at the 99 percent confidence level.

** Significant at the 95 percent confidence level.

*** Significant at the 90 percent confidence level.

Table 2: Panel Study of Income Dynamics, 2003 Data
Head of Household Comparisons of Self-employed and Those Working for Someone Else by Years of College Education
 (percent except as noted)

	Self-employed: Years of college				Work for someone else: Years of college			
	No college	3 years or less	4 years	5 or more years	No college	3 years or less	4 years	5 or more years
Observations (number)	1,124	553	363	290	9,209	3,955	2,248	1,213
Age								
Less than 30 years old	6.5	9.8	5.8	11.7	17.7	23.1	22.0 *	17.0
30 to 39 years old	21.9	24.4	27.5 **	24.1	28.4	26.4	29.0	31.2
40 to 49 years old	36.5	38.0	34.7	28.3	32.8	30.1	28.9 *	32.2
50 to 59 years old	25.8	21.2	21.5 ***	24.1	16.8	16.6	15.8	15.2
60 years of age or older	9.3	6.7	10.5	11.7	4.4	3.8	4.3	4.5
Sex (head of household)								
Male	87.1	84.3	89.3	82.4	79.2	75.0	66.2 *	73.9
Marital status								
Married	78.2	73.2	74.7	67.9	65.6	58.9	51.5 *	59.3
Race (first mention)								
White	62.7	65.1	78.5 *	73.4	43.7	55.8	75.8 *	76.0
Black	23.7	16.6	16.0 *	22.4	39.1	37.1	17.7 *	15.6
Asian or Pacific Islander	2.1	1.8	0.3 **	0	1.6	1.8	2.9 *	4.5
Latino origin or descent	5.5	8.7	4.4	3.1	9.8	2.7	1.5 *	1.0
Other (includes nonresponses)	6.0	7.8	0.8 *	1.1	5.8	2.6	2.1 *	2.9
Military service								
Yes	10.8	22.8	16.8 *	21.7	13.6	20.2	18.8 *	18.1
House value								
Not a homeowner	17.8	25.3	15.1	24.8	30.9	41.6	53.6 *	40.2
Less than \$100,000	14.9	23.5	19.6 **	17.2	19.5	23.1	28.6 *	39.0
\$100,000 to \$249,999	30.9	25.7	42.4*	36.2	30.9	27.5	12.7 *	11.2
\$250,000 to \$999,999	30.7	21.8	22.9 *	20.0	16.3	7.2	5.0 *	9.0
\$1 million or more	5.7	3.6	0 *	1.7	2.3	0.7	0.1 *	0.6
Have a mortgage?								
Yes	67.2	60.6	67.2	56.9	59.9	49.4	34.7 *	46.3
Geography								
Metropolitan areas with 250,000 population or greater	61.4	67.5	73.8 *	78.6	64.8	70.1	76.7 *	74.5
Urban population of 20,000 to 249,999, whether adjacent to a metropolitan area or not	14.2	12.7	11.6	17.9	13.0	13.7	13.8	14.2
Urban or rural population with a population or less than 20,000	23.9	19.9	14.6 *	3.4	21.7	15.8	9.0 *	10.7
Northeastern states	13.9	14.1	14.3	20.3	14.9	13.0	11.6 *	11.9
Southern states	40.7	39.2	32.8 *	34.1 *	40.0	44.8	48.1 *	43.1
Midwestern states	23.7	24.6	30.6 *	25.5 *	25.2	22.8	22.8 **	28.3
Western states	21.6	22.1	22.3	19.3	19.5	19.2	16.9 *	16.5

	Self-employed: Years of college				Work for someone else: Years of college			
	No college	3 years or less	4 years	5 or more years	No college	3 years or less	4 years	5 or more years
Observations (number)	1,124	553	363	290	9,209	3,955	2,248	1,213
Main industry								
<i>Goods producing industries</i>	34.6	28.8	36.6	31.7	35.9	22.9	18.9 *	15.8
Agriculture, forestry, fishing, and hunting	5.2	8.5	7.4	4.5	4.2	0.8	1.2 *	0.3
Construction	23.9	15.7	22.6	20.7	9.8	5.9	3.1 *	3.6
Manufacturing	5.1	4.5	6.6	6.6	21.2	15.5	13.7 *	11.9
Mining	0.4	0	0	0	6.5	0.7	0.9 *	0
<i>Service-producing industries</i>	65.2	70.7	63.4	67.9	62.7	76.4	80.7 *	83.8
Utilities	0	0.4	0	0	1.4	1.6	1.5	0.5
Wholesale trade	3.0	1.4	3.4	1.0	3.9	4.1	5.1 *	2.1
Retail trade	6.3	9.6	6.2	8.6	9.6	10.1	6.3 *	4.7
Transportation and warehousing	5.2	5.6	4.2	6.2	7.1	8.1	4.4 *	2.6
Information	1.7	1.3	0.6	1.0	1.7	4.3	5.0 *	2.6
Finance and insurance	3.4	3.8	4.1	4.5	1.5	5.6	7.7 *	4.8
Real estate, rental, and leasing	3.6	2.4	6.5 **	4.5	1.1	1.8	1.8 *	1.2
Professional, scientific, and technical services	6.8	11.8	9.9 **	9.0	1.5	3.6	5.7 *	11.4
Management, administrative and support, and waste management services	6.0	8.3	3.6 ***	5.2	5.0	3.6	3.4 *	0.4
Educational services	1.0	1.6	0.8	2.1	2.9	5.2	12.4 *	21.9
Health care and social services	9.7	6.9	5.8 **	9.3	8.8	9.2	6.3 *	13.3
Arts, entertainment, and recreation	2.7	1.4	1.9	1.7	1.3	1.4	1.4	2.1
Accommodation and food services	3.4	3.3	2.2	4.8	6.9	4.8	1.7 *	1.5
Other services (except public administration)	12.1	12.7	14.9	10.0	4.1	3.6	3.0 **	3.0
Public administration and active duty military	0.4	0.4	0	0	5.7	9.5	15.1 *	11.8
Computer usage								
Connected to the Internet at home	26.5	32.4	27.3	29.0	18.8	30.8	35.6 *	32.2

Notes: See Table 1. Rounding error and/or nonresponses might prevent some columns from adding to 100 percent.

* Differences between those with **no college** and **those with 4 years of college** are significant at the 99 percent confidence level.

** Significant at the 95 percent confidence level.

*** Significant at the 90 percent confidence level.

Table 3: Panel Study of Income Dynamics
Dynamic Head of Household Comparisons of Self-employment of Working for Someone Else between 1990 and 2003
(percent except as noted)

	Self-employed in 1990		Work for someone else in 1990	
	Self-employed in 2003	Work for someone else in 2003	Self-employed in 2003	Work for someone else in 2003
Observations (number)	671	1,056	1,009	10,135
College education (2003)				
No college (includes nonresponses)	39.8	40.3	42.4	50.3 *
Completed three years or less	22.8	26.3 ***	25.9	26.0
Completed four years	23.5	20.9	17.1	15.9
Completed five or more years	13.9	12.5	14.6	7.8 *
Completed four years since 1990	0	11.2 *	0.4	8.9 *
Completed five or more years since 1990	10.9	12.5	14.6	7.8 *
Main industry (2003)				
<i>Goods producing industries</i>	44.0	28.4 *	29.9	27.2 ***
Agriculture, forestry, fishing, and hunting	14.9	3.3 *	3.0	1.3 *
Construction	22.4	12.0 *	22.7	6.9 *
Manufacturing	6.0	13.1 *	4.3	18.2 *
Mining	0.7	0 *	0	0.8 *
<i>Service-producing industries</i>	55.9	70.8 *	70.1	71.9
Utilities	0	1.3 *	0	1.8 *
Wholesale trade	2.8	6.0 *	1.5	4.0 *
Retail trade	6.6	7.9	9.2	9.0
Transportation and warehousing	4.9	4.5	2.5	7.1 *
Information	0.1	2.8 *	1.5	3.4 *
Finance and insurance	2.7	2.5	5.7	4.2 **
Real estate, rental, and leasing	3.9	0.7 *	5.0	1.6 *
Professional, scientific, and technical services	9.7	6.5 **	9.9	3.6 *
Management, administrative and support, and waste management services	4.2	3.8	5.9	3.7 *
Educational services	1.0	8.7 *	1.3	6.7 *
Health care and social services	6.4	8.7 ***	8.4	8.6
Arts, entertainment, and recreation	0.9	1.3	2.7	1.4 *
Accommodation and food services	3.1	3.0	3.3	4.1
Other services (except public administration)	9.5	3.5 *	12.8	3.6 *
Public administration and active duty military	0	9.6 *	0.4	9.1 *

Notes: See Table 1. Rounding error and/or nonresponses might prevent some columns from adding to 100 percent.

* Differences between the **self-employed** and **non-self-employed** figures are significant at the 99 percent confidence level.

** Significant at the 95 percent confidence level.

*** Significant at the 90 percent confidence level.

Table 4: Multivariate Logit Analysis using Panel Study of Income Dynamics, 2003 Data
Dependent Variable: Likelihood of Being Self-employed, HEAD OF HOUSEHOLD or WIFE

	Head of household				Wife			
	Service sector		Nongovernmental "soft" service sector		Service sector		Nongovernmental "soft" service sector	
	Coefficient estimate/ standard error	Marginal effects after logit	Coefficient estimate/ standard error	Marginal effects after logit	Coefficient Estimate/ Standard Error	Marginal effects after logit	Coefficient estimate/ standard error	Marginal effects after logit
Constant	-3.3879 (0.0849) *	--	-3.6068 (0.0827)	--	-3.1747 (0.1568) *	--	-3.5751 (0.1422) *	--
Education variables:								
Some college, but less than a bachelor's degree	0.3327 (0.0652) *	0.0331	0.2852 (0.0653) *	0.0279	0.0635 (0.1088)	0.0045	0.0389 (0.1090)	0.0025
Bachelor's degree (4 years of college)	0.4311 (0.0685) *	0.0444	0.3811 (0.0684) *	0.0385	0.1959 (0.1112) ***	0.0144	0.1797 (0.1117)	0.0123
Post-bachelor's experience (5+ years of college)	0.7177 (0.0766) *	0.0828	0.6403 (0.0765) *	0.0717	0.3387 (0.1321) *	0.0264	0.3166 (0.1327) **	0.0229
Demographic variables:								
Less than 30 years old					-0.9053 (0.1401) *	-0.0503	0.9089 (0.1398)	-0.0470
40 years old or greater	0.4902 (0.0508) *	0.0440	0.4759 (0.0509) *	0.0425				
Currently married	0.2049 (0.0555) *	0.0182	0.2120 (0.0555) *	0.0187				
Black	-0.8889 (0.0569) *	-0.0723	-0.9255 (0.0568) *	-0.0746	-0.9449 (0.1131) *	-0.0541	-0.9191 (0.1136) *	-0.0493
Military service	0.9327 (0.0799) *	0.1091	0.9445 (0.0799) *	0.1103	0.9357 (0.2673) *	0.0943	1.0795 (0.2719) *	0.1083
Uses the Internet	0.1572 (0.0520) *	0.0147	0.1391 (0.0521) *	0.0129				
Home/wealth variables:								
Is a homeowner	0.8383 (0.0763) *	0.0706	0.8011 (0.0764) *	0.0673				
House value (\$000)	0.0022 (0.0001) *	0.0002	0.0023 (0.0001) *	0.0002	0.0021 (0.0002) *	0.0001	0.0021 (0.0002) *	0.0001
Population variables:								
Population of less than 20,000	0.2996 (0.0601) *	0.0294	0.3318 (0.0601) *	0.0327				
Industry variables:								
Service sector	-0.1476 (0.0502) *	-0.0137			0.7828 (0.1512) *	0.0427		
Nongovernment "soft" service sector			0.3150 (0.0475) *	0.0285			1.3033 (0.1338) *	0.0653
Probit regression stats:								
# of observations	18955		18955		8658		8658	
Log likelihood	-6435.41		-6417.45		-2419.24		-2371.14	
Chi-squared	1258.55 *		1294.47 *		249.69 *		345.89 *	
Pseudo R-squared	0.0891		0.0916		0.0491		0.0680	

Notes: See Table 1.

- * Significant at the 99 percent confidence level.
- ** Significant at the 95 percent confidence level.
- *** Significant at the 90 percent confidence level.

Table 5: Multivariate Logit Analysis using Panel Study of Income Dynamics, 2003 Data
Dependent Variable: Likelihood of Being Self-employed, HEAD OF HOUSEHOLD
(Service Sector Version)

	Model 1: Some college		Model 2: Baccalaureate and/or graduate education		Model 3: Post-baccalaureate experience	
	Coefficient estimate/ standard error	Marginal effects after logit	Coefficient estimate/ standard error	Marginal Effects after Logit	Coefficient estimate/ standard error	Marginal effects after logit
Constant	-3.3903 (0.0847) *	--	-3.3334 (0.0836) *	--	-3.2533 (0.0824) *	--
Education variables:						
Some college	0.4589 (0.0484) *	0.0439				
Bachelor's or post-graduate work			0.4696 (0.0540) *	0.0478		
Post-baccalaureate experience					0.5706 (0.0733) *	0.0632
Demographic variables:						
40 years old or greater	0.4914 (0.0508) *	0.0442	0.4859 (0.0508) *	0.0439	0.4893 (0.0508) *	0.0443
Currently married	0.2044 (0.0565) *	0.0182	0.2031 (0.0555) *	0.0182	0.1893 (0.0555) *	0.0170
Black	-0.9097 (0.0565) *	-0.0740	-0.8917 (0.0568) *	-0.0729	-0.9186 (0.0565) *	-0.0751
Military service	0.9344 (0.0798) *	0.1096	0.9531 (0.0798) *	0.1126	0.9514 (0.0799) *	0.1127
Uses the Internet	0.1566 (0.0519) *	0.0147	0.1715 (0.0518) *	0.0162	0.1895 (0.0518) *	0.0180
Home/wealth variables:						
Is a homeowner	0.8515 (0.0762) *	0.0718	0.8486 (0.0762) *	0.0718	0.8290 (0.0765) *	0.0704
House value (\$000)	0.0022 (0.0001) *	0.0002	0.0012 (0.00001) *	0.0002	0.0021 (0.0001) *	0.0002
Population variables:						
Population of less than 20,000	0.2858 (0.0599) *	0.0280	0.2870 (0.0600) *	0.0282	0.2618 (0.0597) *	0.0257
Industry variables:						
Service sector	-0.1418 (0.0847) *	-0.0132	-0.1240 (0.0500) **	-0.0116	-0.1041 (0.0824) **	-0.0097
Probit regression stats:						
# of observations	18955		18955		18955	
Log likelihood	-6444.86		-6452.97		-6461.42	
Chi-squared	1239.64 *		1223.43 *		1206.52 *	
Pseudo R-squared	0.0877		0.0866		0.0854	

Notes: See Table 1.

- * Significant at the 99 percent confidence level.
- ** Significant at the 95 percent confidence level.
- *** Significant at the 90 percent confidence level.

Table 6: Multivariate Logit Analysis using Panel Study of Income Dynamics, 2003 Data
Dependent Variable: Likelihood of Being Self-employed, HEAD OF HOUSEHOLD
(Nongovernment “Soft” Service Sector Version)

	Model 1: Some college		Model 2: Baccalaureate and/or graduate education		Model 3: Post-baccalaureate experience	
	Coefficient estimate/ standard error	Marginal effects after logit	Coefficient estimate/ standard error	Marginal effects after logit	Coefficient estimate/ standard error	Marginal effects after logit
Constant	-3.6080 (0.0826) *	--	-3.5564 (0.0813) *	--	-3.4758 (0.0797) *	--
Education variables:						
Some college	0.4040 (0.0483) *	0.0382				
Bachelor’s or post-graduate work			0.4203 (0.0539) *	0.0420		
Post-baccalaureate experience					0.5121 (0.0734) *	0.0553
Demographic variables:						
40 years old or greater	0.4771 (0.0509) *	0.0427	0.4719 (0.0509) *	0.0423	0.4748 (0.0509) *	0.0427
Currently married	0.2113 (0.0555) *	0.0187	0.2102 (0.0555) *	0.0187	0.1988 (0.0555) *	0.0177
Black	-0.9443 (0.0565) *	-0.0761	-0.9281 (0.0568) *	-0.0751	-0.9516 (0.0565) *	-0.0770
Military service	0.9453 (0.0798) *	0.1106	0.9644 (0.0788) *	0.1136	0.9637 (0.0799) *	0.1137
Uses the Internet	0.1390 (0.0520) *	0.0129	0.1515 (0.0519) *	0.0142	0.1683 (0.0518) *	0.0158
Home/wealth variables:						
Is a homeowner	0.8113 (0.0763) *	0.0682	0.8094 (0.0763) *	0.0682	0.7902 (0.0765) *	0.0668
House value (\$000)	0.0022 (0.0001) *	0.0002	0.0022 (0.0001) *	0.0002	0.0022 (0.0001) *	0.0002
Population variables:						
Population of less than 20,000	0.3188 (0.0474) *	0.0314	0.3208 (0.0600) *	0.0316	0.2980 (0.0596) *	0.0293
Industry variables:						
Nongovernment “soft” service sector	0.3223 (0.0474) *	0.0292	0.3342 (0.0473) *	0.0303	0.3399 (0.0473) *	0.0309
Probit regression stats:						
# of observations	18955		18955		18955	
Log likelihood	-6425.45		-6430.79		-6437.48	
Chi-squared	1278.47 *		1267.79 *		1254.41 *	
Pseudo R-squared	0.0905		0.0897		0.0888	

Notes: See Table 1. Nongovernment “soft” service sector industries: retail trade; information; finance and insurance; real estate and rental and leasing; professional, scientific, and technical services; management, administrative and support, and waste management services; educational services; health care and social assistance; accommodation and food services; and other services.

- * Significant at the 99 percent confidence level.
- ** Significant at the 95 percent confidence level.
- *** Significant at the 90 percent confidence level.

Table 7: Multivariate Logit Analysis using Panel Study of Income Dynamics, 2003 Data
Dependent Variable: Likelihood of Being Self-employed, WIFE
(Service Sector Version)

	Model 1: Some college		Model 2: Baccalaureate and/or graduate education		Model 3: Post-baccalaureate experience	
	Coefficient estimate/ standard error	Marginal effects after logit	Coefficient estimate/ standard error	Marginal effects after logit	Coefficient estimate/ standard error	Marginal effects after logit
Constant	-3.1757 (0.0157) *	--	-3.1654 (0.1553) *	--	-3.1322 (0.1540) *	--
Education variables:						
Some college	0.1736 (0.0808) **	0.0122				
Bachelor's or post-graduate work			0.2335 (0.0892) *	0.0170		
Post-baccalaureate experience					0.2875 (0.1271) **	0.0221
Demographic variables:						
Less than 30 years old	-0.9011 (0.1401) *	-0.0502	-0.9023 (0.1400) *	-0.0502	-0.9055 (0.1401) *	-0.0504
Black	-0.9609 (0.1126) *	-0.0549	-0.9422 (0.1130) *	-0.0540	-0.9562 (0.1127) *	-0.0547
Military service	0.9375 (0.2667) *	0.0947	0.9293 (0.2671) *	0.0935	0.4656 (0.1349) *	0.0940
Home/wealth variables:						
House value (\$000)	0.0021 (0.0002) *	0.0001	0.0021 (0.0002) *	0.0001	0.0020 (0.0002) *	0.0001
Industry variables:						
Service sector	0.7850 (0.1511) *	0.0428	0.7905 (0.1508) *	0.0430	0.8028 (0.1505) *	0.0436
Probit regression stats:						
# of observations	8658		8658		8658	
Log likelihood	-2420.89		-2419.85		-2420.77	
Chi-squared	246.39 *		248.48 *		246.63 *	
Pseudo R-squared	0.0484		0.0488		0.0485	

Notes: See Table 1.

- * Significant at the 99 percent confidence level.
- ** Significant at the 95 percent confidence level.
- *** Significant at the 90 percent confidence level.

Table 8: Multivariate Logit Analysis using Panel Study of Income Dynamics, 2003 Data
Dependent Variable: Likelihood of Being Self-employed, WIFE
(Nongovernment “Soft” Service Sector Version)

	Model 1: Some college		Model 2: Baccalaureate and/or graduate education		Model 3: Post-baccalaureate experience	
	Coefficient estimate/ standard error	Marginal effects after logit	Coefficient estimate/ standard error	Marginal effects after logit	Coefficient estimate/ standard error	Marginal effects after logit
Constant	-3.5741 (0.1421) *	--	-3.5686 (0.1398) *	--	-3.5311 (0.01377) *	--
Education variables:						
Some college	0.1525 (0.0809) ***	0.0100				
Bachelor’s or post-graduate work			0.2217 (0.0896) **	0.0151		
Post-baccalaureate experience					0.2739 (0.1278) **	0.0195
Demographic variables:						
Less than 30 years old	-0.9046 (0.1397) *	-0.0469	-0.9061 (0.1397) *	-0.0469	-0.9100 (0.01397) *	-0.0471
Black	-0.9356 (0.1130) *	-0.0501	-0.9166 (0.1135) *	-0.0492	-0.9318 (0.1131) *	-0.0499
Military service	1.0787 (0.2711) *	0.1084	1.0733 (0.2717) *	0.1075	1.0782 (0.2709) *	0.1082
Home/wealth variables:						
House value (\$000)	0.0022 (0.0002) *	0.0001	0.0021 (0.0002) *	0.0001	0.0021 (0.0002) *	0.0001
Industry variables:						
Nongovernment “soft” service sector	1.3038 (0.1338) *	0.0655	1.3064 (0.1336) *	0.0655	1.3120 (0.1335) *	0.0658
Probit regression stats:						
# of observations	8658		8658		8658	
Log likelihood	-2372.82		-2371.60		-2372.41	
Chi-squared	342.54 *		344.98 *		343.35 *	
Pseudo R-squared	0.0673		0.0678		0.0675	

Notes: See Table 1. Nongovernment “soft” service sector industries: retail trade; information; finance and insurance; real estate and rental and leasing; professional, scientific, and technical services; management, administrative and support, and waste management services; educational services; health care and social assistance; accommodation and food services; and other services.

- * Significant at the 99 percent confidence level.
- ** Significant at the 95 percent confidence level.
- *** Significant at the 90 percent confidence level.