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Self-Employment and Risk Preference

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Abstract

We explore the relationship between self-employment and attitudes towards financial risk using individual level data drawn from the U.S. *Survey of Consumer Finances (SCF)* and the U.S. *Panel Study of Income Dynamics (PSID)*. Both surveys include questions, which enable us to construct measures of an individual's willingness to take risk allowing us to explore the implications of interpersonal differences in risk preference for the probability and success of self-employment. Our empirical findings suggest that willingness to take financial risk is positively associated with both the incidence and success of self-employment. We find that this relationship is particularly pronounced in cases where the individual actually started the business. Finally, we exploit the panel aspect of the *PSID* and find evidence consistent with a causal relationship between attitudes towards risk and self-employment with attitudes towards risk measured over 1969-1972 (i.e. prior to becoming self-employed) having a statistically significant positive influence on the probability of self-employment in 1996.

I.   Introduction and Background

Over the last three decades, there has been considerable interest amongst both academics and policy-makers in the determinants of self-employment. Such interest is not surprising given that self-employment and entrepreneurship have been regarded as avenues for raising employment with self-employees and entrepreneurs creating their own jobs as well as potentially creating jobs for others thereby serving to alleviate unemployment and poverty. Attitudes towards risk-taking have been a particular area of interest, which dates back to Knight (1921) who recognised that self-employment was riskier than paid employment (Parker, 1997). The focus in the economics literature has been on the financial risk associated with self-employment, although in an early contribution, Liles et al. (1974) suggest that self-employment may be associated with a wider range of risks including career opportunities, family relations and personal well-being.

Recent literature has explored the choice between self-employment and paid employment as well as the division within self-employment between own-account and employer status (see Earle and Sakova, 2000), where individuals compare the utility derived from each sector and then decide which sector to enter. Lucas (1978) demonstrated how the division between entrepreneurs and paid employees relates to the distribution of individuals' characteristics across the population. Kihlstrom and Laffont (1979) and Kanbur (1979) introduced risk into this framework. Kihlstrom and Laffont (1979) assumed that individuals differ in their willingness to accept risk and derive an equilibrium where the less (more) risk averse choose entrepreneurship (paid-employment), whilst Kanbur (1979) analysed how risk and entrepreneurial talent affect the choice between paid employment and entrepreneurship. Van Praag and Cramer (2001) extended this approach by allowing individuals' expectations of entrepreneurial talent to vary with personal characteristics where the expected returns from entrepreneurship depend on the individual's assessment of his/her ability and on his/her risk preferences. Attitudes towards risk are measured by individuals' responses to a question regarding the price they are willing to pay for a hypothetical lottery ticket. The empirical evidence derived from Dutch survey data suggests that risk-taking and ability are important determinants of

entrepreneurial success. Parker (1997) modelled self-employment assuming that individual heterogeneity is determined by entrepreneurial ability (i.e. talent). In this framework, the probability of self-employment increases (decreases) in ability (risk).

Recent empirical research has focused on the attributes of the self-employed generally rather than on their propensity to take risk *per se* (see Le, 1999, for a comprehensive review of this area). Such an approach is not surprising given that risk preferences are difficult to measure. Such studies however offer indirect evidence relating to the relationship between risk preference and self-employment. For example, Rees and Shah (1986) formulate a choice problem based on Knight's (1921) hypothesis that individuals make occupational decisions on the basis of the risk-adjusted relative earnings opportunities in each sector with an individual's degree of relative risk aversion playing a key role. In the empirical analysis, such key characteristics were proxied by a set of individual characteristics including education, gender and race. Attributes that are likely to reduce the risk of self-employment are often found to be positively associated with entrepreneurship in the empirical literature. For example, one would expect marriage, especially to a working partner, to lower the risks associated with self-employment and thus increase the probability of self-employment. Evidence for this is found by Taylor (1996), Clarke and Drinkwater (2000), Georgellis and Wall (2000). Similarly, Taylor (1996, 2001) finds that individuals who have a preference for job security prefer paid- rather than self-employment.

Hence, since risk preferences are typically unobservable, the standard approach to their measurement entails the use of proxies related to an individual's propensity to engage in 'risky' behaviour.[1] Barsky et al. (1997) adopt an experimental approach to elicit individual preference parameters. Participants were asked to respond to situations designed to yield information about

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[1] In a related area, Hersch and Viscusi (1990) and Hersch and Pickton (1995) proxy risk preference by cigarette smoking and seat belt use. These studies explore how differences in individuals' attitudes towards risk affect wage-risk trade-offs in the context of compensating wage differentials. The revealed risk attitudes have an important effect on observed risk premiums with risk averse workers receiving a greater compensating wage differential for on-the-job-risk than other workers. Similarly, Viscusi and Hersch (2001) explore heterogeneous worker attitudes towards health risks and find that smokers select 'riskier' jobs.

their risk aversion such as their willingness to gamble lifetime income. The findings suggest that risk tolerance is positively related to risky behaviour such as smoking, drinking, failing to have insurance and the decision to be self-employed. The self-employed were found to have a higher risk tolerance and have a much lower average propensity to be insured than employees.

In a similar vein, Brown et al. (2006) explore the possibility that a systematic relationship exists between employment within a particular contract type and risk preference by analysing a set of proxies for risk preference, whereby some of the proxies capture risk loving behaviour (expenditure on gambling, smoking and alcohol) whilst others capture risk averse behaviour (expenditure on life and contents insurance, and unearned income). The empirical analysis, based on pooled cross-section data from the U.K. *Family Expenditure Survey* 1997-2000, provides evidence of a systematic relationship between employment contract type and risk preference, with self-employed workers being more (less) likely to engage in the consumption of 'risky' (financial security) products.

Thus, although empirical studies acknowledge the role of attitudes towards risk in influencing self-employment, the lack of measures of risk preference precludes its inclusion in many empirical studies. In one of the few papers, which employs a more direct measure of attitudes towards risk, based on the reservation price that individuals are prepared to pay for a hypothetical lottery ticket, Hartog et al. (2002) find that, in general, risk aversion is lower for the self-employed in the Netherlands. In a similar vein, Ekelund et al. (2005) explore the influence of risk aversion on the probability of being self-employed. Their measure of risk aversion is based on psychometric data relating to harm avoidance. The findings support an inverse relationship between risk aversion and the probability of being self-employed in Finland.

In this paper, we explore the relationship between risk preference and self-employment using data drawn from two U.S. data sets, the *Survey of Consumer Finances (SCF)* and the *Panel Study of Income Dynamics (PSID)*, both of which include detailed information on self-employment and information on individuals' risk preferences. The survey questions, which elicit information on

attitudes towards risk, provide direct measures of risk preference at the individual level thereby enabling us to conduct detailed microeconometric analysis of the implications of risk preference for self-employment. In the remainder of the paper, we firstly discuss how we measure attitudes towards risk in Section II; whilst in Section III, we explore the relationship between the incidence of self-employment and attitudes towards risk. In contrast to the existing literature, we explore whether the influence of risk preference varies with type of self-employment, the extent of business ownership and job creation. In Section IV, we exploit data from the *SCF* and explore the relationship between attitudes towards risk and success in self-employment, which has surprisingly attracted only limited attention in the economics literature. Finally, Section V exploits the panel aspect of the *PSID* and explores issues related to causality, which have been alluded to in the existing literature but, due to data limitations, have not been the focus of empirical scrutiny.

II.   Measurement of Risk Preference

The obvious problem with exploring the relationship between self-employment and risk preference from an empirical perspective lies in locating a suitable measure of risk preference. For this purpose, we exploit data from two U.S. surveys: the *SCF*, which is a cross-section survey of the balance sheet, pension, income, demographic characteristics and use of financial institutions of U.S. families developed since 1983 by the U.S. Federal Reserve Board; and the *PSID*, which is a representative panel of individuals ongoing since 1968 conducted at the Institute for Social Research, University of Michigan.

With respect to the *SCF*, in the 1989, 1992, 1995, 1998, 2001 and 2004 cross-sectional surveys, individuals were asked the following question: *which of the following statements comes closest to describing the amount of financial risk that you are willing to take when you save or make investments? Take substantial financial risks expecting to earn substantial returns; Take above average financial risks expecting to earn above average returns; Take average financial risks expecting to earn average returns; Or not willing to take any financial risks*. The responses to this question thus enable us to categorise individuals according to their attitudes towards taking

risks, with those individuals who indicate that they are not willing to take any financial risks being the most risk averse.[2] We pool the data across the six *SCF* cross-sections (yielding 122,935 observations) and use the responses to this question to create a four point risk attitudes index for the head of household, r, as follows:

$$r = \begin{cases} 0 & \textit{if they are not willing to take any financial risks} & 34.37\% \\ 1 & \textit{if they are willing to take average financial risks for average returns} & 40.41\% \\ 2 & \textit{if they are willing to take above average financial risks for above average returns} & 19.34\% \\ 3 & \textit{if they are willing to take substantial financial risks for substantial returns} & 5.38\% \end{cases}$$

where the percentages of individuals in each category are also presented. It is interesting to note that only 5.38% of respondents state that they are willing to take substantial financial risks for substantial returns (i.e. the least risk averse category).

The 1996 *PSID* survey includes a Risk Aversion Section containing questions, which elicit information on individuals' attitudes towards risk. The Risk Aversion Section contains five questions related to hypothetical gambles with respect to lifetime income. To be specific, all heads of household were asked the following question (M1): *Suppose you had a job that guaranteed you income for life equal to your current total income. And that job was (your/your family's) only source of income. Then you are given the opportunity to take a new, and equally good, job with a 50-50 chance that it will double your income and spending power. But there is a 50-50 chance that it will cut your income and spending power by a third. Would you take the new job?*[3] The individuals who answered 'yes' to this question, were then asked (M2): *Now, suppose the chances were 50-50 that the new job would double your (family) income, and 50-50 that it would cut it in half. Would you still take the job?* Those individuals who answered 'yes' to this question were then asked (M5): *Now, suppose that the chances were 50-50 that the new job would double your*

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[2] Shaw (1996), who explores income growth and risk aversion, bases one of her empirical measures of risk aversion on the above *SCF* question.

[3] As Luoh and Stafford (2005) point out, it is important to acknowledge that the question states that the new job will be 'equally as good' such that there is no difference in the non monetary characteristics of the jobs. Without such a qualification, individuals may be less willing to accept the gamble if there are non monetary attachments to their current job (Barsky et al., 1997).

(family) income, and 50-50 that it would cut it by 75%. Would you still take the new job? Individuals who answered 'no' to Question M1 were asked (M3): *Now, suppose the chances were 50-50 that the new job would double your (family) income, and 50-50 that it would cut it by 20 percent. Then would you take the job?* Those individuals who replied 'no' were asked (M4): *Now, suppose that the chances were 50-50 that the new job would double your (family) income, and 50-50 that it would cut it by 10 percent. Then would you take the new job?*

We use the responses to this series of questions to create a six point risk preference index for the head of household as follows:

$$
r = \begin{cases}
0 & \text{if } M1 = No \ \& \ M3 = No \ \& \ M4 = No & 30.55\% \\
1 & \text{if } M1 = No \ \& \ M3 = No \ \& \ M4 = Yes & 18.36\% \\
2 & \text{if } M1 = No \ \& \ M3 = Yes & 15.65\% \\
3 & \text{if } M1 = Yes \ \& \ M2 = No & 15.09\% \\
4 & \text{if } M1 = Yes \ \& \ M2 = Yes \ \& \ M5 = No & 13.85\% \\
5 & \text{if } M1 = Yes \ \& \ M2 = Yes \ \& \ M5 = Yes & 6.51\%
\end{cases}
$$

Thus, the index is decreasing in risk aversion such that if an individual accepts all the hypothetical gambles offered, the risk attitudes index takes the highest value of 5, whilst if the individual rejects all gambles offered the index takes the value of zero. Intermediate cases lie in between these two extreme values such that individuals are ranked according to their willingness to accept the hypothetical gambles. Figure 1 in the Appendix presents a decision tree to illustrate the relationship between the values of the risk attitude index and the sequence of the *PSID* questions. The series of questions, thus, enables us to place individuals into one of six categories of attitudes towards risk. Furthermore, as stated by Barsky *et al*. (1997), p.540: 'the categories can be ranked by risk aversion without having to assume a particular form for the utility function.' It is interesting to note the similar percentages across both surveys, which characterises the least risk averse category at around 5-6% and the most risk averse category at around 31-34%.

Our focus on two data sets and two different measures of risk preference allows us to explore the robustness of our findings. In addition, both of the surveys have their strengths thereby enabling us to focus on different issues. For example, the *SCF* provides detailed information on the

type of and success in self-employment, whilst the *PSID* provides an array of controls for family background as well as information on the timing of self-employment.

III.   Incidence of Self-Employment and Risk Preference

Survey of Consumer Finances

For the pooled cross-section data drawn from the *SCF*, we initially analyse the probability of being self-employed by specifying a multinomial logit model where we distinguish between four types of employment status (es_{it}) of individual *i* in year *t*: out of the labour force (24.53%)[4]; laid off or unemployed (3.64%); employed (46.83%); and self-employed (25%).[5] We model employment status as follows:

$$es_{it} = \mathbf{X}_{it}\boldsymbol{\beta} + \gamma r_{it} + \varepsilon_{it} \tag{1}$$

where ε_{it} denotes the random error term. In the set of explanatory variables we include: the measure of attitudes towards risk-taking, r; and in the $\mathbf{X}$ matrix: age; age squared; gender; marital status; ethnicity; household size; number of children; educational attainment (highest grade of school or year of college completed); the natural logarithms of labour income, the spouse's income and non labour income; the natural logarithm of wealth[6]; and year dummy variables. Table 1 in the Appendix presents summary statistics for the key variables employed in our econometric analysis.

Given the detailed information in the *SCF*, we are able to distinguish between three different types of self-employee: those who started the business (16.40%); those who were given or inherited the business (1.45%); and those who bought or joined the business (9.09%).[7] Lazear (2005) defines

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[4] Individuals in the out of the labour force category include: students, homemakers, the disabled, the retired, sick leavers and voluntary workers.

[5] Fujii and Hawley (1991) also use the *SCF* to analyse the determinants of the choice of self-employment. We adopt their definition of self-employment where the respondent has an active management role in a privately held business, farm, professional practice or partnership as his/her main job. Throughout the paper, we focus on the individual's first (i.e. main) business. There are a small proportion of individuals who own more than one business (8%). Xiao et al. (2001), who focus on business ownership rather than self-employment, analyse the 1995 *SCF* and find that family business owners are more risk tolerant than non-owners.

[6] Our measure of wealth includes: value of land, buildings, farms or ranches owned by the respondent; value of home, holiday houses or other properties; net worth of businesses owned by the respondent; value of owned cars and other vehicles; financial assets; net of mortgages and loans.

[7] Unfortunately, we are not able to separate the bought or joined categories for all of the *SCF* cross-sections.

an entrepreneur as an individual who initially established a business, which comes closest to our category of self-employees who started the business. We then repeat the multinomial logit analysis distinguishing between five types of employment status allowing us to analyse different types of self-employment. For example, starting a business may be more risky than purchasing or inheriting a going concern or, indeed, buying or joining a business. In the existing economics literature, self-employment has generally been analysed from an empirical perspective as one homogenous group, thus our focus on different types of self-employment represents an interesting contribution to the empirical literature.

Our empirical findings are summarised in Table 2 in the Appendix. For brevity, we only present the marginal effects pertaining to the probability of being self-employed, which is the focus of our study.[8] In Table 2 Panel A, the four point risk attitudes index is included to control for attitudes towards financial risk. It is apparent in Table 2 Panel A that the risk attitudes index (which is increasing in willingness to take financial risk) is characterised by a positive and highly significant estimated marginal effect indicating that willingness to take financial risks is positively associated with the probability of being self-employed. Indeed, a one standard deviation increase in the risk preference index is associated with a 5.1% higher probability of being self-employed.[9] In Table 2 Panel B, in order to distinguish between levels of risk aversion, we replace the risk attitudes index with three dummy variables denoting that: they are willing to take average financial risks for average returns; they are willing to take above average financial risks for above average returns; and, finally, they are willing to take substantial financial risks for substantial returns. Thus, the omitted category is that they are not willing to take any financial risks. It is apparent that in Table 2 Panel B the marginal effects for the three risk attitude dummy variables are all positive and

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[8] The results presented in Table 2 are based on a sample of all individuals aged 17 and over. Our results are robust to restricting the analysis to those individuals aged between 18 and 65. As pointed out by Dunn and Holtz-Eakin (2000), it is not clear how omitting observations based on the retirement age (i.e. 65) influences the measurement of self-employment since the self-employed tend to retire later than employees and even commence self-employment after retirement from employment (Fuchs, 1982).
[9] This is found by multiplying the marginal effect by the standard deviation of the risk preference index.

highly statistically significant indicating a monotonic relationship between the probability of being self-employed and willingness to take financial risks. Furthermore, the magnitudes of the marginal effects are reasonably large indicating that, for example, an individual who is willing to take substantial financial risks has a 24% higher probability of being self-employed relative to a comparable individual who is not willing to take financial risks.[10]

An interesting pattern emerges when we turn to the results relating to the type of self-employee. To be specific, the marginal effects in Table 2 Panels A and B relating to risk attitudes are largest for the case where the individual started the business, where the monotonic relationship between the probability of self-employment and willingness to take risks is the most pronounced. A similar pattern emerges for those individuals who bought or joined a business, whereas for those individuals who were given or inherited a business, the effect of risk attitudes is somewhat different. In this case, willingness to take substantial risk relative to the omitted category is inversely related to this type of business ownership – the marginal effect is moderate yet statistically significant, whereas willingness to take average risk has a small yet positive influence and the effect of willingness to take above average risk is statistically insignificant. Arguably, an individual who is given or inherits a business is taking the least amount of financial risk, hence it is perhaps not surprising that the hypothesis that a self-employee is characterised by low risk aversion does not hold in this case.

An obvious point related to the results presented in Table 2 Panels A and B concerns whether the risk attitude variables are simply capturing other unobserved characteristics of the individuals. In order to explore the robustness of our findings, we replace the risk attitude index with its predicted value from an ordered probit model where the risk attitude index is the dependent

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[10] Unfortunately, there is limited information on past business experience in the *SCF*. However, we are able to control for whether individuals have been turned down for a loan in the last five years. The marginal effect of risk preference is unchanged in terms of magnitude and significance by including this control. Information on whether the individual (and/or his/her spouse) have ever filed for bankruptcy is only available in the *SCF* from 1998 onwards. If we focus on a sub-sample of the *SCF* pooled from 1998 to 2004, the inclusion of controls for having ever filed for bankruptcy and whether the individual has been turned down for credit in the last five years have no effect on the relationship between risk preference and self-employment. Filing for bankruptcy and having been denied credit in the last five years both lower the probability of self-employment.

variable and the explanatory variables represent a combination of individual and household characteristics.[11] Our focus here is not on the direction of causality between self-employment and attitudes towards risk, which we will focus on in Section V below. Moreover, our aim is simply to explore the robustness of our estimated relationship between attitudes towards risk and self-employment. It is apparent in Table 2 Panel C, that our findings with respect to attitudes towards risk are robust to including the predicted values of risk attitudes with respect to sign, significance and magnitude.[12]

Our findings with respect to the other explanatory variables in Table 2 Panels A, B and C are generally in line with the existing literature (see Le, 1999). There is a positive yet diminishing association between age and the probability of self-employment (excluding the case of inheriting the business). Men are more likely to be self-employed than women. With the exception of starting a business, being married is positively associated with self-employment. The number of completed grades of schooling or years of college is positively associated with the probability of self-employment.[13] In general, being black or latin is inversely associated with the probability of self-employment (the omitted category is Asian, American Indian and other ethnic groups). Wealth and

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[11] The explanatory variables include: age; age squared; gender; marital status; white, black or latin; unearned income; household income; household wealth; household size; number of children; highest grade of school or year of college completed; vocational training; and year dummy variables. The set of over-identifying instruments includes: reasons for saving (future major expenses in the next 10 years, illness, rainy day or to enjoy life); attitudes towards credit (i.e. do you think it is good or bad); whether the respondent was suspicious about the study before interview (which may be correlated with unobserved personality traits); and expectations about interest rates and the performance of the U.S. economy over the next five years. The over-identifying instruments are jointly insignificant in the outcome equation and are jointly significant in the risk attitudes equation (at the 1% level), thereby endorsing the validity of the set of instruments.

[12] Recent empirical evidence suggests a link between entrepreneurship and optimism, see Fraser and Greene (2006). To control for the effects of optimism, we have included the following controls as covariates when modelling employment status – expectations about interest rates and the performance of the U.S. economy over the next five years. The marginal effect of risk preference is largely unchanged in terms of magnitude and statistical significance when including such controls or when interacting optimism with risk preference.

[13] The results are robust to replacing the number of completed grades of education with dummy variables for the highest level of educational attainment: high school diploma; junior college degree; bachelor's degree; master's degree; and PhD. However, in the majority of the cross-sections it is not possible to control for those individuals who have a general education diploma (GED). Hence, with the dummy variables there are a relatively large number of individuals in the 'no educational qualification' category, which may be due to our inability to control for low levels of educational attainment (such as the GED). For this reason, we present the results based on completed grades.

non labour income are positively associated with self-employment, whilst the spouse's income is generally positively associated with self-employment.[14]

For a small sample of respondents, the *SCF* has a panel element. To be specific, the same individuals were surveyed in 1983 and 1989, which enables us to control for unobserved fixed effects. Controlling for unobserved fixed effects is potentially important here because the *SCF* does not contain detailed information on the family background of the respondent (such as whether the respondent's father was self-employed). We model the probability of being self-employed via a fixed effects logit specification conditional on the risk attitudes index and time varying characteristics (such as income and wealth). The results are shown in Table 2 Panel D, where once unobserved time invariant heterogeneity has been controlled for, the positive and significant relationship remains between attitudes towards risk-taking and the probability of being self-employed.

We also explore whether the relationship between attitudes towards risk and the probability of self-employment is influenced by whether the individual owns all or part of the business as this may indicate the extent of the financial risk borne by the individual. In Table 3, we repeat our analysis of the incidence of self-employment distinguishing between those self-employed individuals who own 100% of the business and those who own less than 100% of the business. In our sample, 60.76% of self-employees own 100% of the business, with the remaining 39.24% owning less than 100% of the business. In the first two columns of Table 3, specification 1, we split self-employment into two categories: those who own all of the business and those who own less than 100% of the business. It is apparent that the marginal effects pertaining to risk attitudes are more pronounced in the case of 100% ownership indicating that willingness to take financial risks has a greater influence on the probability of self-employment where the self-employee is the sole owner. This finding is robust to replacing the risk attitudes index (Panel A) with dummy variables

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[14] Replacing the natural logarithm of wealth by dummy variables indicating in which quartile the household lies in the wealth distribution suggests that the wealth effect is driven by the top quartile.

(Panel B) and the predicted risk attitudes index (Panel C). In the remaining columns of Table 3, specification 2, we explore a finer classification of business ownership. Out of the 39.24% of individuals who own less than 100% of the business, the mean percentage of business ownership is 40.65% with a standard deviation of 24.22. Given the variance in the extent of business ownership, we create four categories of self-employment: $0\% < ownership < 25\%$; $25\% \leq ownership < 50\%$; $50\% \leq ownership < 100\%$; and 100% ownership. The results show that the magnitude of risk preference increases monotonically not only within the ownership thresholds but also across the different groups. This monotonicity appears consistent with standard agency theory (see, for example, Jensen and Meckling, 1976) in which decreasing managerial share ownership causes an increasing incidence of agency costs.

Finally, we also investigate whether the relationship between risk preference and self-employment differs between those self-employees who create jobs for others relative to those who do not employ others (i.e. own account status). Out of those individuals reporting self-employment, 19% have no employees. We create five categories of self-employment, specifically: no employees; $1 \leq employees < 20$; $20 \leq employees < 50$; $50 \leq employees < 100$; and $\geq 100\ employees$, where the proportions in the last four categories are 49%, 10%, 6% and 16% respectively. The results, summarised in Table 4, reveal that the marginal effect of risk preference is higher, the smaller is the number of employees in the business. This relationship is monotonic across the different size bands. The results are robust to replacing the risk preference index with dummy variables (Panel B) and the predicted risk attitudes index (Panel C). Interestingly, the relationship between risk preference and self-employment is more pronounced in small firms (i.e. $1 \leq employees < 20$) relative to own account status self-employees (i.e. where there are no employees).[15]

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[15] Dividing the category, ≤1 employees < 20, into ≤1 employees <5 and ≤5 employees <20 reveals that it is the former category where risk preference has the dominant marginal effect, which outweighs that for the own account status. The category, ≤1 employees <5, might reflect employees who are family members of the self-employee, where arguably household financial risk might be relatively high.

Panel Study of Income Dynamics

As mentioned above, one shortcoming of the *SCF* relates to the lack of detailed information on the family background of the respondent. In contrast, the *PSID* provides a more detailed profile of the respondent's family background. Thus, we explore the relationship between the six point risk attitudes index defined in Section II and employment status in 1996 distinguishing between the head of household being: out of the labour force (1%); laid off or unemployed (2.12%); employed (88.62%); and self-employed (8.26%).[16] We model employment status as follows:

$$es_i^{T=1996} = X_i\beta + F_i\lambda + \gamma r_i^{T=1996} + \varepsilon_i \qquad (2)$$

The additional control variables given in matrix F, relating to when the respondent was growing up, are as follows: father's occupation; whether the mother worked; whether the mother was born outside of the US; whether the family was religious; and parent's education. We also control for region including fifty state dummy variables.[17]

The results of estimating equation (2) are presented in Table 5, where we focus on the probability of being self-employed with the reference category being an employee. We present two specifications: specification one excludes the family background controls for the purposes of comparison with the *SCF* findings; and specification two includes the additional family background and region control variables. In model one, it is apparent that the risk attitude index is characterised by a positive statistically significant marginal effect where a one standard deviation move up the risk preference index is associated with an increase in the probability of being self-employed of approximately 1%. Hence, the effect of the risk attitudes index in the 1996 *PSID* is smaller in

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[16] Unfortunately, the *PSID* does not include detailed information pertaining to the type of self-employment. In addition, the difference in the distribution of employment status across the four categories relative to that in the *SCF* is apparent. This may reflect differences in the nature of the self-employment questions with the focus in the *SCF* on business ownership. In addition, there are differences in the age profile of the individuals in the two surveys with the *PSID* (*SCF*) being characterised by a relatively low (high) mean age of 40 (50). This may be important as the economics literature suggests that self-employment increases with age.

[17] Unfortunately, information on region is only available in the 1983 *SCF*, hence we are not able to control for regional effects in the *SCF* analysis.

magnitude than the *SCF*, but operates in the same direction. The quadratic in age, education of the respondent and wealth are all positively associated with the probability of being self-employed.[18]

In the second specification, we include the family background and region controls in order to ascertain the robustness of the estimated relationship between risk preference and the probability of self-employment. In terms of the additional control variables, the educational attainment of the mother appears to be particularly important.[19] The marginal effect of the risk attitudes index is again positive and statistically significant. In Table 5 Panel B in order to distinguish between levels of risk preference, we replace the risk attitudes index with four risk attitude dummy variables. For those individuals in the least risk averse category (i.e. $r = 5$), the probability of being self-employed is approximately 4% higher relative to the two most risk averse categories (i.e. $r \leq 1$). In sum, the findings based on the 1996 *PSID* are in accordance with those from the pooled cross-section data derived from the *SCF* indicating that willingness to take financial risks is positively associated with the probability of self-employment.[20]

VI. Business Success and Risk Preference

An interesting line of enquiry, which has attracted limited interest in the economics literature, concerns the relationship between business success and attitudes towards risk. For example, Van Praag and Cramer (2001) measure entrepreneurial success by the size of the firm's workforce and find that risk aversion is an impediment to successful entrepreneurship. In addition to information pertaining to whether the respondent is self-employed, the *SCF* contains further information relating to the success of the business.[21] To be specific, respondents are asked the following three

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[18] As with the *SCF*, in the *PSID* we are able to control for whether the individual has ever been bankrupt. Including this control does not influence the relationship between risk preference and the probability of self-employment. Bankruptcy is inversely associated with the probability of being self-employed.

[19] If the education of the respondent is omitted, the father's occupation becomes statistically significant, which is consistent with Blanchflower and Oswald (1998) who analyse self-employment in the UK. Our other family background controls are insignificant, which is in accordance with the mixed findings in the literature, see Le (1999).

[20] We collapse two of the risk preference categories together due to the number of observations and we do not attempt to instrument risk preference when using the *PSID* due to the lack of suitable over-identifying instruments.

[21] In the *SCF* sample, the majority of the self-employed (92%) have one business only. The analysis in this section relates to the first business recorded by the respondent. A control is included in the set of explanatory variables indicating whether the individual has additional businesses.

questions: *What were the gross receipts or gross sales of the business as a whole*?; *What is the net worth of this business or your share of this business*?[22]; And *what was the business's total net income before taxes*? Thus, our measures of business success are based on the accumulation of sales, net worth and income. Additional information on the size of the workforce is also available thereby representing the self-employee's labour demand. We therefore analyse four measures of business success. Similarly, Burke et al. (2000) measure self-employment performance by measuring self-employment income and the number of jobs created by the self-employed.

In Table 6, we present our empirical findings relating to business success, π, and attitudes towards risk. Our empirical results are based on Ordinary Least Squares where the sample comprises self-employees only:[23]

$$\pi_{it} = \mathbf{Z}_{it}\boldsymbol{\phi} + \gamma\, r_{it} + v_{it} \tag{3}$$

where v_{it} denotes the random error term. In the $\mathbf{Z}$ matrix, we include controls for: a quadratic in the number of workers in the firm; a quadratic in the age of the firm; number of hours worked in the firm by other family members (excluding the respondent and his/her spouse); whether the business is a partnership, sole proprietorship, sub-chapter or other type of corporation; whether the respondent has more than one business; the respondent's educational attainment; and sector of activity dummy variables.[24]

It is apparent that across the four measures of business performance, willingness to take financial risks is positively associated with business success with the largest influence being on net worth and sales.[25] The estimated coefficients on the risk attitude dummy variables presented in

---

[22] The prompt given to the *SCF* interviewer relates to what the business could be sold for. The interviewer notes specify that the value recorded should be net of all loans. This is consistent with the definition of net worth in the Federal Reserve Bulletin (2006) as being the difference between gross assets and liabilities.
[23] Our findings are robust to including an inverse mills ratio term in the set of explanatory variables controlling for the probability of self-employment and, hence, sample selection bias.
[24] Although the 1996 *PSID* has information on profits, losses and business income, the number of observations that are left once missing values have been eliminated is somewhat limited at 190. Furthermore, there is a lack of suitable explanatory variables in the *PSID* to specify a business performance equation.
[25] It is interesting to note that risk preference plays a diminishing role across employee bands, albeit increasing the probability of self-employment (Table 4), yet acts to increase the number of employees in the business.

Table 6 Panel B support a monotonic relationship between business performance and willingness to take risks.[26] Furthermore, this pattern is robust to instrumenting the measure of risk attitudes (constructed as described above in Section III), although the magnitude of the estimated coefficients has increased considerably across Table 6 Panels A and C.[27]

The findings with respect to the other explanatory variables tie in with the existing literature. For example, Burke et al. (2000) find that university education improves both of their measures of performance. Van Praag and Cramer (2001) also find a positive association between the entrepreneur's education and successful entrepreneurship.

Finally, in Table 6 Panel D, we allow for the possibility that causality operates in both directions with successful self-employment being associated with a willingness to take risks and, conversely, individuals may be willing to take more financial risks if their business is successful. We therefore specify a two stage probit least squares model where we jointly estimate: a probit model with a dependent variable, which takes the value of one if the individual is willing to take substantial financial or above average financial risks, otherwise the dependent variable equals zero; and business success i.e. the continuous variable:

$$
\begin{aligned}
r_{it}^* &= X_{1it}\beta_1 + \kappa_{1it} \qquad r_{it} = 1 \ if \ r_{it}^* > 0 \\
\pi_{it} &= Z_{it}\phi + \gamma\, r_{it} + \kappa_{2it}
\end{aligned}
\tag{4}
$$

The variables included in the risk attitudes equation are as given in equation (1) plus the set of over-identifying instruments defined in Section III. The estimates derived from this framework are consistent and have corrected standard errors (see Maddala, 1983). It is apparent from Table 6 Panel D that the positive association between successful self-employment and willingness to take financial risks prevails when we allow for joint modelling of business performance and risk

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[26] It should be noted that the effect from risk preference upon the firm's labour demand remains if we model the number of employees via a tobit specification (around 19% of the self-employed have no employees).
[27] We have also explored the relationship between the return on capital employed (i.e. income/net worth) and risk attitudes and the return on sales (income/sales) and risk attitudes. Our findings suggest that risk taking is significantly and positively related to both of these alternative measures of financial performance.

attitudes. It should be noted that the magnitude of the association is more pronounced when we adopt the joint modelling approach.

V. Risk Preference and Self-Employment: Measurement and Timing

Our results so far do not shed any light on the nature of the causality underlying the correlation between attitudes towards risk and self-employment. Willingness to take financial risks may increase the probability of self-employment, yet self-employment may influence attitudes towards risk. One potential way to investigate causality entails modelling the probability of being self-employed simultaneously with the probability of being willing to take financial risks (as in Table 6 Panel D). Hence, we estimate a bivariate probit model, which allows risk preference to affect the decision to become self-employed and employment status to affect risk preference. Specifically, we model the probability of the individual being willing to take substantial financial risks (expecting to earn substantial returns) or above average financial risks (expecting to earn above average returns), r, and the probability of being self-employed, s, using the *SCF* data

$$
\begin{aligned}
r_{it}^* &= X_{1it}\beta_1 + \varepsilon_{1it} & r_{it} &= 1 \; if \; r_{it}^* > 0 \\
s_{it}^* &= X_{2it}\beta_2 + \lambda r_{it}^* + \varepsilon_{2it} & s_{it} &= 1 \; if \; s_{it}^* > 0
\end{aligned}
\tag{5}
$$

$$
COV\left[\varepsilon_{1t}, \varepsilon_{2t} \middle| X_{1t}, X_{2t}\right] = \rho
$$

The control variables in the self-employment equation, X_{2it}, are: a quadratic in age; gender; marital status; ethnicity; household size; number of children; number of completed grades at school or college; the natural logarithm of labour income; the natural logarithm of spouse's income; the natural logarithm of non labour income; the natural logarithm of wealth; and year dummy variables. The same variables are included in the risk attitudes equation as well as the set of over-identifying instruments defined in Section III. The ρ parameter indicates whether the two probabilities should be estimated independently. The results are summarised in Table 7 Panel A. The marginal effect of attitudes towards risk on the probability of self-employment is still positive and statistically significant and around 4% in terms of magnitude. In addition, ρ is statistically significant, which

signifies that self-employment and risk attitudes are not independent of each other endorsing the joint modelling approach.[28]

The statistical significance of the estimated ρ parameter is perhaps not surprising as in the *SCF*, risk preference is measured after the decision to become self-employed has been made. Similarly, Cramer et al. (2002) conduct structural modelling which relates risk aversion to self-employment, but in this study risk aversion is also measured after the decision to become self-employed has been made. This may not be problematic if attitudes towards risk are constant over time. Ideally, to infer causality risk preference would be measured prior to the decision to become self-employed. Hartog et al. (2002) argue that ideally we should measure risk aversion before individuals make actual decisions, such as to become self-employed. This would enable us to establish whether less risk averse individuals are likely to become self-employed rather than whether risk aversion is less prevalent amongst the self-employed. This might give some indication of whether risk preference has a causal influence on employment status. To consider the issue of causality further, we focus on the timing of the measurement of risk preference in the *PSID*, which, in contrast to the *SCF*, contains information on respondents over time.

Although, a Risk Aversion Section is only included in the 1996 *PSID*, employment status (i.e. self-employment) is measured in subsequent waves thereby allowing us to model employment status in 2005 conditional upon risk preference in 1996. The results shown in Table 7 Panel B show a positive marginal effect of similar magnitude to that found for employment status in 1996. Indeed, a one standard deviation increase in risk preference is associated with an increase in the probability of being self-employed relative to being an employee of around 1%, which suggests that the influence of risk preference on employment status is time invariant.[29] Hence, the results summarised in Table 7 Panel B reveal a positive association between risk preference and the

---

[28] Note we are unable to replicate this approach when using the *PSID* due to the lack of over-identifying instruments.
[29] We omit individuals from the sample who are self-employed in 1996 so that risk preference is measured prior to the self-employment decision, consequently 8% of individuals are omitted from our sample. Our results are however robust to including these individuals in the sample.

probability of becoming a self-employed over the nine years. Although the time horizon between 1996 and 2005 is quite short, our findings are consistent with a causal interpretation.

As mentioned above, unfortunately, a Risk Aversion Section is only included in the 1996 *PSID*. However, over the period 1969 to 1972, an index of risk tolerance is available in four waves of the *PSID* thereby allowing us to analyse a wider gap between when the risk attitudes are measured and when employment status is recorded. This measure of risk preference is derived from questions relating to the head of household's seat belt usage, smoking behaviour and purchases of medical insurance and car insurance. It is possible that individuals are in the sample between 1 to 4 times during the period 1969 to 1972. Hence, we take an average of the risk attitudes index over a maximum of four years as our early measure of risk preference: $\bar{r}^{T=1969-1972}$. Consequently, for those individuals present in the sample over the period 1969-72 and 1996, we can compare the influence of the 1996 risk preference measure on the probability of being self-employed with that of the risk preference measure reported over the period 1969 to 1972. If individuals' risk preferences are largely time invariant, we would expect the early measure to have a similar effect upon employment status with the same direction of influence as the 1996 risk preference measure.[30] It should be explicitly acknowledged that the 1996 risk preference measure and the early measure of risk preference, $\bar{r}^{T=1969-1972}$, do differ in terms of the underlying survey questions, being based on hypothetical behaviour in the case of the 1996 measure and actual behaviour in the case of $\bar{r}^{T=1969-1972}$. Despite these differences for the sub-sample of individuals present in both the early surveys and the 1996 survey, the correlation between the two risk attitudes indexes is 0.0835, which is statistically significant at the 1 per cent level. Thus, the two risk preference variables, although constructed from survey responses to two different risk attitudes questions given two decades apart, are positively related suggesting time invariance of risk preferences.

---

[30] The risk avoidance index is decreasing in risk aversion and so *a priori* we would expect it to be positively correlated with the 1996 measure of risk preference.

In order to explore whether less risk averse individuals are likely to become self-employed rather than whether risk aversion is less prevalent amongst the self-employed, using a multinomial logit model, we regress employment status in 1996 on the risk attitudes index measured over the period 1969 to 1972:[31]

$$es_i^{T=1996} = X_i\beta + F_i\lambda + \gamma\,\overline{r}_i^{T=1969-72} + \varepsilon_i \qquad\qquad (6)$$

This modelling strategy is akin to that used by Fairlie (2002) who investigated whether young drug dealers were more likely to become self-employed in later years, with differences in the timing of the two events enabling an indirect causal relationship to be discerned.

The results of our analysis based upon estimating equation (6) are presented in Table 7 Panel C, where it can be seen that risk preference has a positive and statistically significant marginal effect. Indeed, a one standard deviation increase in the risk preference index is associated with an increase in the probability of self-employment of around 1%. Hence, the marginal effects from the 1996 risk preference measure and the 1969-1972 risk preference measure, although around 25 years apart, are similar in magnitude and are characterised by the same sign. Given that the 1969-72 risk preference index was measured well before employment status reported in 1996, our results are in accordance with a causal influence of risk attitudes on the probability of self-employment.[32]

VI.   Final Comments

In this paper, we have explored the relationship between attitudes towards risk and self-employment using two U.S. data sets: the *SCF* and the *PSID*. These two surveys include information pertaining to individuals' attitudes towards financial risk, elicited from survey questions which differ in content and design. As such, we have analysed two distinct measures of attitudes towards financial risk thereby allowing us to explore the generality and robustness of our empirical findings. We find that willingness to take financial risks is positively associated with the

---

[31] Only 1.6% of self-employed heads of household in 1996 were also self-employed for at least one year over the period 1969 to 1972. To ensure that risk preferences are measured prior to becoming self-employed, these individuals were excluded from our sample. It should be noted that our findings are robust to their inclusion.

[32] The causality argument is less sanguine however if there are unobserved fixed effects that are correlated with risk preference and also correlated with self-employment.

probability of self-employment. Moreover, this finding is most pronounced if individuals have started the business themselves and where they own 100% of the business. In addition, our analysis of the *SCF* indicates that willingness to take risks is positively associated with business performance as measured by gross income, net worth, number of employees and sales. Finally, our results suggest that current employment status and current risk attitudes should be modelled jointly given their interdependence. However, past attitudes towards risk are found to influence current employment status, which is consistent with a causal relationship with attitudes towards risk influencing the probability of self-employment.

Our findings with respect to the relationship between business success and attitudes towards financial risk are interesting from a policy perspective. For entrepreneurs to be successful (such as generating profit or creating jobs), our findings suggest that a willingness to take risks is important. In designing policy initiatives to encourage self-employment and entrepreneurship (such as tax exemptions), it is clearly important to encourage those individuals who have low levels of risk aversion into self-employment since these are the individuals who are most likely to succeed in their entrepreneurial endeavours.

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APPENDIX

M1
$$EV = (1/2)(2y) + (1/2)(1/3y)$$

YES   NO

M2
$$EV = (1/2)(2y) + (1/2)(1/2y)$$

M3
$$EV = (1/2)(2y) + (1/2)(1/5y)$$

YES   NO

YES   NO

M5
$$EV = (1/2)(2y) + (1/2)(3/4y)$$

$r = 3$

$r = 2$

M4
$$EV = (1/2)(2y) + (1/2)(1/10y)$$

YES   NO

YES   NO

$r = 5$

$r = 4$

$r = 1$

$r = 0$
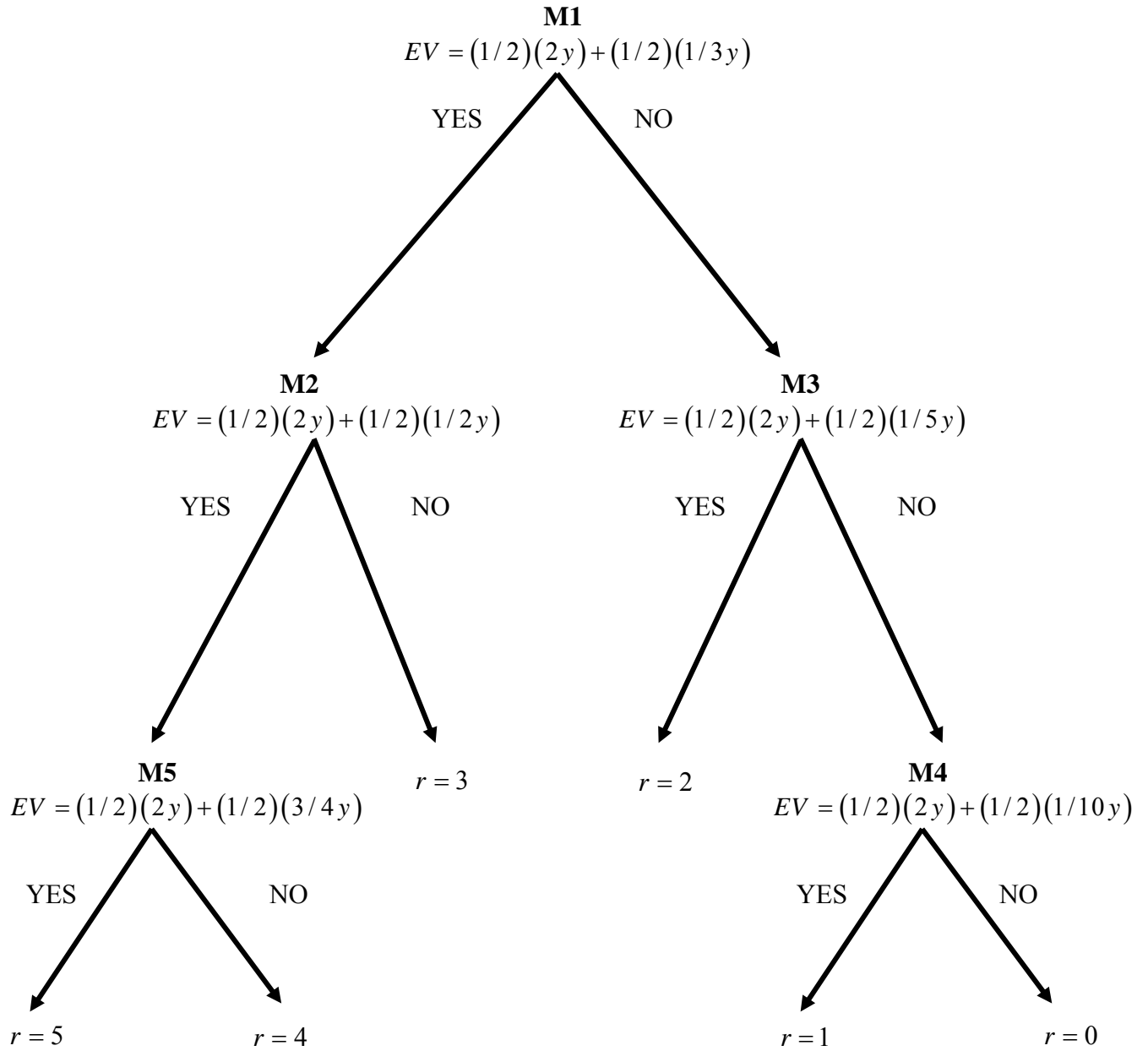
Figure 1: *PSID* Decision Tree

TABLE 1: SUMMARY STATISTICS: KEY VARIABLES

	SCF				PSID			
	ALL		SE		ALL		SE	
	MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD
Age	50	16	51	12	40	11	44	11
Male	0.785	0.411	0.954	0.210	0.732	0.443	0.926	0.262
Married	0.624	0.485	0.835	0.371	0.563	0.496	0.757	0.429
Separated/Divorced	0.170	0.376	0.095	0.292	0.207	0.405	0.139	0.347
Widowed	0.073	0.260	0.022	0.146	0.027	0.163	0.025	0.155
White	0.807	0.395	0.920	0.271	0.637	0.481	0.867	0.340
Black	0.098	0.297	0.022	0.145	0.339	0.474	0.112	0.316
Household size	2.656	1.436	2.970	1.409	2.810	1.429	2.948	1.406
Number of children	1.551	1.851	1.603	1.751	0.986	1.155	0.971	1.153
Education: No of Grades	13.711	2.987	15.103	2.286	12.710	3.176	13.670	2.752
Log labour income	11.681	3.128	8.345	5.041	9.445	2.608	5.915	5.206
Log spouse income	3.671	5.035	4.770	5.429	4.876	4.868	6.465	4.718
Log non labour income	2.561	4.501	4.036	4.670	2.873	2.318	2.958	2.604
Log wealth	4.958	5.034	7.466	5.070	2.264	3.552	4.060	4.468
Mother worked when child	−				0.323	0.467	0.276	0.448
Father professional or managerial	−				0.085	0.279	0.126	0.332
Father self-employed	−				0.048	0.214	0.072	0.259
Father clerical or crafts	−				0.207	0.405	0.243	0.429
Father manual	−				0.159	0.366	0.130	0.337
Mother born outside US	−				0.294	0.456	0.234	0.424
Mother high school education	−				0.331	0.471	0.434	0.496
Mother college education	−				0.128	0.334	0.204	0.404
Father high school education	−				0.210	0.407	0.234	0.424
Father college education	−				0.160	0.367	0.254	0.436
Religious	−				0.115	0.319	0.220	0.415
Risk Attitudes Index	0.957	0.866	1.355	0.832	1.829	1.633	2.117	1.800
OBSERVATIONS	122,935		30,740		5,388		455	

Notes: (i) SE denotes self-employed; (ii) STD denotes standard deviation.

TABLE 2: SELF-EMPLOYMENT AND ATTITUDES TOWARDS FINANCIAL RISK; *SCF*

| PANEL A | Self-Employed | | TYPE OF SELF-EMPLOYEE | | | | | |
| | | | Bought or Joined Business | | Inherited or Given Business | | Started Business | |
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Age	0.0214	*(28.33)*	0.0031	*(8.72)*	0.0001	*(0.92)*	0.0138	*(19.61)*
Age squared	-0.0002	*(24.37)*	-0.0002	*(6.88)*	-0.0000	*(0.35)*	-0.0001	*(14.35)*
Male	0.1553	*(34.36)*	0.0454	*(19.25)*	0.0019	*(1.89)*	0.1139	*(25.93)*
Married	0.0108	*(2.11)*	0.0174	*(7.00)*	0.0036	*(3.72)*	-0.0050	*(1.04)*
Separated/Divorced	0.0373	*(2.92)*	0.0154	*(1.98)*	0.0023	*(0.79)*	0.0334	*(2.82)*
Widowed	-0.0109	*(1.38)*	0.0317	*(5.90)*	0.0080	*(3.94)*	-0.0390	*(5.72)*
White	0.0257	*(3.68)*	0.0133	*(4.27)*	0.0090	*(7.75)*	0.0002	*(0.01)*
Black	-0.1179	*(16.79)*	-0.0264	*(6.83)*	-0.0034	*(1.44)*	-0.0972	*(14.92)*
Latin	-0.0898	*(11.19)*	-0.0206	*(4.87)*	0.0022	*(0.60)*	-0.0761	*(10.23)*
Household size	0.0147	*(11.76)*	0.0066	*(11.54)*	0.0001	*(0.31)*	0.0098	*(8.33)*
Number of children	0.0028	*(2.71)*	0.0028	*(6.39)*	-0.0005	*(2.96)*	-0.0002	*(0.19)*
Education: No of Grades	0.0151	*(21.13)*	0.0026	*(7.66)*	0.0002	*(1.97)*	0.0135	*(19.69)*
Training post school	-0.0096	*(1.96)*	-0.0127	*(5.53)*	-0.0015	*(1.65)*	0.0082	*(1.70)*
Log labour income	0.0068	*(11.92)*	-0.0017	*(8.19)*	-0.0005	*(7.53)*	-0.0053	*(11.13)*
Log spouse income	0.0008	*(2.43)*	-0.0002	*(1.21)*	0.0001	*(1.60)*	0.0020	*(6.51)*
Log non labour income	0.0093	*(23.63)*	0.0027	*(13.59)*	0.0006	*(6.37)*	0.0080	*(21.38)*
Log wealth	0.0376	*(47.43)*	0.0197	*(48.43)*	0.0039	*(22.60)*	0.0259	*(35.28)*
2004	-0.2182	*(58.03)*	-0.0860	*(51.95)*	-0.0180	*(23.81)*	-0.1103	*(22.40)*
2001	-0.2104	*(55.24)*	-0.0828	*(51.09)*	-0.0176	*(23.73)*	-0.1054	*(21.08)*
1998	-0.2048	*(53.90)*	-0.0780	*(49.36)*	-0.0159	*(23.26)*	-0.1037	*(20.81)*
1995	-0.1975	*(50.54)*	-0.0746	*(47.15)*	-0.0150	*(22.86)*	-0.1054	*(21.31)*
1992	-0.1586	*(35.28)*	-0.0711	*(46.68)*	-0.0139	*(22.86)*	-0.0678	*(11.70)*
Risk Attitudes Index	0.0612	*(32.62)*	0.0202	*(23.01)*	-0.0003	*(0.94)*	0.0444	*(25.52)*
Log likelihood ratio	137,477.77		134,137.89					
Pseudo R Squared	0.4791		0.3931					

| PANEL B | Self-Employed | | Bought or Joined Business | | Inherited or Given Business | | Started Business | |
Risk Attitudes:	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Average risk	0.0834	*(20.04)*	0.0298	*(13.20)*	0.0018	*(2.55)*	0.0549	*(14.01)*
Above average risk	0.1354	*(24.24)*	0.0591	*(16.94)*	0.0003	*(0.37)*	0.0834	*(16.29)*
Substantial risk	0.2421	*(26.51)*	0.0770	*(13.66)*	-0.0022	*(2.31)*	0.1680	*(19.73)*
Log likelihood ratio	137,544.21		134,248.04					
Pseudo R Squared	0.4793		0.3935					

| PANEL C | Self-Employed | | Bought or Joined Business | | Inherited or Given Business | | Started Business | |
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Predicted Risk Attitudes Index	0.0690	*(13.80)*	0.0221	*(10.00)*	0.0038	*(1.62)*	0.0333	*(7.26)*
Log likelihood ratio	136,704.82		133,167.64					
Pseudo R Squared	0.4764		0.3903					
Observations panels A-C			122,935					

PANEL D	Self-Employed: *SCF* Panel 1983 and 1989 (Fixed Effects Logit)	
	M.E.	TSTAT
Risk Attitudes Index	0.1415	*(2.90)*
Log likelihood ratio	340.19	
Observations	554	

Notes: (i) Controls in Panels B & C are as in Panel A; (ii) T-statistics based on corrected standard errors are presented in Panel C; (iii) In Panel D we control for log household income and wealth.

TABLE 3: SELF-EMPLOYMENT; ATTITUDES TOWARDS FINANCIAL RISK AND OWNERSHIP OF THE BUSINESS; *SCF*

	SPECIFICATION 1 OWNERSHIP				SPECIFICATION 2 OWNERSHIP							
PANEL A	<100%		100%		>0% to <25%		≥25% to <50%		≥50% to <100%		100%	
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Risk Attitude Index	0.0426	*(25.49)*	0.0152	*(21.98)*	0.0015	*(15.26)*	0.0041	*(15.08)*	0.0068	*(19.36)*	0.0469	*(25.03)*
Log likelihood ratio	141,131.47				139,783.82							
Pseudo R Squared	0.4301				0.3946							
PANEL B	<100%		100%		≥0% to <25%		≥25% to <50%		≥50% to <100%		100%	
Risk Attitudes:	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Average risk	0.0548	*(14.66)*	0.0264	*(14.02)*	0.0017	*(5.89)*	0.0069	*(8.49)*	0.0137	*(13.11)*	0.0569	*(14.18)*
Above average risk	0.0814	*(16.33)*	0.0469	*(16.10)*	0.0036	*(10.15)*	0.0136	*(13.12)*	0.0215	*(16.59)*	0.0868	*(18.32)*
Substantial risk	0.1695	*(19.86)*	0.0676	*(13.75)*	0.0061	*(12.56)*	0.0150	*(11.96)*	0.0313	*(17.91)*	0.1809	*(23.23)*
Log likelihood ratio	141,240.21				139,906.61							
Pseudo R Squared	0.4305				0.3949							
PANEL C	<100%		100%		≥0% to <25%		≥25% to <50%		≥50% to <100%		100%	
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Predicted Risk Attitude Index	0.0381	*(8.54)*	0.0249	*(13.91)*	0.0032	*(11.16)*	0.0068	*(8.26)*	0.0081	*(7.42)*	0.0337	*(5.88)*
Log likelihood ratio	140,390.94				139,043.12							
Pseudo R Squared	0.4279				0.3925							
Observations	122,935											

Notes: (i) Control variables in Panels A, B & C are as in Table 2; (ii) T-statistics are based on corrected standard errors in Panel C; (iii) In specification 2, the dependent variable takes the values: 0=out of the labour force; 1=laid off or unemployed; 2=employed (the base category); 3=ownership >0% to <25%; 4=ownership ≥25% to <50%; 5=ownership ≥50% to <100%; and 6=100% ownership.

TABLE 4: SELF-EMPLOYMENT; ATTITUDES TOWARDS FINANCIAL RISK AND JOB CREATION; *SCF*

	NUMBER OF OTHER EMPLOYEES									
PANEL A	NONE		≥1 to <20		≥20 to <50		≥50 to <100		≥100	
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Risk Attitude Index	0.0175	*(15.76)*	0.0344	*(25.56)*	0.0020	*(14.21)*	0.0009	*(14.56)*	0.0005	*(12.82)*
Log likelihood ratio	149,610.64									
Pseudo R Squared	0.4046									
PANEL B	NONE		≥1 to <20		≥20 to <50		≥50 to <100		≥100	
Risk Attitudes:	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Average risk	0.0233	*(9.34)*	0.0471	*(15.12)*	0.0031	*(7.43)*	0.0014	*(7.17)*	0.0014	*(10.96)*
Above average risk	0.0392	*(12.96)*	0.0723	*(19.36)*	0.0057	*(11.12)*	0.0026	*(10.23)*	0.0019	*(14.26)*
Substantial risk	0.0581	*(13.30)*	0.1459	*(23.66)*	0.0082	*(12.08)*	0.0049	*(13.05)*	0.0024	*(12.26)*
Log likelihood ratio	149,773.44									
Pseudo R Squared	0.4050									
PANEL C	NONE		≥1 to <20		≥20 to <50		≥50 to <100		≥100	
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Predicted Risk Attitude Index	0.0135	*(3.80)*	0.0415	*(9.65)*	0.0023	*(5.40)*	0.0015	*(8.61)*	0.0011	*(9.29)*
Log likelihood ratio	148,927.42									
Pseudo R Squared	0.4028									
Observations	122,935									

Notes: (i) Control variables in Panels A, B & C are as in Table 2; (ii) T-statistics are based on corrected standard errors in Panel C; (iii) In specification 2, the dependent variable takes the values: 0=out of the labour force; 1=laid off or unemployed; 2=employed (the base category); 3=self-employed with no other employees; 4=employees ≥1 to <20; 5=employees ≥20 to <50; 6=employees ≥50 to 100; and 7=employees ≥100.

TABLE 5: SELF-EMPLOYMENT AND ATTITUDES TOWARDS FINANCIAL RISK; *PSID*

| PANEL A | SELF-EMPLOYED IN 1996 | | | |
| | MODEL 1 | | MODEL 2 | |
	M.E.	TSTAT	M.E.	TSTAT
Age	0.0038	*(2.73)*	0.0021	*(2.30)*
Age squared	-0.0003	*(1.90)*	-0.0001	*(1.70)*
Male	0.0424	*(7.02)*	0.0282	*(5.65)*
Married	0.0151	*(1.42)*	0.0115	*(1.60)*
Separated/Divorced	0.0141	*(1.24)*	0.0093	*(1.28)*
Widowed	0.0250	*(0.87)*	0.0195	*(0.05)*
White	0.0154	*(1.02)*	0.0106	*(1.00)*
Black	-0.0210	*(1.39)*	-0.0096	*(0.87)*
Household size	-0.0058	*(1.24)*	-0.0029	*(0.96)*
Number of children	0.0072	*(1.40)*	0.0036	*(1.08)*
Education: No of Grades	0.0032	*(3.57)*	0.0014	*(2.40)*
Log labour income	-0.0138	*(3.23)*	-0.0091	*(2.31)*
Log spouse income	0.0006	*(0.78)*	0.0003	*(0.53)*
Log non labour income	-0.0012	*(1.19)*	-0.0007	*(1.13)*
Log wealth	0.0033	*(5.37)*	0.0019	*(4.94)*
Mother worked when child	–		-0.0006	*(0.17)*
Father professional or managerial	–		-0.0032	*(0.64)*
Father self-employed	–		0.0013	*(0.21)*
Father clerical or crafts	–		-0.0045	*(1.24)*
Father manual	–		-0.0043	*(1.03)*
Mother born outside US	–		0.0042	*(1.01)*
Mother high school education	–		0.0111	*(2.81)*
Mother college education	–		0.0135	*(2.31)*
Father high school education	–		0.0018	*(0.43)*
Father college education	–		0.0059	*(1.20)*
Religious	–		0.0001	*(0.02)*
Risk Attitude Index	0.0043	*(3.10)*	0.0026	*(2.84)*
Log likelihood ratio	1,364.97		1,533.14	
Pseudo R Squared	0.2874		0.3228	

| PANEL B | SELF-EMPLOYED IN 1996 | | | |
| | MODEL 1 | | MODEL 2 | |
Risk Attitudes:	M.E.	TSTAT	M.E.	TSTAT
$r = 2$: M1 = No & M3 = Yes	0.0018	*(0.27)*	0.0001	*(0.01)*
$r = 3$: M1 = Yes & M2 = No	-0.0005	*(0.07)*	-0.0005	*(0.11)*
$r = 4$: M1 = Yes & M2 = Yes & M5 = No	0.0175	*(2.01)*	0.0103	*(1.90)*
$r = 5$: M1 = Yes & M2 = Yes & M5 = Yes	0.0429	*(2.93)*	0.0361	*(2.67)*
Log likelihood ratio	1,383.47		1,547.64	
Pseudo R Squared	0.2913		0.3259	
Observations	5,388			

Notes: Controls in Panel B are as in Panel A; (ii) In Model 2 we also include 50 state dummy variables.

TABLE 6: BUSINESS PERFORMANCE AND ATTITUDES TOWARDS FINANCIAL RISK; *SCF*

PANEL A	BUSINESS PERFORMANCE INDICATOR							
	Log sales		Log net worth		Log income before tax		Log number of employees	
	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
Intercept	10.008	*(5.90)*	13.437	*(6.73)*	5.4437	*(2.08)*	0.8358	*(2.11)*
No. employees	0.0023	*(41.75)*	0.0010	*(16.04)*	0.0021	*(24.52)*	–	
No. employees squared (×100)	-0.0009	*(30.75)*	-0.0005	*(13.44)*	-0.0008	*(18.12)*	–	
Tenure	0.3453	*(62.87)*	0.1829	*(28.22))*	0.3332	*(39.33)*	0.0853	*(34.97)*
Tenure squared	-0.0059	*(45.92)*	-0.0025	*(16.85)*	-0.0055	*(27.96)*	-0.0011	*(18.98)*
Hours/wk non HH & spouse	0.0049	*(2.77)*	0.0150	*(7.14)*	0.0069	*(2.52)*	0.0035	*(4.42)*
Partnership	0.1060	*(0.95)*	-0.3587	*(4.01)*	0.6896	*(5.90)*	0.0274	*(0.81)*
Sole proprietor	-1.3833	*(12.93)*	-2.3587	*(29.25)*	-0.2209	*(2.10)*	-1.5943	*(52.63)*
Sub chapter	1.1866	*(10.99)*	0.8248	*(9.78)*	0.6655	*(6.04)*	0.3401	*(10.69)*
Other corporation	0.5113	*(4.43)*	0.1435	*(1.02)*	0.5608	*(3.05)*	0.1272	*(2.40)*
More than one business	-0.8946	*(2.31)*	-0.3477	*(1.18)*	-1.9882	*(0.77)*	-0.4838	*(0.65)*
Education: No of Grades	0.1452	*(13.96)*	0.0172	*(1.41)*	0.0809	*(5.04)*	0.0763	*(16.51)*
2004	0.2459	*(3.39)*	-0.0201	*(0.24)*	-0.0621	*(0.56)*	-0.0113	*(0.35)*
2001	-0.0113	*(0.15)*	0.0706	*(0.82)*	-0.4360	*(3.86)*	0.0479	*(1.47)*
1998	-0.6533	*(8.72)*	-0.4228	*(4.78)*	-1.2463	*(10.78)*	-0.0156	*(0.47)*
1995	-0.2240	*(3.04)*	-1.0874	*(12.50)*	-1.6140	*(14.18)*	0.0768	*(2.34)*
1992	-0.4532	*(5.57)*	-1.3560	*(14.10)*	-2.4023	*(19.11)*	-0.0982	*(2.71)*
Risk Attitude Index	0.2742	*(10.22)*	0.4331	*(13.69)*	0.1790	*(4.33)*	0.1653	*(13.86)*
F Statistic	638.10		345.52		230.22		685.85	
Adjusted R Squared	0.3132		0.1978		0.1409		0.3082	

PANEL B	Log sales		Log net worth		Log income before tax		Log number of employees	
Risk Attitudes:	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
Average risk	0.1548	*(15.41)*	0.5693	*(7.17)*	0.0790	*(0.76)*	0.3207	*(10.72)*
Above average risk	0.9415	*(19.71)*	1.0089	*(11.69)*	0.2076	*(1.84)*	0.4339	*(13.35)*
Substantial risk	1.0662	*(17.54)*	1.2806	*(11.68)*	0.5279	*(3.68)*	0.5090	*(12.33)*
F Statistic	859.87		196.64		294.35		580.37	
Adjusted R Squared	0.4191		0.1420		0.1988		0.3115	

PANEL C	Log sales		Log net worth		Log income before tax		Log number of employees	
	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
Predicted Risk Attitude Index	1.2479	*(18.64)*	0.9753	*(24.35)*	0.7465	*(16.92)*	0.6709	*(22.56)*
F Statistic	654.15		782.68		266.68		778.04	
Adjusted R Squared	0.3186		0.3673		0.1474		0.3127	

PANEL D: 2S PROBIT LEAST SQUARES	Log sales		Log net worth		Log income before tax		Log number of employees	
	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
Above Average Risk	2.2369	*(15.33)*	1.9899	*(19.65)*	2.3680	*(13.70)*	1.5292	*(19.24)*
F Statistic	686.08		784.08		336.77		772.82	
Adjusted R Squared	0.3189		0.3791		0.1866		0.3231	
Observations	30,740							

Notes: (i) Controls in Panels B & C are as in Panel A; (ii) Sector of business activity dummy variables are included in each panel: manufacturing; retail; restaurant; finance and utilities; (iii) T-statistics are based on corrected standard errors in Panel C; (iv) In Panel D controls in the business success equation are as in Panel A and the risk attitudes equation is supplemented by the over-identifying instruments defined in Section III.

TABLE 7: JOINT MODELLING, MEASUREMENT AND TIMING

PANEL A: BIVARIATE PROBIT; *SCF DATA*	PROBABILITY OF SELF EMPLOYMENT	
	M.E.	TSTAT
Above Average Risk	0.0445	*(52.63)*
Wald	52620.21	
ρ	-0.5778 *(4.16)*	
Observations	122,935	
PANEL B: 2005 EMPLOYMENT STATUS, *PSID DATA*	PROBABILITY OF SELF EMPLOYMENT IN 2005	
	M.E.	TSTAT
Risk Attitude Index	0.0030	*(2.08)*
Log likelihood ratio	1,403.32	
Pseudo R Squared	0.2568	
Observations	3,035	
PANEL C: EARLY RISK MEASURE; *PSID DATA*	PROBABILITY OF SELF EMPLOYMENT IN 1996	
	M.E.	TSTAT
$\bar{r}^{-T=1969-72}$	0.0040	*(2.81)*
Log likelihood ratio	910.69	
Pseudo R Squared	0.3336	
Observations	3,504	

Notes: (i) In Panel A the controls in the self-employment and risk attitudes equations are as in Table 2; (ii) The risk attitudes equation is supplemented by over-identifying instruments defined in Section III; (iii) In Panels B and C the control variables are as in Table 5.