

The Risk Tolerance and Stock Ownership of Business Owning Households

Cong Wang and Sherman D. Hanna

Data from the 1992-2004 Survey of Consumer Finances were used to examine the risk tolerance and stock ownership of three types of households: those that do not own a business, those that own and manage a business, and those that own but do not manage a business. Non-manager business owners were the most likely to be willing to take risks and to hold stocks. Manager-business owners were more willing to take risk than non-owners but were less likely to own stocks than otherwise similar non-owner households. Research on risk tolerance and stock ownership should consider business ownership to account for differences between the household types.

Key Words: business management, business ownership, risk tolerance, stock ownership, Survey of Consumer Finances

Introduction

Few studies have examined how business owning households differ from non-business owning households in terms of financial risk tolerance and stock ownership. In 2004, business assets held by U.S. households amounted to over 2.6 times the value of publicly traded stocks held directly by households and 1.5 times the value of investment real estate held by households.¹ Kennickell and Lusardi (2004) noted that business owning households have very different saving motives and behaviors than non-business owning households. Researchers also have pointed out that financial risk tolerance makes a significant difference in household portfolio decision making (Hanna & Lindamood, 2004) and is a crucial factor related to ownership of high return assets (Gutter & Fontes, 2006) that are important for financial goal achievement. Because business owning households may have different risk tolerance and motives than non-owning households, it is plausible that business owning households make different financial investment decisions than households that do not own a business.

We investigated risk tolerance differences among three types of households: those that do not own a business, those that both own and manage a business, and those

that own but do not manage a business. We also investigated differences in stock ownership among these household types, using stock ownership as an indicator of household risk-taking behavior. Our analysis of the effect of business ownership on risk tolerance and stock ownership provides financial educators and advisors insight into characteristics related to risk tolerance for all households, including those that do not own a business. This is particularly important in understanding households and population groups that are more likely to own a business.

Literature Review

Risk Aversion/Tolerance and Risk Taking

Arrow (1964) and Pratt (1964) developed the concepts of *absolute* and *relative risk aversion*. Individuals' relative risk aversion is at the core of the expected utility framework of modern portfolio theory. Campbell and Viceira (2002) demonstrated that differences in risk aversion lead to very different optimal portfolio allocations between risky assets and safe assets. Risk-averse households must determine their best trade-off between risk and expected return. Investment advisors typically discuss risk tolerance, which Barsky, Juster, Kimball, and Shapiro (1997) defined as the inverse of risk aversion.

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Hanna, Gutter, and Fan (2001) noted that there are at least four methods of inferring investment risk tolerance, three of which are (a) observation of actual investment choices, (b) asking hypothetical questions with carefully specified scenarios, and (c) attitudinal measures. Previous research that attempted to infer risk tolerance from actual investment choices assumed that households were informed and making rational choices based on their situation and risk tolerance (Friend & Blume, 1975; Wang & Hanna, 1997). Therefore, such estimates of risk tolerance have limitations, considering that households might not have made informed, rational choices.

Using responses to hypothetical income gamble questions that were part of the 1992 Health and Retirement Study to construct measures of the Arrow-Pratt concept of risk aversion, Barsky et al. (1997) found that households differed markedly in their willingness to bear risk. Moreover, risk aversion had considerable predictive power on the risky choices the households actually made.

A number of researchers have analyzed financial risk tolerance attitude using the risk tolerance question in the Federal Reserve Board's Survey of Consumer Finances (SCF). The SCF question is

Which of the statements on this page comes closest to the amount of financial risk that you and your (spouse/partner) are willing to take when you save or make investments? 1. Take substantial financial risks expecting to earn substantial returns; 2. Take above average financial risks expecting to earn above average returns; 3. Take average financial risks expecting to earn average returns; 4. Not willing to take any financial risks.

Grable and Lytton (2001) discussed the SCF risk tolerance measure and concluded that it was a reasonably reliable measure of investment risk tolerance. Yao, Hanna, and Lindamood (2004) noted that the measure was first included in the 1983 SCF. They found that only a small percent of respondents have chosen the "substantial" response over the years, whereas a modest percent have chosen the "above average" response. Several researchers have combined the first three positive responses—"average," "above average," and "substantial"—into a "some" risk category to enable more robust estimates of the effects of demographic variables on risk tolerance and the effects of risk tolerance on investment choices.

Risk tolerance has been found to be related to various demographic and financial characteristics of households. Yao et al. (2004) found that survey year, race, age, education, marital status, presence of young children, monetary assets relative to income, non-financial assets, household income, self-employment status, expectation of an inheritance, and health status were related to willingness to take some financial risk. Campbell and Viceira (2002) demonstrated that, when controlling for risk aversion, the optimal stock allocation should decrease with age. Gutter and Fontes (2006) found that risky asset ownership (mostly stock ownership) was related to race, marital status, education, income, net worth, employment status, owning a home, and risk tolerance.

Business Owning Households

Business owning households include a variety of types of households and businesses. Yilmazer and Schrank (2006) divided small businesses that had managerial involvement by at least one household member into *family businesses* and *non-family businesses*. A family business was defined as one where at least two family members were working in the business; they defined a non-family business as any other business. Their combined sample of the 1989, 1992, 1995, 1998, and 2001 SCF datasets included 1,099 family business households and 3,047 non-family business households.

Xiao, Alhabeed, Hong, and Haynes (2001) compared the risk attitude and risk-taking behavior of business owning and non-owning families in the 1995 SCF. They found that family manager-business owners were more risk tolerant than non-owners. Xiao et al. also analyzed the risky asset proportion of total household assets and found that business owning households had higher risky asset ratios than otherwise similar non-owner households. The researchers discussed differences between family business owners and family households that did not own a business, but their comparisons actually were between manager owner households and a group that included both non-owners and non-manager owners.² They found that 99% of business owners were male in their sample of couple households. This conclusion was due to a failure to recognize that the SCF defined the male as the head in mixed-sex couple households. Therefore, Xiao et al. did not control for the sex of the respondent in their analyses. They also examined some business characteristics and found that, except for the number of employees, there were no strong relationships between the owners' risk attitude and business characteristics.

Portfolios of Business Owners

Stocks should represent a substantial proportion of household portfolios for many households (Campbell & Viceira, 2002). Lai and Hanna (2004) discussed the efficiency of household investment portfolios and found that efficient portfolios for most older households should include business investments (proxied by the performance of microcap public stocks). Faig and Shum (2002), using the 1995 SCF, found that households that were saving to invest in their own homes or in their own businesses had significantly less volatile financial portfolios than those who were saving for retirement. Gutter and Saleem (2005) analyzed the financial vulnerability of small business owners and found that business owners allocated less of their wealth to retirement assets than non-owners and the business comprised the bulk of their wealth. Campbell (2006) pointed out that private business assets can explain much of the nonparticipation in public equity markets by wealthy households. Moskowitz and Vissing-Jørgensen (2002) found that households with investments in private businesses had very undiversified portfolios. Because entrepreneurs typically own a single private firm, the risk the average entrepreneur faces may be higher still.

Heaton and Lucas (2000) found that households with variable proprietary business income held less wealth in stocks than other similarly wealthy households, perhaps due to the higher background income risk they faced. Therefore, for a manager-business owning household, it is plausible that its personal business might be a substitute for investing in publicly traded stocks in terms of its optimal household portfolio. For a non-manager business owning household, investment in one or more businesses might simply be an alternative to investing in publicly traded stocks.

Methodology

Dependent Variables and Hypotheses

The dependent variables examined were risk attitude and stock ownership. The risk attitude variables, based on the SCF question about willingness to take risks with investments, were operationalized as two cumulative levels, some risk, high risk, and also the substantial risk level, as done by Yao et al. (2004). The stock ownership variable was an indicator of risk-taking behavior and was based on whether a household owned stocks directly and/or indirectly.

We expected business owners to be more willing to take risk than non-owners because risk tolerance may reflect a

preference for options such as being an employee versus a business owner. However, manager owners may be less willing to invest in publicly traded stocks and stock mutual funds because they take the responsibilities of maintaining and promoting the performance of their own businesses and invest a large portion of their assets into their businesses. For this reason, it may be rational for business owners to invest in their businesses rather than in stock investments. The observations discussed above were the basis of the hypotheses shown below, which assumed that other relevant variables such as survey year, demographic characteristics, and financial characteristics were controlled. Under Hypotheses 1A and 1B, we expected that business owners had higher risk tolerance than non-owners because owning a business requires acceptance of more risk than other types of investments. Although the direction of the causation possibly could be from risk tolerance to business ownership, we followed the example of the risk tolerance attitude analysis in Xiao et al. (2001). We extended their analysis by differentiating between manager owners and non-manager owners. Therefore, our hypotheses about risk preferences were

Hypothesis 1A: Manager owners have higher risk tolerance than non-owners.

Hypothesis 1B: Non-manager owners have higher risk tolerance than non-owners.

We expected that manager owners would be less likely to hold stocks than non-owners because, for a given level of risk tolerance, income, and other characteristics, a manager owner may have substituted business assets for publicly traded stock investments. Thus, Hypothesis 2A was that manager owners would be less likely to own stocks than non-owners. Hypothesis 2B was that manager owners were less likely to hold stocks than non-manager owners. We assumed that manager owners were more confident about their business investment than non-manager owners and therefore were less likely to own stocks. The Xiao et al. (2001) analysis of risky behavior was similar, except that their risk behavior measure was the ratio of risky assets to total assets. Because Xiao et al.'s definition of risky assets included the business as a risky asset, it was not surprising that business owners had higher ratios than non-owners. Therefore, our hypotheses about risky investment behavior related to manager owners were

Hypothesis 2A: Manager owners are less likely to own stocks than non-owners.

Hypothesis 2B: Manager owners are less likely to own stocks than non-manager owners.

Our purpose was different from Xiao et al. (2001) because we were interested in the substitution of business investments for publicly traded stock investments. Hypothesis 3 proposed that non-manager owners were less likely to hold stocks than non-owners. We assumed that by controlling for other variables in the multivariate analysis, non-manager owners regarded their business investment as a substitute for stock investments; therefore, non-manager owners may have been less likely to hold stocks than non-owners with similar levels of risk tolerance, resources, and other characteristics. Therefore, our hypothesis about risky behavior of manager owners versus non-manager owners was

Hypothesis 3: Non-manager owners are less likely to hold stocks than non-owners.

Based on theoretical discussion and empirical results in the literature discussed above, other variables were likely to be related to risk attitude and to stock ownership, including sex of the respondent, homeownership, income, race, and having financial assets greater than monthly income. Therefore, these variables were included in the multivariate analyses as control variables. In addition, it was expected that stock ownership was related to risk tolerance attitude. Because of this, we included variables for the different risk tolerance levels of the SCF risk tolerance measure in the multivariate analysis of stock ownership.

The Data

The SCF contains a substantial amount of demographic and financial information about households in the United States (Bucks, Kennickell, & Moore, 2006). The SCF dataset includes information about businesses owned and managed by households. Our study investigated whether households owning and managing a business differed from those owning but not managing a business as well as from non-owners. A primary focus of the study was the difference in risk tolerance attitude and risk behavior decisions of business owning households with and without managerial involvement. To obtain robust estimates of differences between the two types of business owning households while controlling for a number of demographic variables, we combined all households from the 1992, 1995, 1998, 2001, and 2004 SCF. The actual sample sizes were 3,906 in 1992, 4,299 in 1995, 4,305 in 1998, 4,442 in 2001, and 4,519 in 2004, giving a total of 21,471 households. For descriptive analyses, the SCF population weights were used to represent the U.S. population as a whole. Unlike the Xiao et al. (2001) study in which households were

limited to family households, this study included all households for the comparisons, including non-couple households.

Ownership of a business was measured by using responses to the survey question, "Do you own or share ownership in any privately-held businesses, farms, professional practices, limited partnerships, or any other types of partnerships?" If the response was "yes," the household was considered a business owner; otherwise, it was counted as a non-owner. The SCF also classified privately owned business interests into those in which the family had an active management role and those in which they did not. Having an active management role in a business was measured by responses to the question, "Do you or anyone in your family living here have an active management role in any of these businesses?" If the answer was "yes," the household was considered a manager-business owner. If the answer was "no" for a household owning a business, the household was considered a non-manager business owner. Of the 21,471 households interviewed in the five surveys from 1992 to 2004, 13.3% owned businesses. Among all business owning households, 91.9% were manager owners and 8.1% were non-manager owners.

Operationalization of the Dependent Variables

The dependent variables were financial risk tolerance and stock ownership. Stock ownership was a plausible indicator of financial risk-taking behavior and referred to owning stocks directly or indirectly, including mutual funds or retirement accounts. We analyzed the respondents' risk attitudes by using their responses to the SCF risk tolerance question. Four risk tolerance levels were provided by SCF: willingness to take substantial risk to earn substantial returns ("substantial risk tolerance"), willingness to take above average risk to receive above average returns ("above average risk tolerance"), willingness to take average risk to get average returns ("average risk tolerance"), and unwillingness to take any risk ("no risk tolerance").

Statistical Analyses

Cross-tabulations and means tests were carried out to provide descriptive information about the different household types. Logistic regression was an appropriate technique for a multivariate analysis of a dependent variable with a small number of levels and has been used by previous authors who analyzed the SCF risk tolerance variable (Yao et al., 2004).

The models used in this paper were

$$\text{Risk tolerance} = f(B_m, B_{nm}, X_i, Y_i) \quad (1)$$

$$\text{Stock ownership} = f(B_m, B_{nm}, X_i, R_i, Y_i) \quad (2)$$

where $B_m = 1$ if household was a manager owner, and 0 otherwise; $B_{nm} = 1$ if household was a non-manager owner, and 0 otherwise; X_i was a vector of households' demographic and financial characteristics; R_i was a vector of dummy variables that represented the response to the SCF risk tolerance question; Y_i was a vector for survey year dummy variables, accounting for any time trend.

In Model 1, we first tried the procedure used by Xiao et al. (2001) that ran an ordered logit of the SCF risk tolerance measure as a dependent variable coded 1 to 4; the results of the score test indicated that the parallel assumption of ordered logit was not appropriate. Therefore, we followed the procedures used by Yao et al. (2004) and set up three separate logit analyses, each with a different risk tolerance level as a dependent variable. The dependent variables were substantial risk, some risk (comprised of substantial, above average, and average risk), and high risk (comprised of substantial and above average risk).

For Model 2, a logit investigating variables related to stock ownership was conducted. For most households, directly or indirectly owning stock assets is an indicator of risk taking. For a business owning household, investing in stocks is a decision that might be related to the decision to invest in one's own business. In the stock ownership model, we also included as independent variables the SCF levels of risk tolerance, relative to being unwilling to take any risk. The stock ownership logit was of a dichotomous variable indicating whether a household directly and/or indirectly owned stocks. Both the risk tolerance and the stock ownership models were based on the same set of independent variables except that the stock ownership model also controlled for the respondents' risk tolerance levels.

The repeated-imputation inference (RII) method (Montalto & Sung, 1996) was used for the means tests shown in Table 4 and the logits in Tables 5 and 6 to correct for underestimation of variances due to imputation of missing data. The logits were not weighted,³ based on the possible bias due to the endogeneity of the SCF population weights (Deaton, 1997).

Independent Variables

The main focus of analysis was the effect of the business/management status⁴ of the household, which was categorized as either non-owner, manager-owner, or non-manager owner. In addition to these independent variables, three types of independent variables were used in the multivariate analyses: the year of the survey, demographic characteristics, and financial characteristics. The demographic variables included age and age squared of the respondent; education, race, and sex of the respondent; presence of related children aged under 19; homeownership; and household composition with dummy variables for whether the household included a single head with no partner or spouse (non-couple household), a partner couple household, or a married couple household. (A person in a self-described partner relationship that did not include marriage could be still married to somebody outside of the household economic unit, so it is technically incorrect to refer to such households as unmarried couple households.) The reference category in the multivariate analyses was a married couple household.

Another independent variable was whether a household's financial assets exceeded monthly income; if it did not, it is unlikely that the household would be in a position to make investment decisions. The other independent variables were the level of non-financial assets and household income. Because the relationships between those monetary amounts and the dependent variables were not necessarily linear, the natural logs of income and of non-financial assets were used. Economic theory could not be directly used to form hypotheses about variables related to risk tolerance unless an additional assumption was made about the relationship of the SCF risk tolerance measure and the portfolio choices or familiarity with financial markets in the United States. For instance, it seemed plausible that the SCF measure of risk tolerance would be related to age, as the investment horizon shortens as a worker approaches retirement, and Yao et al. (2004) reported that risk tolerance decreased with age. Having young children at home might mean, all other things equal, that immediate needs and perhaps college costs would result in lower financial risk tolerance. Hispanics and Asian-Americans might have lower financial risk tolerance due to lack of familiarity with U.S. financial investments. For the stock ownership logit, dummy variables representing the risk tolerance levels that corresponded to the original responses to the SCF risk tolerance question were used.

Table 1. Business Ownership and Management Status by Survey Year

Survey year	Non-owners	Manager owners	Non-manager owners
1992	85.64%	13.36%	1.00%
1995	87.22%	11.57%	1.21%
1998	87.32%	11.70%	0.98%
2001	86.45%	12.30%	1.25%
2004	86.67%	12.42%	0.91%
Combined samples	86.68%	12.25%	1.07%
Weighted number	18,610	2,631	230
Actual number	14,889	5,918	663

Note. Analyses are weighted, except for the actual numbers. Calculated by authors based on 1992, 1995, 1998, 2001, and 2004 SCF datasets.

Results

Descriptive Results

Table 1 shows the distribution of household business owner/manager typed by survey year.⁵ The percent of households with owner managers has remained approximately the same, being 13% in 1992 and 12% in 1995, 1998, 2001, and 2004.

Business owning households had higher household incomes, equity assets, financial assets, non-financial assets, debt, and net worth than non-owners (see Table 2). Households that owned a business represented 13% of households in the United States over the period 1992-2004 but owned 48% of household net worth. Non-manager owners had considerably higher levels of income and assets than manager owners. Whites and races other than Blacks and Hispanics represented higher proportions of business owners than of non-owners; for instance, 74% of non-owner households were White, 89% of manager owner households were White, and 88% of non-manager owner households were White. Blacks and Hispanics represented lower proportions of business owners than of non-owners; for instance, 14% of non-owner households were Black, 5% of manager owner households were Black, and 4% of non-manager owner households were Black.

Non-manager business owners had higher education levels than those in the other categories, with 56% of non-manager owners holding bachelor degrees, compared to 52% of manager owners and 31% of non-owners. Manager-business owners were less likely to be in non-couple households than the other two groups: 20% of manager owner households were non-couple, compared to 24% of non-manager business owners and 45% of non-owners.

A majority (57%) of non-owner households had female respondents, compared to 43% of manager owner households and 37% of non-manager owner households.

Table 3 shows that 84% of non-manager owners were willing to take some risk with their investments, followed by manager-business owners (77%) and non-owners (54%). A similar pattern can be seen with high risk and with substantial risk. Respondents in non-manager owner households were over twice as likely to be willing to take substantial risk as non-owners. The three types of households differed from each other significantly in each level of risk tolerance. Business owners were more likely to have stock investments: 71% of non-manager owners, 63% of manager owners, and only 43% of non-owners reported that they directly and/or indirectly owned stocks.

Logit Results

Risk tolerance levels. Three separate logits compared business owners' risk tolerance in each risk category (some, high, and substantial) when controlling for other variables. In each risk category, manager-business owners and non-manager business owners were compared with non-owners. Both logit coefficients and marginal effects of each independent variable on the predicted probability⁶ of the dependent variable are presented in Table 4 and Table 5.

When controlling for the other variables in the logits, both manager owners and non-manager owners were significantly more likely to be willing to take some, high, and substantial risk than non-owners (see Table 4 and Figure 1). For example, non-manager owners had a predicted probability of being willing to take substantial risk of 7.8%

Table 2. Characteristics by Business-Ownership Status

Characteristics	Non-owners	Manager owners	Non-manager owners
Demographic characteristics			
Mean age	48.3	47.0	50.9
Race/ethnicity			
White	74.21%	88.61%	88.20%
Black	14.05%	4.63%	4.45%
Hispanic	8.19%	3.18%	3.04%
Other groups	3.55%	3.90%	4.00%
Education			
< High school diploma	17.08%	5.08%	6.35%
High school diploma	32.06%	23.55%	18.58%
Some college	19.66%	19.87%	18.67%
Bachelor's degree and above	31.20%	51.51%	56.41%
Household composition			
Married couple	48.63%	74.84%	68.86%
Partner	6.68%	5.44%	7.42%
Non-couple	44.69%	19.72%	23.71%
Have child < 19 at home	36.39%	44.64%	35.75%
Female respondent	57.17%	42.98%	36.67%
Financial characteristics			
Mean household income	50,162	128,200	209,912
Median household income	35,000	67,101	82,013
Mean net worth	205,397	1,187,083	1,976,488
Median net worth	62,100	318,258	508,981
Mean assets	251,721	1,304,467	2,124,026
Mean debts	46,324	117,384	148,538
Mean financial assets	111,479	357,628	1,100,395
Mean non-financial assets	140,241	947,839	1,023,631
Mean equity assets	47,021	161,681	590,035
Own stocks directly and/or indirectly	42.83%	62.52%	71.07%
Financial assets > 1 month income	69.68%	86.95%	92.65%

Note. All dollar amounts are adjusted to 2004 dollars. Analyses are weighted based on 1992, 1995, 1998, 2001, and 2004 SCF datasets.

at the mean value of other variables, compared to 7.6% for manager owner households and 3.6% for non-owner households. The marginal effect of 4.2% for non-manager households in the substantial risk logit represented the difference between the predicted probability of 7.8% for those households and the predicted probability of 3.6% for

non-owner households. Although this effect seems small, the predicted level for non-manager owners was more than twice the predicted level for non-owners. As shown in Table 4, the actual rates of being willing to take substantial risk were 8.1% for non-manager owners and 3.6% for non-owners, a difference of 4.5 percentage points. Controlling

Table 3. Risk Tolerance and Risk-Taking Behavior (Stock Ownership) by Business-Ownership Household Type

Characteristic	Non-owners	Manager owners	Non-manager owners
Risk tolerance			
Some risk	53.73%	76.84%	84.16%
High risk	17.65%	29.89%	36.03%
Substantial risk	3.56%	6.12%	8.14%
Risk-taking behavior			
Own stocks directly and/or indirectly	42.83%	62.52%	71.07%

Note. Analyses are weighted based on 1992, 1995, 1998, 2001, and 2004 SCF datasets. The three types of households were significantly different from each other at $p < .0001$ for each risk tolerance level and for stock ownership based on an RII procedure.

for income and other variables, the difference between the household types in terms of being willing to take substantial risk narrowed slightly but was still relatively large. Manager owners did not significantly differ from non-manager owners in predicted willingness to take some risk, high risk, or substantial risk.⁷

The logits in Table 4 also reveal the relationship between risk tolerance and other independent variables. The combined effects of age and age squared indicated a negative relationship between age and risk tolerance for all three risk tolerance levels in the model. The older the person was, the less likely he or she was willing to tolerate finan-

cial risk. For instance, at the mean values of other variables, the predicted probability of being willing to take some risk was 71% for respondents aged 25 but only 29% for respondents aged 80, a difference of 42 percentage points.

If a household had financial assets exceeding monthly income, the respondent was significantly more likely to be willing to take some and high risk. Female respondents were significantly less likely than male respondents in otherwise similar households to be willing to take substantial, high, or some risk. As income increased, the likelihood of being willing to take risk increased. Predicted risk

Table 4. Cumulative Logistic Analysis of Risk Attitude

Parameter	Substantial risk		High risk		Some risk	
	Coefficient	Marginal effect on predicted probability ^a	Coefficient	Marginal effect on predicted probability	Coefficient	Marginal effect on predicted probability
Intercept	-3.6493***		-2.6914***		-1.3267***	
Business-ownership						
Manager-business owners	0.7941***	4.0%	0.5333***	9.3%	0.6726***	15.6%
Non-manager business owners	0.8298***	4.2%	0.6002***	10.6%	0.8947***	20.0%
Non-business owner (reference category)						
	Demographic characteristics					
Race/ethnicity						
Black	0.3013**	1.2%	-0.1177	-1.8%	-0.3216***	-7.8%
Hispanic	0.5314***	2.4%	0.0385	0.6%	-0.6159***	-15.3%
Other groups	0.1068	0.4%	-0.1968*	-3.0%	-0.5886***	-14.6%
White (reference category)						

Table 4. Cumulative Logistic Analysis of Risk Attitude (continued)

Parameter	Substantial risk		High risk		Some risk	
	Coefficient	Marginal effect on predicted probability ^a	Coefficient	Marginal effect on predicted probability	Coefficient	Marginal effect on predicted probability
Demographic characteristics						
Age	-0.0240	-5.5% (25 to 80)	-0.000625	-18.0% (25 to 80)	-0.0114	-41.8% (25 to 80)
Age squared	-0.00004		-0.00023***		-0.0002**	
Education						
High school diploma	0.2238	0.7%	0.3085***	3.7%	0.5743***	13.8%
Some college	0.3260*	1.1%	0.6124***	8.2%	1.0953***	26.7%
Bachelor's degree and above	0.4146**	1.5%	0.9910***	15.0%	1.5819***	37.5%
< High school diploma (reference category)						
Household composition						
Partner couple	0.1664	0.6%	0.0984	1.5%	-0.0905	-2.3%
Non-couple	0.4508***	1.8%	0.2064***	3.2%	-0.0352	-0.9%
Married couple (reference category)						
Have child < 19 at home	-0.0306	-0.1%	-0.0521	-0.8%	-0.1233**	-3.1%
Female respondent	-0.5334***	-2.1%	-0.6141***	-9.2%	-0.5808***	-14.1%
Financial characteristics						
Financial assets ≥ monthly income	0.2499*	0.9%	0.5593***	8.1%	0.8760***	21.5%
Log (annual household income)	0.0961***	0.7% (\$20,000 to \$120,000)	0.1278***	3.7% (\$20,000 to \$120,000)	0.1563***	6.8% (\$20,000 to \$120,000)
Homeownership						
Homeowner	0.0450	0.2%	0.2255***	3.5%	0.3155***	7.7%
Renter (reference category)						
Year of survey						
1992	-0.2096*	-0.8%	-0.4956***	-7.6%	-0.5015***	-12.3%
1995	-0.1472	-0.6%	-0.2892***	-4.7%	-0.2477***	-6.0%
2001	-0.0738	-0.3%	-0.0596	-1.0%	-0.0798	-1.9%
2004	-0.2280*	-0.9%	-0.2824***	-4.6%	-0.2087***	-5.0%
1998 (reference category)						
Concordance	67.5%		73.7%		81.7%	
Chi-square test of the likelihood ratio	462.28	<.0001	3006.09	<.0001	6425.39	<.0001

Note. Analysis of 1992, 1995, 1998, 2001, and 2004 SCF; multivariate analyses were unweighted, using RII technique.

^aMarginal effects were calculated at the mean values of all other variables and represent percentage point differences in the predicted probability of being willing to take risk.

* $p < .05$. ** $p < .01$. *** $p < .001$.

tolerance at all three levels was highest in 1998, with 2001 levels not being significantly different from 1998 and 2004 levels being lower than 1998.

Stock ownership. Based on the stock ownership model (see Table 5), non-manager business owner households were significantly more likely to hold stocks than the other two types of households after controlling for other vari-

ables in the logit (see Figure 2). Manager owners were significantly less likely to hold stocks than non-owner households.

There was not a steadily increasing relationship between level of risk tolerance and stock ownership, but households willing to take some level of risk were significantly more likely to hold stocks than households unwilling to take any

Table 5. Logistic Analysis of Risk-Taking Behavior: Stock Ownership

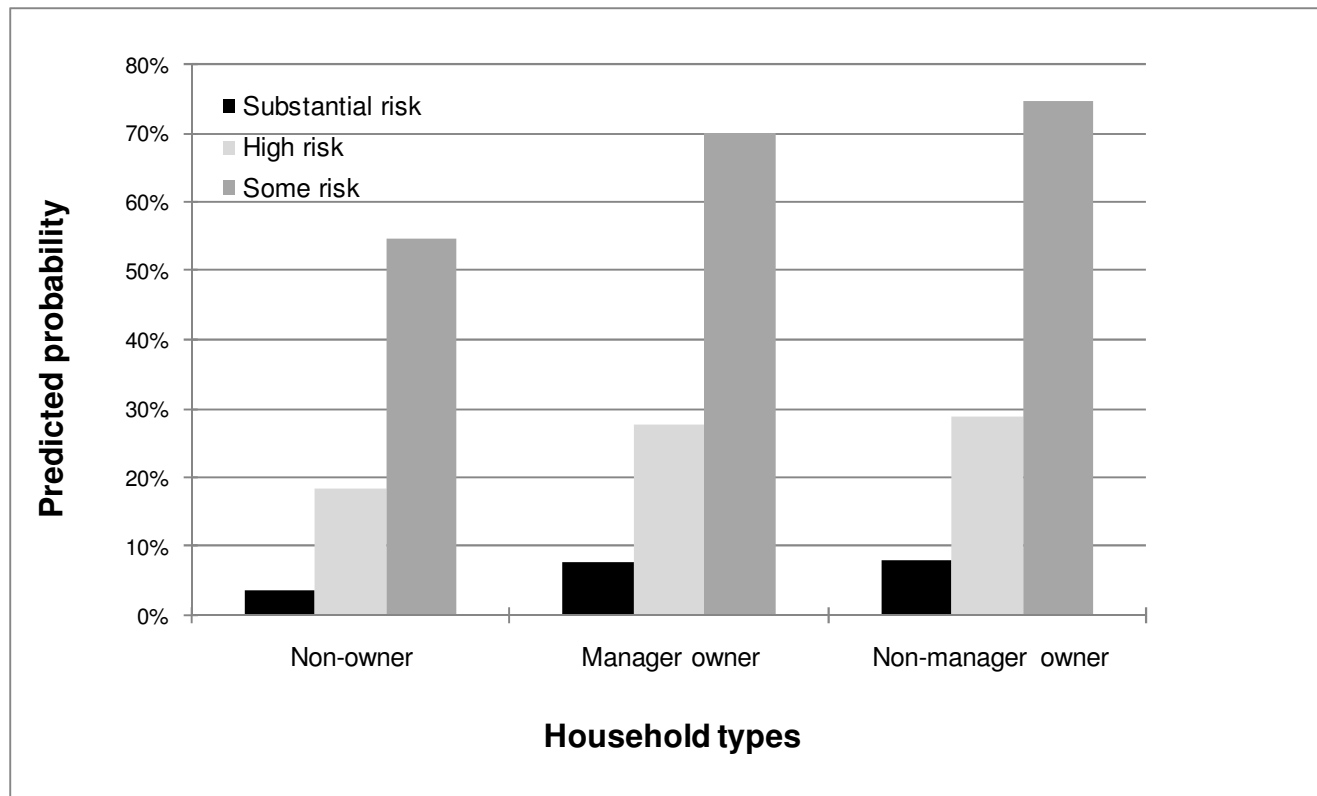
Parameters	Coefficient	Marginal effect on predicted probability ^a
Intercept	-8.0029***	
Business-ownership		
Manager-business owners	-0.1304***	-3.2%
Non-manager business owners	0.5058**	12.6%
Non-business owner (reference category)		
Risk tolerance level		
Average risk	1.0476***	25.0%
Above average risk	1.4884***	35.6%
Substantial risk	1.0995***	26.3%
No risk (reference category)		
Demographic characteristics		
		-11.4%
Age	0.0364***	(45 to 80)
Age squared	-0.0004***	
Race/ethnicity		
Black	-0.4798***	-11.7%
Hispanic	-0.6380***	-15.3%
Other groups	-0.4873***	-11.9%
White (reference category)		
Education		
High school diploma	0.6173***	13.6%
Some college	0.9011***	20.6%
Bachelor degree or above	1.3102***	30.8%
< High school diploma (reference category)		
Household composition		
Partner couple	-0.0939	-2.3%
Non-couple	-0.2752***	-6.8%
Married couple (reference category)		
Have child < 19 at home	-0.0286	-0.7%
Female respondent	-0.0210	-0.5%
Financial characteristics		
Financial assets ≥ monthly income	2.5053***	50.6%
		15.1%
Log (annual household income)	0.3394***	(\$20,000 to \$120,000)
Homeownership		
Homeowner	0.3141***	7.7%
Renter (reference category)		
Year of survey		
1992	-0.4600***	-11.2%
1995	-0.2979***	-7.4%
2001	0.1810**	4.5%
2004	0.0207	0.5%
1998 (reference category)		
Concordance Ratio	89.4%	
Chi-square test of the likelihood ratio	11904.7	<0.0001

Note. Multivariate analyses are unweighted, using RII. Estimated by the authors based on analysis of 1992, 1995, 1998, 2001, and 2004 SCF.

^aMarginal effects were calculated at the mean values of all other variables and represent percentage point differences in the predicted probability of holding stocks.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 1. Predicted Probability of Risk Tolerance Level by Business Ownership Category at Mean Values of Other Variables



Note. Created by authors based on logit results in Table 5.

risk. Households willing to take above average risk were significantly more likely to hold stocks than households with other risk tolerance levels, but households willing to take substantial risk were not significantly different from households willing to take average risk in terms of stock ownership.

Both age and age squared were significant variables in this model, with age positively related and age squared negatively related to stock ownership. The combined effect of the age variables was that at the mean values of other variables, predicted stock ownership increased from 42% at age 25 to 46% at age 45, then decreased to 34% by age 80. Predicted stock ownership increased from 1992 to 2001, but the level in 2004 was not significantly different from 1998.

Discussion

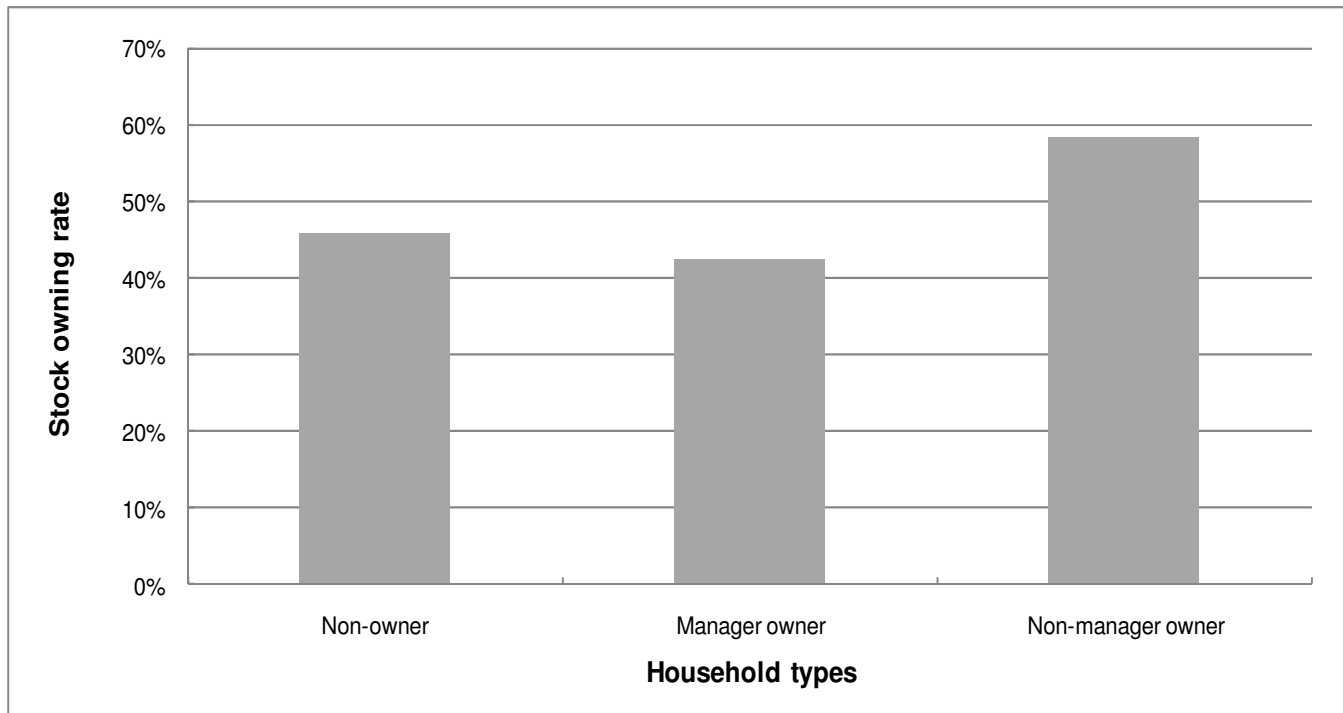
Hypotheses

Table 6 shows our hypotheses and whether the multivariate results in Tables 4 and 5 confirmed the hypotheses.

Business owners had significantly higher predicted risk tolerance than non-business owners, so Hypotheses 1A and 1B were supported. These results are consistent with Xiao et al. (2001) in that they also found that business owners tended to tolerate higher levels of risk than those who did not own family businesses. Our results provide more insights into the analyses presented by Xiao et al. We replicated their result that business owner households had higher predicted risk tolerance than non-business owner households with a larger, combined sample of SCF datasets from 1992 to 2004 and with a more appropriate statistical technique. We also found that non-manager business owner households had higher predicted risk tolerance than non-owner households that were otherwise similar in terms of the variables in the logits.

We made the same assumption of causality as Xiao et al. (2001), that being a business owner affected risk tolerance, but it is possible that the causation is from risk tolerance to the likelihood of being a manager-business owner. Wang and Hanna (2006) found that as risk tolerance increased,

Figure 2. Predicted Probability of Stock Ownership by Business Ownership Category at Mean Values of Other Variables



Note. Created by authors based on logit in Table 6.

the predicted likelihood of being a manager-business owner increased from 8.5% for those unwilling to take any risk to 25.5% for those willing to take substantial risk. Future research should use structural models that reflect the possible two-way causality between business ownership and risk tolerance.

Manager owners were significantly less likely to hold stocks than non-owner households; therefore, Hypothesis 2A was supported (see Table 6). This result is not consistent with the findings of Xiao et al. (2001) because they concluded that family business owners actually took higher risks reflected in their asset portfolios than non-

Table 6. Hypotheses About Business Ownership Status, Risk Tolerance, and Stock Ownership, and Empirical Results

Hypothesis	Result
Attitudes	
H1: Manager owners and non-manager owners have higher risk tolerance than non-owners	
A. Manager owners versus non-owners	Accepted at all 3 levels
B. Non-manager owners versus non-owners	Accepted at all 3 levels
Behavior	
H2: Manager owners are less likely to hold stocks than non-manager owners and non-owners	
A. Manager owners versus non-owners	Accepted
B. Manager owners versus non-manager owners	Accepted
H3: Non-manager owners are less likely to hold stocks than non-owners	
Non-manager owners versus non-owners	Rejected

owners. Manager owners were less likely to hold stocks than non-manager business owners; therefore, Hypothesis 2B⁸ was supported. Our results show that non-manager owners were significantly more likely to hold stocks than non-owners with similar levels of income and other variables in the logit and the same level of the SCF risk tolerance measure; therefore, Hypothesis 3 was rejected. Business owners' managerial role in business made a difference in holding stocks. Manager owners were less likely to own stocks than non-owners, whereas non-manager owners were more likely to own stocks than were non-owners. Manager-business owners might be simply replacing stocks with the equity in their own business as the risky part of their total household portfolio. Non-manager owners might be even more willing to invest in risky assets than their SCF risk tolerance answers indicate.

Effects of Other Independent Variables on Risk Tolerance

Most of the other independent variables in the risk tolerance logits had effects similar to those found by Xiao et al. (2001) with some important exceptions. Xiao et al. found that Whites had higher risk tolerance than households of other racial/ethnic groups. We found that Whites were more likely than Blacks, Hispanics, and others to be willing to take some risk, no different for high risk, and less likely than Blacks and Hispanics to be willing to take substantial risk (see Table 4).

Xiao et al. (2001) did not control for whether the respondent was female, but we found that female respondents were less willing to take substantial, high, or some risk than male respondents, even after controlling for marital status and other characteristics. Xiao et al. found that age had a negative effect on risk tolerance. We found that age had a negative effect on risk tolerance (considering the combined effect of age and age squared) for high risk and for some risk, but neither age nor age squared was significant in the substantial risk logit. Xiao et al. found that education had a positive effect on risk tolerance, and the general pattern of our results also showed a positive relationship between education and risk tolerance.

Xiao et al. (2001) found that household size was negatively related to risk tolerance. We did not use household size, but instead used dummy variables for whether the household had a child under age 19 at home and for household composition, including one for whether it was a non-couple household. We found that households with a child were less likely to be willing to take some risk, and non-

couple households were more likely to be willing to take substantial and high risk than married couple households.

Like Xiao et al. (2001), we found that income was positively related to risk tolerance. Xiao et al. found that net worth was positively related to risk tolerance. We did not control for net worth but instead controlled for whether or not the household had financial assets greater than 1 month's income, which had a large positive impact on each level of risk tolerance. Xiao et al. did not find a significant impact of homeownership on risk tolerance, but we found that homeownership had a significant effect on high and some risk tolerance.

Effects of Other Independent Variables on Risk-Taking Behavior

Xiao et al. (2001) did not control for risk tolerance in their tobit analysis of risk-taking behavior as measured by the ratio of risky assets to total assets. In our logit analysis of risk-taking behavior as measured by stock ownership, we found that those willing to take some level of risk were more likely to own stocks than those unwilling to take any risk (see Table 5).

Xiao et al. (2001) found that Whites had riskier behavior than households of other racial/ethnic groups, which was consistent with our findings. Xiao et al. did not control for whether the respondent was female, but we found that female respondents were not significantly different from households with male respondents in stock ownership. Xiao et al. found that age was not significantly related to risk-taking behavior, but we found that age had a positive effect up to age 45 and a negative effect after age 45 on stock ownership. Xiao et al. found that education had a positive effect on risk-taking behavior, which was consistent with our findings. Xiao et al. found that household size was not related to risk-taking behavior. We found that having a child under 19 at home had no effect on stock ownership, but non-couple households were less likely to own stocks than married couple households.

Both Xiao et al. (2001) and the present study found that income was positively related to risk-taking behavior. Xiao et al. found that net worth was positively related to risk-taking behavior. We found that having financial assets greater than 1 month's income was positively related to stock ownership. Xiao et al. found a negative impact of homeownership on risk-taking behavior, but we found that homeownership had a positive effect on stock ownership.

Implications

Implications for Future Research

The effect of being female on business decisions of households should be studied in more depth, as many business owning households had female respondents. We could not determine which partner in couple households was the owner or primary manager of the business, so another dataset would be needed for future research on this issue.

Research on non-couple households would provide insights for public policy and financial education although they were not considered by some previous research on business owning households (i.e., Xiao et al., 2001). All other things equal, respondents in non-couple households were more likely to be willing to take substantial and high risk than respondents in married couple households but were less likely to own stocks.

The lack of a consistent relationship between stock ownership and risk tolerance levels, even after controlling for other variables, should be studied in more depth. Given the large differences between business owners and non-owners, it might be appropriate for future researchers to analyze non-owner households separately, as more appropriate implications for non-owners might be developed.

Implications for Financial Educators

Our study has a number of implications for financial educators. Business owners had higher risk tolerance levels than non-owners, so to help households who want to start a business, it is important to understand their risk tolerance levels and related household characteristics. The involvement of business owners in their business management is an important consideration in their investment behavior. Financial educators and advisors should take into account the managerial role of the household in any businesses owned. Manager owners are distinctive in that they are involved in the management of both households and businesses. The risks they are confronted with are highly associated with business performance and family issues, so they are more concerned about meeting their financial goals within their own families and businesses as suggested by previous researchers (Haynes, Walker, Rowe, & Hong, 1999). Therefore, for manager owners, comprehensive financial planning advice, including insurance and estate planning, may be more useful than specific advice about investment alternatives. If there are sufficient resources, investment diversification might be wise. In contrast, non-manager business owners may be interested in investment advice from financial planners, though given

their wealth levels, a high degree of expertise may be needed to serve these households well.

There is a relationship between risk tolerance attitude as measured by the SCF and stock ownership rates though there is not a steady increase of stock ownership as risk tolerance increases. It is unclear why households with substantial risk tolerance had lower predicted stock ownership than those with above average risk tolerance. It might be a peculiarity of the SCF risk tolerance measure, but financial planners should be careful about assuming that higher risk tolerance should lead to riskier investments.

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Endnotes

¹Estimated by the authors based on Tables 4 and 7 in Bucks et al. (2006).

²It is not clear from Xiao et al. (2001) exactly how they defined business owning families. Xiao (personal communication to authors, 2005) stated that they had defined a business owning household as one that both owned and managed a business. Therefore, a household that owned a business but did not manage that business would have been included in the same category as households that did not own a business.

³As Lindamood, Hanna, and Bi (2007) noted based on Deaton (1997), although unweighted multivariate analyses may be the better choice for hypothesis testing, it might also be reasonable to run weighted analyses and check if the independent variables of primary interest have effects that are consistent with the unweighted results. In the four logistic regressions, only one independent variable of primary interest changed from significance to insignificance after weighting was used (this difference is discussed in Endnote 8). For the stock logit (see Table 5), other than the variables discussed in Endnote 8, all independent variables that were significant at the .05 level or better were also significant in the weighted version of that logit. In the risk tolerance variables in Table 4, none of the business ownership variables changed with weighted logits, but a few other variables changed from significant to insignificant or vice versa. None of these changes were important for the discussion in this article.

⁴Largely consistent with the results of Xiao et al. (2001), when we added other business characteristics to the logistic regressions, the number of employees had significantly positive impacts on high and substantial risk tolerance. However, only the number of businesses and the log of the gross sale of the business had significantly positive relationships with some risk tolerance, and sole proprietorship was the only business characteristic that had a significant (negative) relationship with stock ownership. In order to focus more on the effects of household business ownership and management, this study did not include business characteristics in the models. Introduction of additional business characteristic variables would lead to the statistical problem of multicollinearity, as those variables would have a value of zero for all non-owner households.

⁵A few households were in different business ownership categories in different implicates, so the actual numbers of households in the combined dataset averaged across 5 implicates were 14,889.4 non-owners, 5,918.4 manager-owners, and 663.2 non-manager owners.

⁶The predicted probability for a particular combination of independent variables in a logit can be calculated by the following formula:

$$P = e^{BX} / (1 + e^{BX})$$

where B is a vector of coefficients from the logit;
and X is a vector of values of the independent variables.

The marginal effect of being a female respondent, for example, represents the difference in the predicted probability for female respondents and the predicted probability for male respondents at the mean values of other variables. With a logit, the predicted probability at the mean values of all independent variables does not equal the sample mean of the probability; therefore, we adjusted the predicted probability so that at the mean value of all variables, the predicted probability was equal to the sample mean. For continuous variables, such as age and the log of income, the “marginal” effects shown are really the effect of a change in a range of each variable as a one unit change would not be very informative.

⁷In the logits, the significance levels shown for the two business ownership categories are for comparison with the non-owner households. In order to test the significance of differences between the business owner groups, we ran each of the logits with everything the same as the logits presented in Tables 4 and 5 except that the reference category for business ownership status was manager owner rather than non-owner.

⁸We also ran weighted versions of the logits in Tables 4 and 5 as recommended by Deaton (1997) and Lindamood, et al. (2007). The only difference in significance for the business type variables was in the stock logit for the effect of non-manager business owners versus the other two

types. In particular, non-manager business owners were not significantly different in predicted stock ownership from non-owners, in contrast to a significantly higher predicted stock ownership for non-manager owners in the unweighted logit shown in Table 5. It is plausible that the lack of significance for the non-manager business owner variable when weighting was applied was due to the low apparent number of such households. As Table 1 shows, there were 663 non-manager business owner households in the combined dataset, but on a weighted basis there were only 230 households. The difference between the unweighted logit results shown in Table 5 and the weighted logit results (not shown but available from the authors) did not affect Hypothesis 3, which was not accepted based on either logit result. Hypothesis 2A was accepted based on both the weighted and unweighted logit results. Hypothesis 2B was accepted based on the unweighted logit shown in Table 5. However, in a weighted version of that logit, the difference was significant only at the $p = .06$ level based on a 2-tail test. Given that Hypothesis 2B was stated as manager-business owners having a lower stock ownership rate than non-manager business owners, a 1-tail test was appropriate so the hypothesis could be accepted even based on the weighted logit result.

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