



The myth of the risk-tolerant entrepreneur

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Abstract

Entrepreneurs have long been assumed to be more risk-tolerant than the general population. In this article, we analyze the financial risk propensity of business founders using a unique, representative dataset of nascent entrepreneurs in the United States. We deploy two models of entrepreneurial behavior: a strategic model of risk tolerance, based on investment choices; and a non-strategic model of risk tolerance, based on information bias about business success. For both models, our empirical results consistently show that nascent entrepreneurs are more risk-averse than non-entrepreneurs. To reconcile the financial risk aversion of entrepreneurs with the high risk of financial loss among startups, we suggest that many of the motivations that individuals have for founding business ventures are non-pecuniary in nature.

Key words • entrepreneurs • risk propensity • pecuniary and non-pecuniary motivations

Introduction

In economics, entrepreneurs have long been assumed to have a high risk propensity relative to the general population. The French economic tradition of Cantillon (1755 [1979]) and Say (1803 [1971]) equates the term ‘entrepreneur’ with an individual who has the motivation and ability to undertake financial risk (see also Marshall, 1890 [1930]). In the tradition of Knight (1921), economic theory has examined the choice made by individuals to become entrepreneurs or employees, emphasizing their attitude toward risk. For instance, Kihlstrom and Laffont (1979) used a general equilibrium model to analyze how less risk-averse individuals become entrepreneurs, assuming that everyone has identical skills. Recent empirical work in economics underscores this assumption. Based on the finding that entrepreneurs do not invest wealth more conservatively than non-entrepreneurs (apart from their sizeable investment in the private equity of their own firm), Gentry and Hubbard (2001) argue that

entrepreneurs may be more risk-tolerant than the general population.¹ Similarly, Moskowitz and Vissing-Jorgensen (2002) find that average returns from poorly diversified private equity are unattractive and suggest that one explanation for startup activity is that entrepreneurs are more financially risk-tolerant.

While economists have largely provided indirect evidence of entrepreneurs' risk tolerance, psychologists offer more direct empirical examinations. The central question that psychologists have been studying for decades is whether entrepreneurs have a greater risk propensity than non-entrepreneurial managers. Despite the theoretical importance of the issue, research has until recently been theoretically divergent and empirically inconclusive (Stewart and Roth, 2001). One line of research suggests that there is a marked difference in risk propensity between entrepreneurs and managers. According to this perspective, entrepreneurs are generally believed to be more risk-tolerant than managers because entrepreneurs need to cope with a less structured, more uncertain set of possibilities (Bears, 1982) and bear the ultimate responsibility for their decisions (Gasse, 1982; Kilby, 1971; Knight, 1921). A second, competing theoretical position suggests that entrepreneurs do not differ from managers in their dispositions toward risk, since both are high in achievement motivation (Perry, 1990; Sexton and Bowman, 1985). Persons high in need for achievement set challenging goals of moderate difficulty, take personal responsibility for decisions (McClelland, 1961) and are more moderate risk-takers (Atkinson, 1957).

Empirical studies examining the relative risk-taking propensities of entrepreneurs and managers have produced conflicting findings, posing an impediment to theory development (Stewart and Roth, 2001). For instance, one of the most frequently cited studies (Brockhaus, 1980) indicates no risk propensity differences between entrepreneurs and managers. Using a different test instrument, research by Sexton and Bowman (1983, 1984) showed that a high propensity for risk-taking was a characteristic that delineated entrepreneurs and non-entrepreneurs. To clarify the inconsistent research results, Stewart and Roth (2001) performed a meta-analysis of 12 studies published between 1980 and 1999, showing that the risk propensity of entrepreneurs is greater than that of managers. Most recently, Miner and Raju (2004) meta-analyzed 14 studies not included in the Stewart and Roth (2001) analysis and came to the opposite conclusion, that entrepreneurs are more risk-averse than managers. They assert that the role of risk propensity in entrepreneurship remains unresolved.

Such inconsistency is unsurprising, given that extant analyses are based on small, non-representative samples and simple psychometric assessments of risk propensity. Since most previous studies have used small samples (Greenberger and Sexton, 1988), a sizeable portion of cross-study variance in risk propensity differences can be attributed to sampling error (Stewart and Roth, 2001). The psychometric statements employed to measure risk in many of these studies are also subject to critique. Risk attitude measures, which are based on an expected utility model derived from responses to lotteries, have been shown to be better predictors of actual risk behavior (Pennings and Smidts, 2000). More generally,

previous studies have provided limited theory about the relationship of risk and economic decision-making.

In this article, we address shortcomings in the existing literature using the Panel Study of Entrepreneurial Dynamics (PSED), a unique, representative dataset that includes information on nascent entrepreneurs in the United States as well as a non-entrepreneurial comparison group (Reynolds, 2000). Our theoretical model assumes that there are two forms of risk tolerance that may lead individuals toward entrepreneurial activity: strategic and non-strategic. In strategic risk tolerance, rational actors actively prefer low-probability, high payoff outcomes. In non-strategic risk tolerance, rational actors need not have active risk preferences, but only appear to prefer low-probability, high payoff outcomes because their information on the distribution of outcomes is significantly biased. The latter form of risk-taking builds on Knight's (1921) model of entrepreneurs, viewing them as individuals who must make business decisions under conditions of imperfect knowledge.

To explore strategic risk tolerance, we analyze the reactions of 1261 nascent entrepreneurs (NE) and comparison group (CG) participants to a series of vignettes concerning business investment decisions, controlling for sensitivity to respondent income. To ensure that the different risk tolerances of NE and CG are not the result of *ex ante* individual differences or *ex post* experiential effects, we also implement an ordered logit analysis of responses concerning the business investment decisions, controlling for additional individual characteristics, such as age, gender, marital status, wealth and prior entrepreneurial experience. With respect to non-strategic risk tolerance, we analyze the subjective probability of success and the distribution of startup valuations assigned by NE and CG respondents to young business firms (those in existence for less than five years). A parametric model of risk tolerance is applied to explain the decision of entrepreneurs to search for new business opportunities rather than remaining committed to non-entrepreneurial employment.

We find that entrepreneurs are significantly more risk-averse than the general population in pursuing pecuniary benefits. Our results imply that many of the motivations that individuals have for founding business organizations are non-pecuniary. Drawing on concepts from sociology and psychology, we tentatively propose two classes of non-pecuniary motivation that lead to business formation, which include autonomy and identity fulfillment. Our empirical analysis reveals that entrepreneurs generally view identity fulfillment and autonomy as being significantly more important than pecuniary benefits.

Theories of risk-tolerant entrepreneurs

In classical decision theory, risk is viewed as a function of the variation in the distribution of possible outcomes, the associated outcome likelihoods and their subjective values, with the decision choice entailing risk and expected trade-offs

(March and Shapira, 1987). In their foundational article on utility maximization, Friedman and Savage (1948) observed that ‘occupations differ greatly in the variability of income they promise, [and] [w]hether or not they realize it and whether or not they take explicit account of the varying degrees of risk involved, individuals choosing among occupations are making choices analogous to those they make when they decide to buy insurance or to gamble’. Much of the traditional research on the risk propensity of decision-making has been based on the premise that an individual’s risk orientation is pervasive, affecting perceptions and behaviors. Conversely, Jackson and colleagues (1972) have argued that there are four distinctive dimensions of risk-taking: monetary, physical, ethical and social. We focus only on the monetary dimension of risk among entrepreneurs and non-entrepreneurs.²

We propose that theoretically there are two forms of financial risk-bearing that may lead individuals into entrepreneurial activity (Table 1 summarizes our main ideas). One is strategic risk tolerance. In strategic risk tolerance, rational actors prefer low-probability, high payoff outcomes because their utility functions for pecuniary benefits are less concave than those of other actors (Luenberger, 1997). For individuals with such utility functions, small increases above current wealth have little impact on their utility, but larger increases make them substantially better off. To see why, consider an employee who has an annual salary of \$30,000 and who would be happy only if he or she owns a house valued at \$1,000,000 or more. If the employee’s annual salary is increased to \$40,000, his or her condition would be little changed – the employee’s utility of \$30,000 or \$40,000 is almost the same, since neither would make him or her wealthy enough to incur the mortgage for the house. In this situation, the individual might be willing to start a risky but lucrative business in order to possibly buy the house, thinking ‘If the business fails, I am still not happy, but if the business is successful, I will be able to buy such a house and be very happy!’ We refer to such behavior as strategic risk tolerance because the individuals prefer low-probability, high payoff investments in order to satisfy their ends.

The other form of risk tolerance is non-strategic, in which rational actors need not have active risk preferences, but appear to prefer low-probability, high payoff outcomes because their information on the distribution of the outcomes is significantly biased. While employees work under relatively detailed employment contracts, the entrepreneur faces a more uncertain set of possibilities (Knight, 1921). Brockhaus (1982) suggested that the primary consideration in becoming an entrepreneur may be the perceived degree of financial risk and the perceived likelihood of failure associated with a new venture. Two mechanisms lead to biased inferences about these outcomes: entrepreneurs may either employ a different logic of inference when exposed to the same information as the general population; or have access to different information while relying on a consistent logic of inference. The former mechanism readily explains why entrepreneurs tend to be more risk-tolerant than non-entrepreneurs. For instance, when exposed to the same information about a startup’s environment,

Table I Summary of arguments and counter-arguments

	Risk tolerance	Risk aversion
Strategic	<ul style="list-style-type: none"> Entrepreneurs actively prefer low probability, high payoff outcomes to satisfy their ends because their utility functions for pecuniary benefits are less concave than those of other actors. 	<ul style="list-style-type: none"> Entrepreneurs tend to develop better capabilities in learning about business risks than the general population. Fast learners are less likely to engage in risky activities than slow learners (Denrell and March, 2001). Entrepreneurs should be faster in avoiding bets on low probability, high payoff outcomes than non-entrepreneurs. When non-pecuniary motivations are dominant, entrepreneurs are even more risk-averse than the general population.
Non-strategic	<ul style="list-style-type: none"> Due to self-enhancing biases (Ross and Staw, 1986), entrepreneurs may have overconfident estimates of startup success rates and the distribution of valuations. Entrepreneurs need not have active risk preferences, but appear to prefer low probability, high payoff outcomes because their information on the distribution of outcomes is significantly biased. 	<ul style="list-style-type: none"> Entrepreneurs often obtain more accurate information about startup risks since they analyze the business environment and competitors. While entrepreneurs have the opportunities to sample both good and poor stories about the startups, the general population is overwhelmed by the successful stories from the news media coverage. Entrepreneurs therefore have more conservative information about the environment of startups and a lower tendency toward non-strategic risk propensity.

it is quite possible that NE tend to be overconfident due to self-enhancing biases (Pinfold, 2001). Research has shown that most decision-makers overestimate their own capabilities and pay insufficient attention to the risks that exist in a situation (Bazerman, 1990; Kahneman and Tversky, 1972). Ross and Staw (1986) demonstrated that self-enhancing bias escalates an individual's commitment to an activity. NE tend to focus on stories of successful startups and reject messages about failed ones, thereby leading to overconfident estimates of startup success rates and the distribution of startup valuations. Moreover, the greater the entrepreneur's investment in the startup process, the more likely he or she is to escalate the commitment. Given this vicious circle, entrepreneurs may appear to be more risk-tolerant compared with their non-entrepreneurial counterparts. In

this case, however, the risk tolerance is not strategic, but is dominated by cognitive and affective biases.

Counterarguments: the risk-averse entrepreneur

For both the strategic and non-strategic models of risk tolerance, counterarguments in organizational theory suggest that entrepreneurs could actually be more risk-averse than the general population. This holds, in particular, if social and psychological goals are more important than economic goals.

In the organizational learning literature, March (1996) shows that adaptation as a process of sequential sampling naturally leads learners to favor less risky alternatives. The basic mechanism is that alternatives that have evidenced relatively beneficial outcomes in the past are more likely to be sampled than alternatives that have evidenced relative poor outcomes. A risky alternative that has the potential to improve with practice – and eventually to surpass an existing, more certain alternative – is initially likely to perform poorly in comparison with the more certain one. However, the short-run disadvantage might make the learner avoid sampling the risky alternative further. Consequently, the adaptation mechanism produces a bias against the risky option. Denrell and March (2001) argue further that slower learners should be more likely to engage in risky activities than faster learners because slower learners are presumably slow in eliminating poorly performing alternatives in favor of better ones. Struggling with the uncertain environment of startups, entrepreneurs should tend to develop better capabilities in learning about business risk than non-entrepreneurs. The entrepreneurs should be faster in avoiding bets on risky alternatives than the general population and, hence, will be more risk-averse.

Consider the implications of learning for the strategic risk tolerance model. As individuals who are faster in eliminating low-probability, high-return alternatives, entrepreneurs could have a more concave utility function for income than the general population. In fact, Hamilton (2000) finds that most entrepreneurs actually have both lower initial earnings and lower earnings growth than comparable workers in non-entrepreneurial positions. This finding also suggests that the social and psychological goals of entrepreneurs may be more important than pecuniary ones. To achieve those non-pecuniary benefits, entrepreneurs only need to take minimal financial risks to keep their business running, rather than taking large risks to achieve high profitability. As long as the business survives and runs smoothly, the entrepreneur will be respected as a business owner in the community, will have personal autonomy and can fulfill various purposive goals associated with his or her identity. But if the entrepreneur takes large financial risks and fails, he or she may not have the second chance to restart a business to achieve those non-pecuniary goals. Hence, when non-pecuniary motivations are dominant, entrepreneurs as fast learners should be strategically even more risk-averse than the general population.

In non-strategic terms, entrepreneurs may also be more risk-averse than individuals in the general population. As noted earlier, entrepreneurs may have overconfident inferences about the same information due to self-enhancing biases. However, entrepreneurs often obtain more accurate information about startup risks as they analyze the business environment and competitors. Organizational learning scholars argue that individuals and organizations routinely learn from each other (Miner and Haunschild, 1995). While the general population relies heavily on news media coverage, which typically consists of successful stories about startups, entrepreneurs will rely on their social networks, including other entrepreneurs. Research suggests that entrepreneurs actively sample the performance of other entrepreneurs and then update their beliefs about the likelihood of success in creating a new venture in the local environment (Sorensen and Sorenson, 2003). Hence, while entrepreneurs have the opportunities to sample both good and poor stories about startups, the lay general population is overwhelmed by the successful stories. NE may therefore have more conservative information about the environment of startups and a lower tendency toward non-strategic (i.e. information-biased) risk propensity.

In summary, contrary to the argument that entrepreneurs are strategically risk-tolerant, the organizational learning literature suggests that entrepreneurs should be more risk-averse (with more concave utility functions), because they are faster in avoiding bets on low-probability, high payoff outcomes than non-entrepreneurs. In contrast to the theory that self-enhancing biases lead entrepreneurs to have overconfident estimates of startup success rates and the distribution of valuations, counterarguments suggest that entrepreneurs should obtain more conservative information about startup risks as they analyze business environment and competitors, leading to a lower tendency toward non-strategic risk-propensity.

Data and measures

The data

We use data from the PSED to evaluate the risk propensity of entrepreneurs. Between July 1998 and January 2000, a total of 64,622 individuals in the United States were contacted by telephone using a random digit dialing process to identify those in the process of starting a business ('nascent entrepreneurs'). Two items were used to determine whether an adult respondent qualified as a nascent entrepreneur: first, 'Are you, alone or with others, now trying to start a business?'; and second, 'Are you, alone or with others, now starting a new business or venture for your employer?'. If the respondent answered yes to either of the questions, two additional questions were used to qualify whether they were actively involved with the startup process, and whether he/she would share ownership in the business.

In the next phase of the research design, the names, telephone numbers and basic sociodemographic information of individuals who met the screening criteria were forwarded to the University of Wisconsin Survey Laboratory (UWSRL), where a detailed phone interview was conducted followed by a mail questionnaire. The final sample of respondents in the PSED consists of 830 NE. In the first wave, data were also collected on CG, which consists of 431 individuals who were not identified as NE. Hence, the data used here consisted of 1261 participants in total.

Since several of the subsamples described earlier involved oversampling of certain subgroups of the population, we employed post-stratification weights for each respondent based on estimates from the US Census Bureau's current Population Survey. The post-stratification scheme was based on gender, age, education and race/ethnicity. More complete details about the computation of the weighting scheme can be found in Reynolds (2000).

Dependent variables

The variables of primary interest come from items on the phone interview designed to collect information about: first, behavioral differences between NE's and CG's strategic business investment choices; and second, information bias concerning the business environment of startups, in particular, information concerning the failure rates of startups and the eventual valuation of surviving firms.

To capture the risk propensity differences behaviorally, NE and CG were asked about their preferences among three ventures which have the same expected payout in the sense that the probability of the success times the profit is the same.³ The three options were: a profit of \$5,000,000 with a 20 percent chance of success; a profit of \$2,000,000 with a 50 percent chance of success; and a profit of \$1,250,000 with an 80 percent chance of success.

The levels of NE's and CG's information bias were examined by two questions. The first question asks: 'Considering all the new businesses that will be started in the US this year, what percent do you expect to close within five years?' The second question is: 'Of all new business starts, what percent will eventually be worth \$0–499,999, \$500,000–999,999, \$1,000,000–4,999,999, \$5,000,000–9,999,999, and \$10,000,000 or more, respectively?'

Independent variable

The independent variable is a dichotomous variable, which has a value of 1 for NE and 0 for CG.

Control variables

The multivariate analyses control for a number of characteristics that may affect the financial risk tolerance of the respondents, including the following.

1. Income (either logged or scaled to \$100,000s).
2. Household wealth. We followed the wealth calculation of Kim et al. (2004). This includes the value of total assets (e.g. physical property and investments, including primary residence) net of the outstanding debt (e.g. mortgage, home equity and car loans). Since some cases involve negative wealth, we also transformed the raw wealth variable into a positive integer (by adding all values by the most negative wealth plus one) and then took the natural logarithm of the transformed wealth variable.
3. Wealth dummy. A dummy variable was controlled to signify cases where wealth was less than or equal to zero. 1 if wealth ≤ 0 , 0 otherwise.
4. Gender. 1 = male, 0 = female.
5. Age.
6. Education. 1 = up to high school degree, 2 = technical or vocational, 3 = some college, 4 = college degree, 5 = post college.
7. Prior entrepreneurial experience. 1 = yes, 0 = no.
8. Marital status. 1 = married, 0 = not married.
9. Head of household. 1 = yes, 0 = no.
10. Household size. Total number of persons in the household.
11. Autonomy – pecuniary motivation (see a full description of control variables, no. 11 and no. 12 in the section ‘Alternatives to the risk-bearing, profit-maximizing entrepreneur’).
12. Identity – pecuniary motivation.

In Table 2, we present the summary statistics and correlation matrix among independent and control variables.

Model of strategic risk tolerance

Expected utility models

To compare the risk propensity of NE and the general population under the strategic risk tolerance model, we analyze behavioral differences in venture investment choices employing the commonly used negative exponential utility function:

$$u(x) = 1 - e^{-rx} \quad (1)$$

where r is a risk-aversion parameter, x is the amount of payoff and $u(x)$ is the utility as a function of the payoff.⁴ The bigger the r parameter, the more risk-averse an individual becomes.

Assuming that each individual is rational, if an individual prefers option i among the three venture investment options mentioned above, the expected utility from that option is greater than the expected utility from either of the two other options, j and k . That means $E(u(i)) > E(u(j))$ and $E(u(i)) > E(u(k))$. Combining both inequalities into a single objective function, this implies that,

Table 2 Summary statistics and correlation matrix among independent and control variables

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Type of respondent (NE=1)	.67	.47	...												
2. Income (logged)	10.63	1.01	.09	...											
3. Household wealth (logged)	13.07	.54	.01	.28	...										
4. Wealth dummy	.12	.33	-.03	-.13	-.26	...									
5. Gender	.49	.50	.07	.08	.03	-.06	...								
6. Age	39.89	12.19	-.04	.01	.19	-.17	-.05	...							
7. Education	4.11	1.12	.12	.22	.20	-.01	-.01	.14	...						
8. Prior entrepreneurial experience	.66	.47	.31	.16	.11	-.10	.09	.03	.07	...					
9. Marital status	.55	.50	.04	.24	.09	-.07	-.01	.16	.06	.13	...				
10. Head of household	.89	.31	.07	.01	-.02	.01	-.03	.25	.13	.05	.25	...			
11. Household size	3.21	1.59	.01	.10	-.07	-.04	-.05	-.21	-.13	.05	.34	-.14	...		
12. Autonomy – pecuniary motivation	.39	1.14	.04	.02	-.01	-.01	-.11	.15	.14	.04	.12	.04	-.01	...	
13. Identity – pecuniary motivation	.42	1.15	.06	.05	.03	-.06	-.13	.12	.16	.08	.03	.03	-.04	.72	...

Note: All pairwise correlations at magnitude .07 or above (absolute value) are significant at $p < .05$.

for each individual, $2E(u(i)) - E(u(j)) - E(u(k)) > 0$. Assuming that entrepreneurs and non-entrepreneurs attempt to clearly differentiate the utility between their preferred and non-preferred options, we can simply estimate the risk-aversion parameters for NE and CG by maximizing the sum of $2E(u(i)) - E(u(j)) - E(u(k))$ across all survey participants.

After deleting all missing values in the venture investment preference variable and the annual income variable, we have 862 cases left from the original 1261. Investment preference information for those survey participants is used for the maximization estimation: $\text{Max} (\sum_{b=1}^{862} [2E(u(i)) - E(u(j)) - E(u(k))])$, where either i, j or k could be option 1, 2 or 3. By combining the post-stratification weight variable $w(h)$ into the formula, we have:

$$\text{Max} (\sum_{b=1}^{862} [2E(u(i)) - E(u(j)) - E(u(k))] *w(h)) \tag{2}$$

In our initial model specification, we allow the risk-aversion parameter to be a linear function of a dummy variable, $N(b)$, which has a value 1 for NE and 0 for CG, thereby, $r = \alpha + \beta * N(b)$. The expected utilities from options 1, 2 and 3 will be $E(u(1)) = .2 * (1 - e^{-(\alpha + \beta * N(b)) * 5000000})$, $E(u(2)) = .5 * (1 - e^{-(\alpha + \beta * N(b)) * 2000000})$, and $E(u(3)) = .8 * (1 - e^{-(\alpha + \beta * N(b)) * 1250000})$, respectively.

Equation 2 was implemented in Matlab and produced the estimates $\alpha = 5.1323$ and $\beta = .9726$ (see Table 3, model 1). For β , $\text{mean}/\text{s.e} = .9726/.0159$ is significant at the p level of .001, suggesting that NE on average are more financially risk-averse than the general population. Figure 1 illustrates the risk propensity differences between NE and CG. In the graph, the horizontal axis is a standardized monetary value ranging from 0 to 1 and the vertical axis is the corresponding utility value.

Table 3 Strategic risk-bearing: parameter estimates from the expected utility models

Variables	Model 1	Model 2 (reweighted)	Model 3
Constant	5.1323*** (.0301)	4.9372*** (.0022)	5.0765*** (.0320)
Dummy variable for nascent entrepreneurs	0.9726*** (.0159)	0.2991*** (0.0340)	6.9180*** (.0301)
Annual income	—————	—————	12.0638*** (0.0197)
Number of cases	862	862	862

Note: Numbers in parentheses are standard errors.
 * $p < .05$ ** $p < .01$ *** $p < .001$ (two-tailed tests)

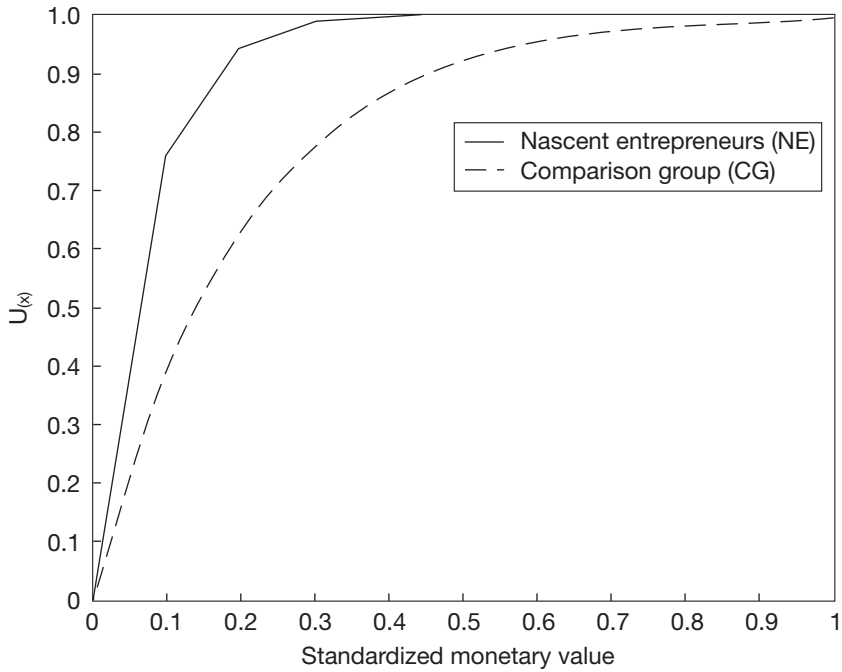


Figure 1 Nascent entrepreneurs (NE) and comparison group (CG): average levels of risk aversion

In model 2, we rescaled the weight $w(h)$ for NE by $830/64622$ and the weight $w(h)$ for CG by $(1-830/64622)$.⁵ In doing so, we gave CG a weight corresponding to the prevalence of non-entrepreneurs in the US population as a whole. Even in this very conservative test, we obtain a $\beta = .2991$ with a standard error of .0340 (see Table 3). This test provides additional support for the hypothesis that entrepreneurs are more risk-averse than the general population.

In model 3, we examine whether NE are more risk-averse than the general population when annual income is taken into account. The risk-aversion parameter r is specified as a function of an intercept, a dummy variable $N(b)$, and a standardized income variable (Inc), scaled to \$100,000s; therefore, $r = \alpha + \beta * N(b) + \delta * (Inc/100000)$. Our Matlab estimates are $\alpha = 5.0765$, $\beta = 6.9180$ and $\delta = 12.0638$. Even controlling for income, NE are much more risk-averse than the general population. Figures 2 and 3 plot the level of risk aversion at different annual income levels (\$50,000–200,000) for NE and CG, respectively.

An ordered logit model

Attitudes toward risk may be related to several sociodemographic and experiential characteristics. Women and older people tend to have a more negative attitude toward risk, while income and education level are positively related to an

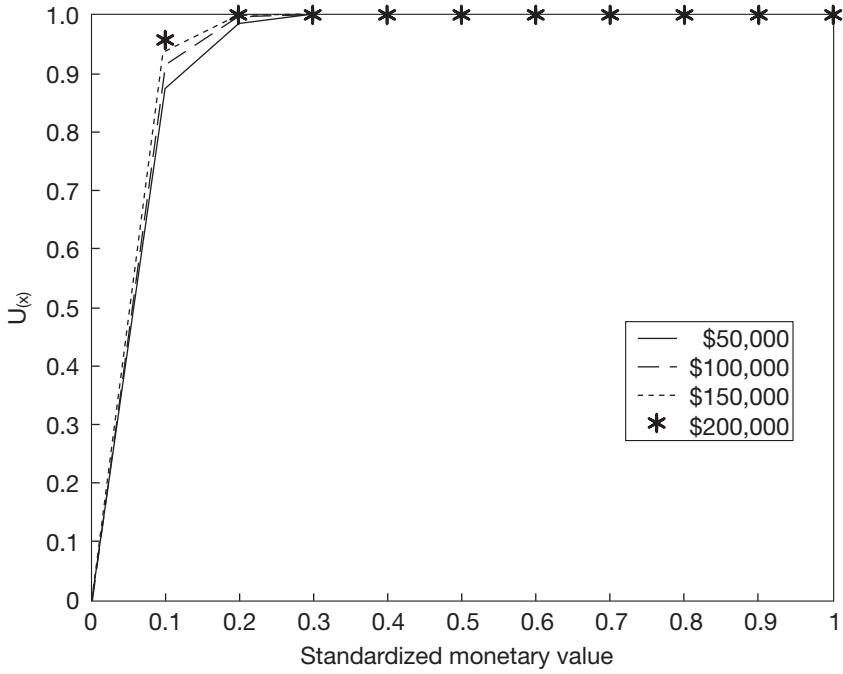


Figure 2 Nascent entrepreneurs: levels of risk aversion with different annual income

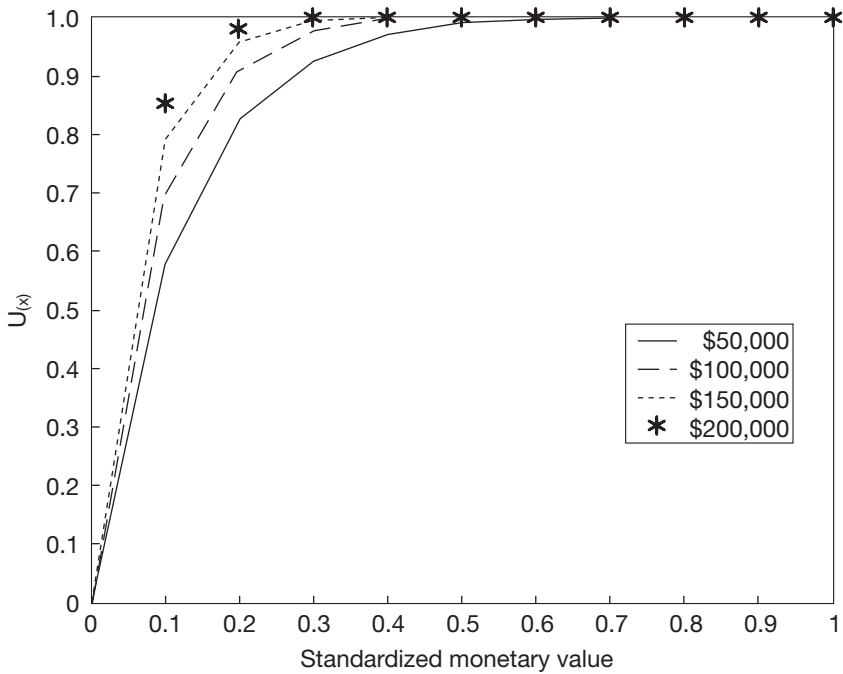


Figure 3 Comparison group: levels of risk aversion with different annual income

individual's attitude toward risk (Donkers et al., 2001; Weber et al., 2002). Aside from these sociodemographic characteristics, prior entrepreneurial experience could also affect the level of risk tolerance among NE. Our identification of entrepreneurs as individuals currently in the process of starting a business allows for the possibility that our control group, the general population, might include individuals who have been entrepreneurs in the past. To ensure that the different risk tolerances of NE and CG do not result from ex ante individual differences or ex post experiential effects, we estimated an ordered logistic regression of the venture investment preferences, controlling for characteristics such as age, gender, wealth, marital status and prior entrepreneurial experience. The ordered logit model assumes that there is a natural ranking in the possible values of the dependable variable. This is clearly the case for the venture investment choices: 'A profit of \$5,000,000 with a 20 percent chance of success' (value = 1) is a less risk-averse choice than 'a profit of \$2,000,000 with a 50 percent chance of success' (value = 2), which is still less risk-averse than the option of 'a profit of \$1,250,000 with an 80 percent chance of success' (value = 3).

We present the results of the ordered logistic analysis in model 1 of Table 4. Controlling for individual characteristics, the ordered logit model shows that NE are still significantly more risk-averse in venture investment decisions than the general population represented by CG. This corroborates the estimates from the expected utility models. Consistent with previous literature, the analysis suggests that women are significantly more risk-averse than men and older people are sig-

Table 4 Ordered logistic analyses of entrepreneurs and comparison group's venture investment preferences

Variable	Model 1	Model 2	Model 3
Independent variable			
Types of respondents (NE = 1)	.354 (.168)*	.368 (.170)*	.349 (.170)*
Control variables			
Income (logged)	-.133 (.117)	-.141 (.121)	-.127 (.119)
Household wealth (logged)	-.055 (.177)	-.031 (.176)	-.042 (.177)
Wealth dummy	.161 (.257)	.129 (.258)	.141 (.258)
Gender (male = 1)	-.421 (.158)*	-.373 (.161)*	-.384 (.160)*
Age	.023 (.007)**	.023 (.008)**	.024 (.007)**
Education	-.015 (.076)	-.024 (.078)	-.019 (.078)
Prior entrepreneurial experience	.011 (.172)	.012 (.174)	-.014 (.174)
Marital status	.022 (.190)	-.004 (.193)	.015 (.191)
Head of household	.352 (.302)	.393 (.307)	.357 (.303)
Household size	.046 (.058)	.053 (.059)	.061 (.059)
Autonomy – pecuniary motivation	-----	.113 (.074)	-----
Identity – pecuniary motivation	-----	-----	.052 (.072)
Log likelihood	-608.689	-593.103	-595.594
Number of cases	713	701	701

* $p < .05$ ** $p < .01$ *** $p < .001$ (two-tailed tests)

nificantly more risk-averse than younger people. Previous startup experience has no statistically significant impact on the level of financial risk tolerance.

Model of non-strategic risk tolerance

To explore the presence of non-strategic risk tolerance, we examine the information bias that NE and CG have about the percentage of startups failing within five years, as well as their estimated valuation of surviving firms. Following a search theory framework (Diamond, 1984), our basic assumption is that an individual would search for new business opportunities only if the expected utility of entrepreneurial profit is at least as great as the utility of his or her current income. Consequently, individuals in CG do not initiate searches for business opportunities because the utility from their income is at least as large as the utility from the expected values of entrepreneurial profit.

As noted above, NE and CG were asked about their expectations of the percentage of businesses that would be closed in five years. They were also asked to provide probabilistic estimates of the eventual worth of those new business startups that succeed, using the valuation categories \$0–499,999, \$500,000–999,999, \$1,000,000–4,999,999, \$5,000,000–9,999,999 and \$10,000,000 or more. We calculate each individual's expected entrepreneurial profit over a five-year horizon. To do so, we first take the product of the median of each valuation category and the corresponding (estimated) percentage of firms achieving that valuation, summing across all categories for each individual:

$$M_i = \sum_{j=1}^5 (m_j * p_{ij}) \quad (3)$$

where M_i is individual i 's expectations of average entrepreneurial profit, m_j is the median valuation of category j , and p_{ij} is individual i 's estimate of the percentage of successful startups falling in category j . Next, each individual's expected entrepreneurial profit was obtained by multiplying their estimate of firm success rates and their expected value of the eventual worth of all firms, $EP_i = M_i * (1 - F_i)$, such that, EP_i is individual i 's expected entrepreneurial profit in five years and F_i is his/her estimation of the percentage of closed firms in five years. EP_i is standardized in \$1000s in our model.

The PSED data show that the average estimate of firm failure among NE is 57.7 percent, which is more conservative than that of CG, averaging 48.9 percent (see Figure 4). Both NE and CG are overconfident in their estimates, according to historical surveys by the US Department of Commerce, which suggest that roughly two-thirds of startups close within five years (Dickinson, 1981).⁶ NE are also much more conservative than CG in their estimates of startup valuation. While about 30 percent of NE estimate that a typical startup will eventually be worth more than \$1 million, roughly 50 percent of the respondents in the general population do so (see Figure 5).

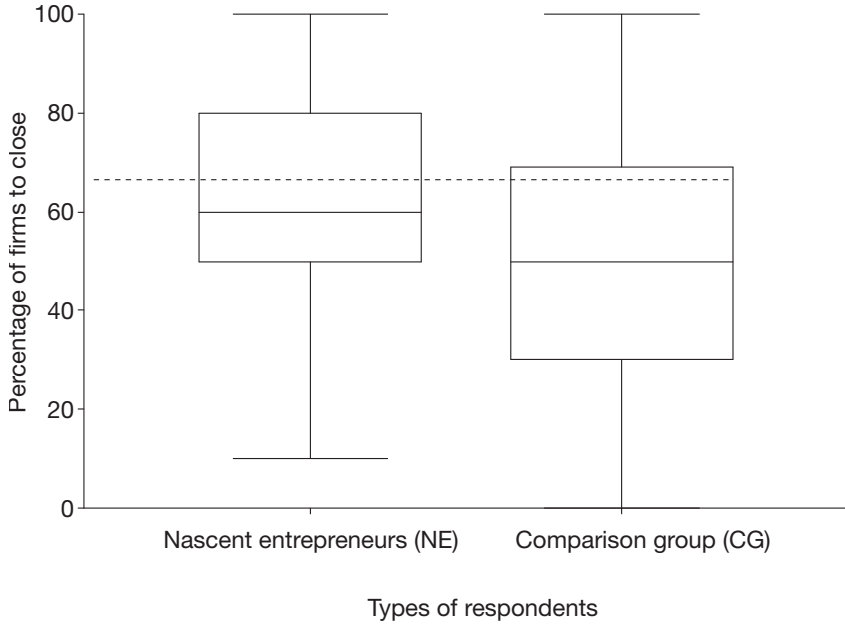


Figure 4 Estimated percentage of startups to close within initial five years

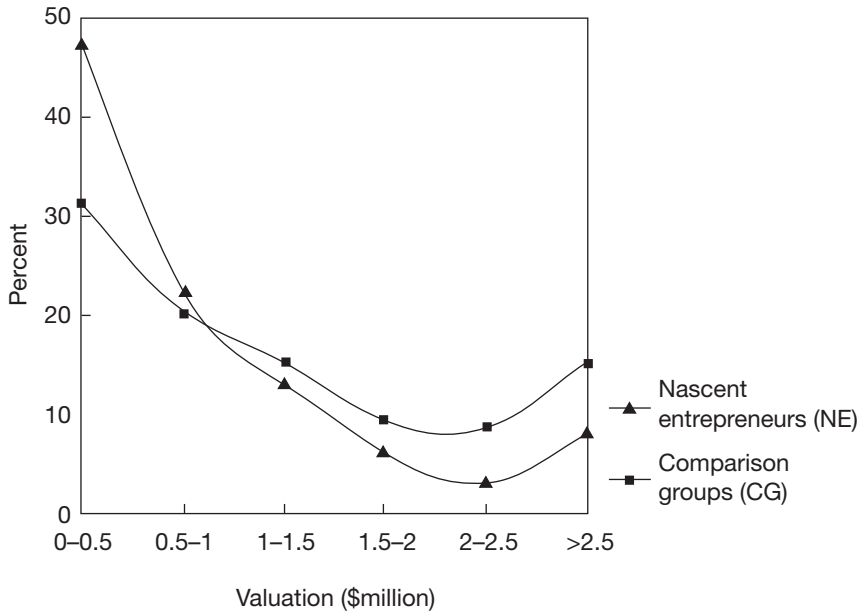


Figure 5 Estimates of eventual value for surviving startups

To allow for utility comparisons with expected entrepreneurial profit, we sum non-entrepreneurial income over the next five years (also standardized to \$1000s) and continue to employ the negative exponential function, $u(x) = 1 - e^{-rx}$. The risk-aversion parameter is expressed as a function of an intercept,

the estimate of firm failure rates in five years (F_i), and the dummy variable $N(b)$, which is 1 for NE and 0 for CG; therefore, $r = \alpha + \beta * F_i + \delta * N(b)$.

For NE, $U(5*Inc, F_i) <= \int U(EP_i, F_e) dF(F_e)$, and for CG, $U(5*Inc, F_i) >= \int U(EP_i, F_c) dF(F_c)$. F_e and F_c , as random variables, represent the distributions of expected percentage of closed firms of NE and CG, respectively. By taking differences in estimates of startup failures and long-term business valuation into account, the search model provides an evaluation of the risk propensity differences between NE and CG from the perspective of non-strategic risk-bearing.

After listwise deletion of all missing values for income, estimated percentage of closed firms and estimated firm worth, 707 valid cases remain for analysis. Information from these cases is used to maximize the following objective function:

$$Max \sum_{i=1}^{707} \int ((U(EP_i, F) dF(F) - U(5*Inc, F_i)) * I(b)) \tag{4}$$

where $I(b)$ is an indicator variable, which has a value of 1 for NE and a value of -1 for individuals in CG, and F is the random variable representing the expected percentage of closed firms. F_e is used as F for NE, and F_c is used as F for CG.

Matlab generated the parameter estimates $\alpha = .1036$, $\beta = .1306$, and $\delta = 1.7736$ (see Table 5). For β , mean/s.e = .1306/.0401 = 3.2569, which is significant at the p level of .01. We conclude that the higher an individual's expectations of startup failure, the greater the risk aversion of that individual. For δ , mean/s.e = 1.7736/.0048, which is significant at the p level of .001. Taking subjective estimates of startup failure rates into account, NE are still more risk-averse than CG.

Figure 6 shows the risk attitude difference between NE and CG. The graph is drawn based on the estimated values of α , β and δ , and the mean values of NE's and CG's expected percentage of closed firms in five years. The figure reveals that NE are much more risk-averse than CG after controlling for their beliefs about startup failure rates.

Table 5 Parameter estimates from the non-strategic risk-bearing model

Variables	The search model
Constant	0.1036 (.0786)
Estimated firm failure rates in five years	0.1306** (.0401)
Dummy variable for nascent entrepreneurs	1.7736*** (0.0048)
Number of cases	707

Note: Number in parentheses are standard errors.
 * $p < .05$ ** $p < .01$ *** $p < .001$ (two-tailed tests)

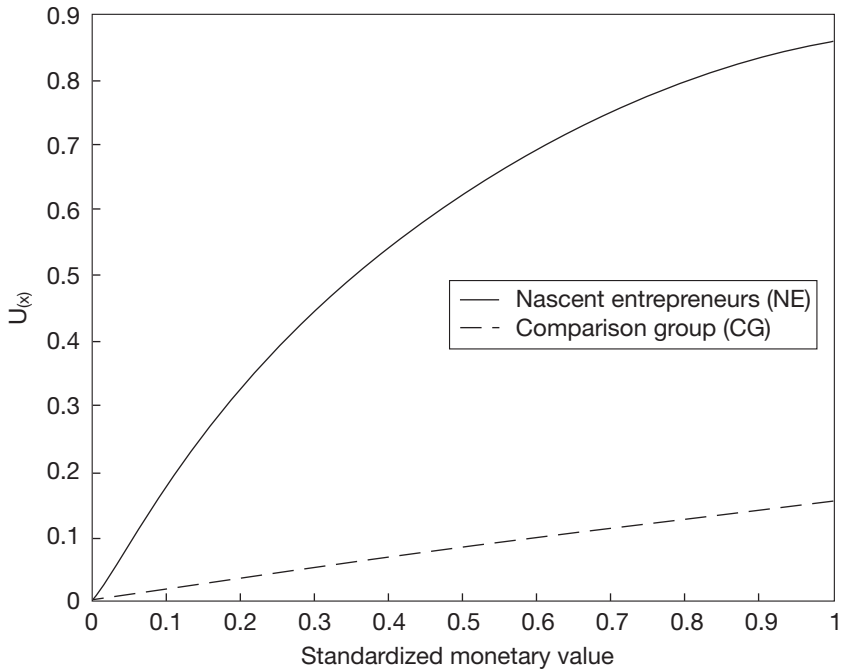


Figure 6 Nascent entrepreneurs (NE) and comparison group (CG): average levels of risk aversion, controlling for information bias

Alternatives to the risk-bearing, profit-maximizing entrepreneur

Both our strategic and non-strategic models consistently show that NE are more risk-averse than the general population in pursuing pecuniary benefits. These findings fail to corroborate the popular image of entrepreneurs as risk-tolerant gamblers. Given the high risk of financial failure among new enterprises, this also leads us to question profit-maximizing explanations of entrepreneurial behavior more generally.

Many of the motivations that individuals have for founding business organizations seem to be non-pecuniary in nature. Drawing concepts from organizational sociology and social psychology, we tentatively identify two categories of non-pecuniary motivations.⁷ The first is autonomy. By autonomy we mean the avoidance of relationships that restrict an individual's actions in professional and personal life. This definition is consistent with the interpretation of entrepreneurial behavior found in Hamilton (2000) and Moskowitz and Vissing-Jorgensen (2002). For instance, the benefits of having autonomy include being one's own boss and enjoying a flexible schedule for personal and family life. The second category is what we call identity fulfillment, a more psychological concept. It captures the need of entrepreneurs to develop and challenge themselves and establish an enduring personal legacy.

In the PSED sample, both NE and CG were asked to indicate how important identity fulfillment, autonomy and pecuniary motivations were in their careers, using a 5-point scale ranging from 1 ('to no extent') to 5 ('to a great extent'). The three items used to measure identity fulfillment were: 'To continue to grow and learn as a person', 'To challenge myself', and 'To fulfill a personal vision' (Cronbach's Alpha = .72). The two items measuring autonomy are: 'To have greater flexibility for my personal and family life', and 'To have considerable freedom to adapt my own approach to work' (Cronbach's Alpha = .68). Finally, the two items utilized to measure pecuniary motivation were: 'To have a chance to build great wealth or a very high income', and 'To earn a larger personal income' (Cronbach's Alpha = .77). Given the reliability scores for each cluster of questions, composite scales were calculated for identity fulfillment, autonomy and pecuniary motivation.

Paired-samples *t*-tests suggest that NE generally view identity fulfillment and autonomy as much more important than material motivations (see Table 6). But CG respondents do not regard identity fulfillment as more important than pecuniary motivation in developing a career. While CG respondents also feel that autonomy is more important than pecuniary achievement, the magnitude and statistical significance is much smaller than that estimated for NE.

To directly examine the effects of non-pecuniary motivations on risk aversion, we implement analyses of how autonomy and identity fulfillment affect venture investment preferences. The ordered logit models in Table 7 suggest that the more a respondent values non-pecuniary over pecuniary benefits, the more risk-averse he or she becomes in venture investment choices.⁸

Without controlling for the non-pecuniary motivations, model 1 in Table 7 shows that NE are significantly ($p = .042$) more risk-averse than the general population. Controlling for how much autonomy is valued over pecuniary benefits ('autonomy – pecuniary motivation'), model 2 shows that the more differential value a respondent places on autonomy, the more risk-averse he or she becomes (coefficient = .200 and p -value = .002). After controlling for the difference between the autonomy and pecuniary motivation scores, the independent variable ('types of respondents') is still significant at $p < .05$ but the p -value increases from .042 in model 1 to .047 in model 2. This suggests that the autonomy measure picks up on some differences between NE's and CG's venture investment preferences.

Table 6 Paired-samples *t*-tests for non-pecuniary and pecuniary motivations

	Pecuniary motivation	
	Nascent entrepreneurs (NE)	Comparison group (CG)
Autonomy	5.545**	2.466*
Identity	5.859**	1.905

* $p < .05$ ** $p < .01$ (two-tailed tests)

Table 7 Ordered logit models: the effects of non-pecuniary motivations on venture investment preferences

Variable	Model 1		Model 2		Model 3	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Independent variable						
Type of respondent	.285 (.140)*	.042	.282 (.142)*	.047	.260 (.141)	.066
Control variables						
Autonomy – pecuniary motivation	-----	-----	.200 (.064)**	.002	-----	-----
Identity – pecuniary motivation	-----	-----	-----	-----	.160 (.062)**	.010
Log likelihood		-774.114		-750.626		-757.593
Number of cases		873		873		878

Note: Numbers in parentheses are standard errors.

* $p < .05$ ** $p < .01$ *** $p < .001$ (two-tailed tests)

Controlling for the difference between identity and pecuniary motivations, model 3 demonstrates that the more identity fulfillment is valued over pecuniary benefits, the more financially risk-averse a respondent becomes (coefficient = .160 and p -value = .010). Model 3 also shows that the independent variable ('types of respondents') becomes statistically insignificant at $p < .05$. The p -value increases from .042 in model 1 to .066 in model 3. Hence, identity fulfillment also explains some variation in venture investment choices initially picked up by the entrepreneurship covariate.

To examine the effects of the non-pecuniary motivations when other variables are controlled for, we introduce the two relative non-pecuniary measures into the ordered logit models in Table 4. Both models 2 and 3 in Table 4 suggest that the more a nascent entrepreneur values autonomy/identity fulfillment over pecuniary benefits, the more financially risk-averse he or she becomes. But neither of the two coefficients is statistically significant at $p < .05$. This might be due to the Likert scale measures of the motivations. Even if other control variables have low correlations with the motivation variables, a packed 5-point scale measure could become insignificant in explaining the variation in the dependent variable.

Conclusion

Our goal has been to investigate whether entrepreneurs can be assumed to be more risk-tolerant than the general population, as popular images of business founders often suggest. After proposing two theoretical models of risk tolerance, strategic and non-strategic, we empirically examined the risk propensity differences between NE and the general population using a nationally representative dataset. Analyses based on venture investment choices and information biases about the startup environment supported the argument that entrepreneurs are significantly more risk-averse than the general US population.

In conjunction with the high rate of financial loss among new ventures, the finding that entrepreneurs are more risk-averse than the general population suggests that many of the motivations that individuals have for founding business organizations are non-pecuniary. In order for entrepreneurs to obtain those non-pecuniary benefits, they need to be risk-averse in pursuing profit so that they can lower the risk of business closure. Drawing on concepts from organizational sociology and social psychology, we identified two classes of non-pecuniary motivations that contribute to business formation, including autonomy and identity fulfillment.

Several limitations of this study should be noted. First, our venture investment vignette is about entrepreneurial activity. Although response rates suggest that the vignette is equally comprehensible to both nascent entrepreneurs and the general population, some critics might argue that the vignette has a built-in bias, in so far as entrepreneurs may be more likely to feel that it is necessary for

them to engage in post-hoc justification of their actions in responding to the vignette. Second, as an overall assessment of nascent entrepreneurs' risk propensity, this study does not address the potential risk propensity difference between growth-oriented and nongrowth-oriented entrepreneurs. Future research should examine to what extent risk attitudes vary among different types of startups.

Instead of assuming that entrepreneurs are profit-maximizing agents, future research must also look at the multidimensional nature of the motivations that entrepreneurs have in founding business ventures. More analyses are needed to explore how the social structure within which entrepreneurs are located determines or influences their non-pecuniary motivations in starting a business. Some researchers have already moved in this direction. For instance, Halaby (2003) recently examined the effects of social origins, including gender, family and schooling, on individual preferences for different job properties in terms of the trade-off between risk and return in the pursuit of economic welfare.

A broader issue for organizational research is how the low risk tolerance and non-pecuniary motivations of entrepreneurs can be taken into account in strategy formulation. Much of the existing pedagogy in strategy presumes that profit maximization is the ultimate goal of the firm and that managerial risk-taking is an acceptable practice when oriented toward this end (Ruef, 2003). For entrepreneurs in the process of creating new business ventures, however, strategy formulation may need to differ substantially from this common template.

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Notes

- 1 Heaton and Lucas (2001) suggest that private equity-holders might be expected to hold a larger share of their remaining wealth in public equity due to the background risk and positive income flow of private equity income.
- 2 Variations in risk propensity need not be attributed to stable individual traits. Instead, an individual's risk propensity could be significantly shaped by the social structure (i.e. social networks) or decision-making context in which he or she is embedded. As long as entrepreneurs and non-entrepreneurs face different social structures, the two groups could have a systematic difference in terms of risk propensity.
- 3 Respondents in both the NE and CG samples are presented with a hypothetical vignette to assess their risk propensities. Because attitudes toward risk are context-sensitive, it is appro-

priate that the vignette pertains specifically to risk-taking in entrepreneurial activity. A vignette that refers to gambling activity or the decision to purchase insurance could fail to capture many of the implicit decision elements (e.g. the importance of non-pecuniary motivations) that might factor into entrepreneurship.

Our descriptive statistics suggest that the hypothetical vignette is equally comprehensible to both NE and CG. There is no substantial difference between the two groups' response rates to this question (in fact, the general population has a slightly higher response rate). This is unsurprising given that individuals in the general population make investment decisions in their daily life, including venture investments.

- 4 Both exponential and power functions were applied to the data. Consistent with Pennings and Smidts (2000), we found that the exponential utility function fits our data better in risk attitude assessment than the power function.
- 5 $N = 64,622$ is the total number of individuals that were contacted initially to identify nascent entrepreneurs.
- 6 This statistic comes from the Department of Commerce survey in 1967. A 1954 survey by the Department of Commerce suggests that 71 percent of startups close in the first four and one-half years. The 1967 survey statistic is referenced here because it is more conservative and consistent with the estimates of academics (Dickinson, 1981).
- 7 Besides autonomy and identity fulfillment, we identified three other types of non-pecuniary motivations: creativity, embeddedness and social status. Creativity entails the development of innovative products, services, or other ideas. Entrepreneurs often gain more utility from the process of producing new products and ideas than the financial gains resulting from those ideas. Embeddedness involves a desire among entrepreneurs to develop familial cohesion, friendship ties, and respect from community leaders. The last non-pecuniary goal is social status. Many individuals engage in entrepreneurial activity to achieve a higher status, thereby gaining respect and exercising influence in their communities by becoming business owners. Prior research based on the PSED sample has partitioned entrepreneurial motivations in a slightly different way from our categorization here (Carter et al., 2004).
- 8 The two relative non-pecuniary measures, 'autonomy – pecuniary motivation' and 'identity – pecuniary motivation', are controlled for in two separate models because the measures are highly correlated ($r = 0.72$, see Table 2).

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