

# OPTIMISM, ENTREPRENEURSHIP, AND ECONOMIC CHOICE

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ABSTRACT. This paper presents some of the first large-scale survey evidence linking optimism to significant work/life choices. We create a novel measure of optimism based on life expectancy biases using the Survey of Consumer Finance. We find that entrepreneurs are more optimistic than non-entrepreneurs. Moreover, more optimistic people in general, work harder, and anticipate longer age-adjusted work careers. Optimism correlates not just to work related choices but also to other significant life choices, such as remarriage and stock market participation. Optimistic people are more likely to remarry, and are more likely to own stock. We also relate optimism to risk preferences. We find that entrepreneurs are more risk loving than non entrepreneurs. However, the correlation between risk taking and optimism is low, suggesting that attitudes to risk and optimism explain different aspects of decision making. These findings help resolve some existing puzzles but also raise new questions.

## 1. INTRODUCTION

Entrepreneurs make peculiar financial choices. They hold poorly diversified portfolios (Gentry and Hubbard, 2001; Heaton and Lucas, 2000). They bear excessive risk for the returns they earn (Moskowitz and Vissing-Jorgensen, 2002). They accept lower median life-time earnings than similarly skilled wage-earners (Hamilton, 2000).

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Why do entrepreneurs make these choices? As previous scholars have noted, these financial decisions are consistent with a range of explanations. Perhaps entrepreneurs are risk-takers. Perhaps entrepreneurs either derive substantial non-pecuniary benefits from self-employment, or some of their pecuniary benefits are unobserved. Or perhaps they are optimistic about their entrepreneurial prospects.

This paper focuses on optimism. In this paper, we present what we believe to be some of the first large-scale evidence linking optimism to a series of significant work and life related choices. Our findings not only contribute to a better understanding of entrepreneurship; more generally, they also help us to understand how differences in attitudes drive a wide range of economic choices and outcomes.

We address two main questions. First, we ask how entrepreneurs differ from non-entrepreneurs in terms of fundamental attitudes such as optimism and risk taking. Second, we ask whether such differences are economically important. That is, we extend these findings to economically relevant questions that go beyond the issue of entrepreneurship. Do differences in attitudes affect work and life choices in economically meaningful ways?

We link optimism to entrepreneurship and other economic choices using data from the Survey of Consumer Finances (SCF). To the best of our knowledge, we are the first to use the SCF to study the attitudes of entrepreneurs. In part, this may stem from the fact that the survey does not ask respondents about optimism directly. The SCF does, however, ask respondents how long they expect to live. In addition, the survey tracks detailed demographic characteristics for each respondent. Therefore, we create a measure of optimism based on a

series of questions that reveal biases in attitudes toward one's health and life expectancy.

Actuarial science is well developed in predicting a person's expected life-span based on their age, gender, race, education and health behaviors (i.e., smoking). We measure optimism by calculating the difference between a respondent's self-reported life expectancy and their statistical life expectancy obtained from smoking-, age-, gender-, race-, and education-corrected life tables. To ensure that we are measuring optimism, and not some unobserved characteristics that are correlated with life expectancy, we are careful to control for alternative explanations such as unobserved health quality, smoking status, etc.

Prior research shows that people tend to be optimistic about their life-span; they think they will live longer than actually predicted by the life-tables. Our calculations confirm this. However, we find that entrepreneurs are significantly more likely to think they will live longer. This suggests that entrepreneurs are, in general, more optimistic about their life prospects.

We next examine how optimism relates to other significant economic choices. In the domain of labor market decisions, we find that more optimistic people (regardless of whether they are entrepreneurs) seem to view work more favorably: they work longer hours, they anticipate longer age-adjusted work careers, and they are more likely to think that they will never retire. In life related choices such as the decision to remarry, we find that more optimistic people are more likely to remarry. The relation of optimism to significant work related choices and life choices is an interesting finding because it supports the notion that differences in attitudes, (and in particular, optimism) has economic significance. Increasingly this notion has found its way into finance

and economics, but large scale micro-evidence on this point has lagged behind.<sup>1</sup>

We also relate optimism to risk preferences by making use of survey questions that elicit the respondent's self-perceptions about the amount of financial risk they are willing to bear for a commensurate level of return. The respondents are read four statements on financial risk-taking and asked which statement comes closest to the amount of financial risk taking that they are willing to take. The statements range from "take substantial financial risk expecting to earn substantial returns" to "unwilling to take any financial risk."

Using this question as a measure of risk-tolerance, we find striking evidence that entrepreneurs are more risk-loving than the non-entrepreneurial population. And yet the correlation between risk tolerance and optimism is low. Moreover, attitudes toward risk and optimism explain different aspects of entrepreneurial decision-making. Further, we find that entrepreneurs have longer planning horizons, are less likely to smoke, and are more likely to be married, and on average have a larger number of children than others. Entrepreneurs are risk-lovers, but this willingness to take risk is tempered by strong family ties, good health practices, and long planning horizons.

Our findings are important for a number of reasons. From a psychological perspective, many researchers have noted that optimism in one domain of activity does not necessarily translate into optimism about other domains (Weinstein, 1980). In other words, optimism is often

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<sup>1</sup>For example, Gervais and Goldstein (2004) model how overconfidence in one's own ability leads to excessive effort. Rigotti, Ryan, and Vaithianathan (2004) develop a model in which optimists are more likely to embrace occupations with ambiguous returns, leading optimists to naturally choose entrepreneurship. See Barberis and Thaler (2003) for a broad survey of behavioral finance, Baker, Ruback, and Wurgler (2004) for a survey of the literature on behavioral corporate finance, and Hirshleifer (2001) for a survey of how psychology affects asset prices.

thought to be event, or domain based, and while individuals may display optimism about a certain event, this does not necessarily translate into optimism about other events. Weinstein and Klein (1996) caution, “Studies of biases...must be careful to ask, ‘Biased about what?’ and should refrain from assuming that what is found in one domain will apply in another.” Note, we measure optimism in a particular event, namely the expectation of future life span. Prior research in psychology indicates that optimism in this domain need not necessarily apply to other arenas. Yet, our measure of optimism seems to be relevant for a wide variety of events such as work choices, life choices such as remarriage, as well as portfolio participation choices. Thus, our measure of optimism, even though it is event based, seems to capture important elements of dispositional optimism. This warrants further exploration, given that dispositional optimism is normally measured in quite different ways.<sup>2</sup>

Our findings have important economic implications as well. Given the importance of small businesses for economic growth in the U.S., understanding the determinants of entrepreneurial decision-making is critical for policy. A better understanding of the attitudes that go

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<sup>2</sup>Dispositional optimism is a generic optimism that spans many domains. One of the most popular measures used to assess this is Scheier and Carver’s (1985) Life Orientation Test (LOT) and their recently revised Life Orientation Test (LOT-R). This measures general attitudes, with agreement to statements like “in uncertain times, I usually expect the best,” as opposed to questions about specific events (such as our question on life span). LOT and LOT-R scores correlate with reports of general better physical and mental well being. For example, they correlate with lower mortality risk for cancer patients (Schulz, Bookwala, Knapp, Scheier, and Williamson, 1996), and faster recovery after coronary artery bypass surgery (Scheier, Matthews, Magovern, Lefebvre, and Abbot, 1989). On mental well being such optimism facilitates adjustment to difficult life events; e.g., optimists adjust more smoothly to college (Aspinwall and Taylor, 1992) or to failure to achieve a desired pregnancy (Litt, Tennen, Affleck, and Klock, 1992).

along with the entrepreneurship decision is useful in understanding entrepreneurship more broadly.

Also, our results help to explain part of the private equity premium puzzle identified by Moskowitz and Vissing-Jorgensen (2002). By providing empirical evidence on the systematic ways in which entrepreneurs differ from others, this paper gives some guidance to choices in modelling entrepreneurs. But more broadly, our findings linking optimism—regardless of whether a person is self-employed—to a wide range of economic choices demonstrates the importance of attitudes for economic outcomes.

The remainder of the paper is structured as follows. In Section 2, we discuss the SCF in greater detail and highlight some of the econometric challenges that are often overlooked when using the SCF. In Section 3, we develop our measure of optimism. In Section 4, we measure risk tolerance and explore the relation between the two measures. Sections 5 through 8 present our main findings linking optimism to a range of economic choices, including entrepreneurship, labor market participation, re-marriage, and portfolio choice. Section 9 concludes.

## 2. DATA AND ECONOMETRIC ISSUES

**2.1. The Survey of Consumer Finances.** Our primary data source for this research is the Survey of Consumer Finances (SCF). Since 1989, the SCF has been conducted every three years. In 1995, the survey broadened the set of questions it asked respondents to include questions about life expectancy. Thus, most of our data come from the three SCFs conducted in 1995, 1998, and 2001. For some of the risk measures we explore later in the paper, we are able to use data going back to 1992.

The survey randomly samples individuals to develop a picture of the economic health of a wide spectrum of the U.S. economy. who are surveyed on a number of dimensions. The survey also covers the respondents' employment status and whether they own their own business. We define an entrepreneur as anyone who is self-employed and also own their own duly incorporated business. Our sample thus consists of a sizeable number of both entrepreneurs as well as non-entrepreneurs.

**2.2. Multiple Imputation in the SCF.** To provide the most complete data possible to the research community, the SCF employs a statistical technique called multiple imputation to correct for missing or sensitive data.

The exact multiple imputation procedures used by the Federal Reserve in the design of the SCF are described in great detail in a series of articles by Arthur Kineckell and other economists at the Federal Reserve. In particular, the interested reader should refer to Kinneckell (2000) and the references therein.

A simple description of the multiple imputation approach to missing data is as follows. In general, some data from the SCF are missing due to nonresponse or the desire to protect sensitive information that might identify a particular respondent. To create a survey with the most usability for researchers, the SCF replaces missing data with imputations that are chosen to best adhere to the covariance structure of the data in question. For example, suppose a respondent does not answer a question regarding the value of her primary residence, but we do know the person's education level, income, and geographic region. Then it would be possible to impute her missing value with a best guess chosen to preserve the overall correlation between house value, education, income, etc.

The SCF uses Markov-chain Monte Carlo (MCMC) methods to carry out the imputation procedure. This, by its very nature, introduces an element of randomness into the imputed data. Thus, the SCF actually provides five distinct iterations of the data, with possibly differing values of some responses across implicates, depending on the stochastic structure of the imputation algorithm.

Correctly accounting for the effect of multiple imputation is often overlooked, but is critical for making appropriate statistical inference. When data have been treated by multiple imputation, the appropriate point estimate is simply the mean of the point estimates obtained from each separate imputation. But standard errors must be adjusted to correctly account for the statistical properties of multiple imputation. Put simply, standard errors based on the average across implicates are too small; standard errors based on a randomly chosen implicate may be too small or too large.

To adjust our standard errors, we follow techniques described in Montalto and Sung (1996a) and Little and Rubin (1987). The correct standard error is the average of the standard errors from each imputation, plus an add-on that accounts for the variation across implicates. Thus, a multiple imputation-corrected standard error may be smaller than that obtained from a randomly chosen implicate (if the imputation of the data chosen produced large standard errors relative to the average across implicates, and the across-imputation variance was not too large). But it will always be larger than the standard error obtained by averaging the covariates across the imputations of the data before analysis (because doing so ignores across-imputation variance and may shrink within-imputation variance). We describe the exact



procedures for producing the standard errors in an appendix available from the authors.<sup>3</sup>

**2.3. Defining Entrepreneurship.** Our first empirical challenge is to identify entrepreneurs in the SCF. Our aim is to provide a definition of entrepreneurship that facilitates a comparison of our results with extant research in portfolio choice, which tends to focus on private equity ownership, as well as labor and family economics, which tends to focus on self-employment.

As a result, to satisfy our definition of entrepreneurship, we require a respondent to meet two criteria: the respondent must own some or all of at least one privately owned business, and the respondent must be full-time self-employed. This definition excludes a number of types of individuals. For example, it excludes consultants who work out of their home and bill their time to companies (so-called 1099 employees). It excludes individuals who work in publicly owned firms but own side businesses that they run out of their home. It excludes those who work part-time at a business they own. It also includes individuals like professionals in private practice—doctors, lawyers, architects—who are not typically considered entrepreneurs, but who nevertheless bear the risks of private equity ownership and work in the firms that they own.

This definition facilitates a ready comparison to the work of Heaton and Lucas (2000), Moskowitz and Vissing-Jorgensen (2002), and Gentry and Hubbard (2001), who focus on portfolio holdings of private equity owners, as well to the work of Dunn and Holtz-Eakin (2000)

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<sup>3</sup>In an appendix to be made available from the authors, we provide the exact formulas, as well as the STATA code, for producing multiple imputation-corrected standard errors. See Montalto and Sung (1996b) for SAS code.

and Hamilton (2000), whose primary focus is the self-employment decision. None of our main findings, however, hinge on the fact that respondents must satisfy both criteria to be called entrepreneurs. All of findings on both larger samples of private equity owners and self-employed individuals.

Table 1 provides a break-down of how the SCF data match our definition of entrepreneurship. We have 12,386 survey respondents over the four survey years, of which 74% are full-time employed. Of the 9,198 respondents who report full-time employment, 4,053 of them report being self-employed. This fraction is certainly higher than the rate of self-employment in the overall population; this is a reflection of the fact that the survey over-samples high net-worth individuals. As Moskowitz and Vissing-Jorgensen (2002) have shown using the same data, weighting the raw respondents by the sample weights provided by the SCF makes the data far more representative of the U.S. population as a whole. However, since it is not our objective to make statements that are statistically appropriate for the U.S. population in its entirety, we focus on the unweighted data throughout the paper.

Thirty-nine percent, or 4,835 respondents, report owning some or all of at least one privately owned business. (Some individuals report owning part of more than one business.) Combining these criteria, we arrive at 3,405 entrepreneurs in the data, roughly evenly distributed across the four sample years. This represents a little more than one-third of the full-time employed sample, and roughly one-quarter of the entire survey.

Panel B reports the demographic composition of entrepreneurs. Relative to the typical respondent in the SCF, entrepreneurs are much

more likely to be college-educated white males. In fact, they are almost twice as likely to have completed college than non-entrepreneurs. While at present we do not have detailed data on occupational choice, we believe this reflects the fact that many of the entrepreneurs in our sample are the owners of professional service organizations in which they work.

Regardless of the outcome, it seems clear that race and gender are exogenous factors affecting the labor market choices of survey respondents. And while not completely exogenous to the labor market participation decision, educational decisions are likely to have been partly made prior to the vocational choice decision, thereby affecting the set of vocational choices available to a respondent when they chose to enter the labor market. Although we do not observe individuals as they are about to make the decision to become entrepreneurs, it is nonetheless important to control for these exogenous factors that affect the opportunity set individuals face.

### 3. MEASURING OPTIMISM

Our measure of optimism involves comparing respondents' self-reported life expectancy to that implied by actuarial tables. Formally, let  $E_r(l|x)$  be the expected value of respondent  $i$ 's remaining lifespan  $l$  conditional on a vector of personal characteristics  $x$ , taken under their subjective probability distribution, denoted by  $E_r(\cdot)$ . Similarly, let  $E_a(l|x)$  be the conditional expectation of  $l$  taken from an actuarial table. Our measure of optimism is then simply

$$(1) \quad \text{Optimism}_i = E_r(l|x) - E_a(l|x).$$

First we describe how the pieces of Equation 1 are calculated or obtained. Then we study optimism in greater detail, exploring, in particular, whether the measure captures differences in expectations, or whether it is primarily captures differences in  $x$  between the individual and the life table.

**3.1. Self-assessments of life expectancy.** Beginning in 1995, survey participants were asked the question “About how long do you think you will live?” We use the answer to this question as our value for  $E_r(l|x)$ .

Panel A of Table 2 tabulates responses to this question. This panel shows that entrepreneurs think they will live longer. This difference is highly statistically significant.<sup>4</sup>

The remainder of Panel A reports common responses for each group of respondents. Respondents were allowed to report any positive integer, but there is a great deal of clustering in the data around ages that are evenly divisible by five. The top five responses, in order of prevalence, are living to ages 80, 85, 90, 75, and 70. The rank-ordering for the responses is the same across entrepreneurs and non-entrepreneurs; entrepreneurs are just more likely to report higher values. For example, 20.29% of entrepreneurs report living until 80; only 17.6% of non-entrepreneurs report living to age 80. The fact that entrepreneurs think they will live longer across the board can be seen by comparing the t-statistic and accompanying p-value across the age spectrum. A

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<sup>4</sup>We inspected the data by hand to ensure that this difference is not being driven by peculiar interpretations of the question. For example, if one group was disproportionately prone to respond in remaining years of life, rather than age at death, this would impart a difference in recorded life expectancies for no real reason. For instance, if all 50-year old respondents expected to live to age 80, but non-entrepreneurs answered with 30 and entrepreneurs answered with 80, then this would impart a difference where no difference existed. This does not appear to be the case.

statistically larger fraction of non-entrepreneurs reports living until 70, there is no difference in the fractions reporting death at age 75. But a greater fraction of entrepreneurs expect to live until age 80, 85, and 90.

Living to exactly 100 years old is also a fairly common response: about 7% of the sample expects to die in their centenary year. The odds of a randomly chosen working age male living to age 100 are tiny. Thus, we view this response as some combination of apathy, lack of attention, or fanciful thinking on the part of the respondent. Interestingly, entrepreneurs are less likely to report living to 100 than non-entrepreneurs; only about 6% of entrepreneurs give this response, and a t-test for the difference in proportions across groups has a value of over 3.3. This indicates that the difference between entrepreneurs and non-entrepreneurs does not stem from the former group giving a flippant response (i.e., responding “I’m going to live to 100! Next question, please,” without thinking through the question). Thus, we feel confident that differences in reported life expectancy accurately reflect personal beliefs about longevity, and not misunderstanding or apathy.<sup>5</sup>

**3.2. Actuarial life expectancy.** While Panel A provides clear evidence that entrepreneurs think they will live longer than other respondents, this alone does not constitute a valid measure of optimism, for entrepreneurs may have good reasons to feel this way. Perhaps they are healthier, engage in fewer risky behaviors, or come from demographic

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<sup>5</sup>We use unwindsorized values of this variable throughout our analysis, but windsorizing at 1% and 99% has no effect on our results.

groups pre-disposed towards greater longevity. The challenge is to correct for these measures so that the optimism measure simply measures miscalibration in beliefs.

We do this by consulting statistical tables that calculate expected mortality rates over a person's life span. These are commonly known as 'life tables' in demography and forensic economics. Standard life tables are known as current life tables, since they are obtained by assembling a large sample of individuals running the gamut from very young to very old, rather than by following a particular cohort from birth to death.

The linchpin of a life table calculation is the mortality rate at age  $x$ , which we will denote  $m(x)$ . The (age-specific) mortality rate is typically calculated empirically by observing the proportion of a sample of individuals  $x$  years of age that die over the interval  $(x, x + 1)$ . Using the mortality function, we can define the number of individuals alive at year  $x$  as

$$(2) \quad l(x) = l(0) \exp\left(-\sum_{j=0}^x m(j)\right)$$

where  $l(0)$ , the radix of the life table, is typically normalized to 100,000 individuals. Effectively,  $\frac{l(x)}{l(0)}$  is the probability of being alive at age  $x$  given that an individual faced the mortality conditions summarized in  $\sum_j m(j)$ . The life expectancy of an individual at age  $x$  is calculated by taking the sum of the remaining person-years until all currently living individuals are dead, and dividing by the number of individuals alive of that age:

$$(3) \quad e(x) = \frac{\sum_x^T l(x)}{l(x)}$$

where it is assumed that all individuals have died by some year  $T$ .<sup>6</sup>

We draw life tables from a number of sources to create the most accurate possible estimate of a respondent's lifespan. These are reported in Panel B of Table 2. The third column in Panel B, labelled statistical life expectancy, summarizes the mean life expectancy for respondents based on age-, gender-, and race-specific life tables obtained from the National Institutes of Health. Taking the difference between this and the respondent's self report results in a level of optimism recorded in column (4). Under this measure, entrepreneurs expect to live 3.65 years longer than predicted by the life tables, whereas other individuals only expect to live 1.76 years longer than the tables. This difference is highly statistically significant.

Using age, gender and race specific life tables helps to account for the exogenous differences between entrepreneurs and other individuals, but it still leaves this optimism measure open to many potential alternative interpretations. The most glaring alternative is that entrepreneurs take better care of themselves, which is reflected in their self-assessments. To account for this, we make further corrections for whether a person smokes, and what their level of education is. Our smoking and education corrections follow (Richards, 1999).

First we adjust the previous calculation for the differential impact of smoking on mortality. As column (5) indicates, entrepreneurs are far less likely to smoke than other individuals. About one quarter of

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<sup>6</sup>Note that this implies life expectancies are biased downward, since current mortality of a person aged  $x + t$  is used to assign  $t$ -period-ahead mortality risk to a person aged  $x$ , rather than the expected future mortality  $t$  periods from now. In other words, the mortality risk of persons currently aged 60 is used to assess the life expectancy of individuals currently aged 40, even though current 40-year olds may face lower mortality in 20 years than current 60 year olds do today. This bias has no impact on our measurements, since we are interested in cross-sectional variation in this measure.

non-entrepreneurs in the SCF report that they smoke; only 13% of entrepreneurs do. The smoking-corrected life expectancy is reported in column (6). It still demonstrates a statistically significant difference between the two groups.

We also know that education affects mortality risk (Richards, 1999). Highly educated individuals tend to hold jobs with fewer occupational hazards; this translates into longer life expectancies. To control for this effect, we made adjustments for a person's level of schooling following the tables in Richards (1999). The effect of education differs across race and gender categories: in general, it has a stronger effect for blacks and hispanics than for whites, and a stronger effect for men than women, because the former groups are more likely to find themselves in more dangerous jobs absent higher education.

The education-, smoking-, gender-, and age-corrected optimism measure is presented in the final column of Panel B. It shows that entrepreneurs expect to live about eight months longer than non-entrepreneurs.

This eight-month difference is highly statistically significant, but is it economically important? In some sense, this is the subject of the remainder of the paper. We show that this difference has a large impact on a wide range of outcomes, therefore we argue that it is economically important. However, the magnitude of the difference warrants discussion. The fact that it is small actually allows us to argue against a range of alternative explanations for the findings we report. It is not the case, for example, that entrepreneurs expect to live ten to fifteen years longer than other individuals, and that this drives them to remarry. Rather, we think that they are simply more optimistic about life, and that we have found an empirical proxy for that optimism.



**3.3. Understanding optimism.** Our optimism measure differs substantially from measures used in prior work. For example, Malmendier and Tate (2004) use the early exercise behavior of CEOs who hold stock options in their own firms as a proxy for optimism. Jenter (2004) uses manager's private portfolio trades to proxy for the manager's perceptions of his firm's mispricing. As Jenter points out, these measures, while being consistent with optimism, are also consistent with different interpretations.

Before we conclude that we have uncovered an empirical proxy for optimism, we first must rule out the possibility that we are simply capturing unobserved differences in health quality, or other characteristics that are likely to cause a person to rationally and accurately believe they will live longer. We do this in Tables 3 and 4.

The SCF asks respondents to rate their own health. They can respond with either 'excellent,' 'good,' 'fair,' or 'poor.' The survey contains no way to objectively measure a respondent's health, therefore this too could be a measure of optimism. Nonetheless, we treat it as if it were objective, and study how this relates to optimism. This is reported in Panel A of Table 3.

As Panel A shows, respondents who report excellent health think they will live about five years longer than predicted by the tables, regardless of whether they are an entrepreneur. The difference between the groups is insignificant. All of the difference in optimism is coming from individuals with less-than-excellent health quality. Among these groups, non-entrepreneurs display pessimism (they underestimate their life-span relative to the tables), whereas entrepreneurs report a statistically larger degree of optimism.

Panel B relates age to optimism. It shows that older respondents tend to overestimate their life expectancy to a greater degree than younger respondents. This affect holds across groups, and in each age cohort, entrepreneurs demonstrate significantly greater optimism than other individuals.

As mentioned above, self-reported health quality likely measures some combination of optimism and unobserved health quality. To see which of these effects is likely to be responsible for our findings, we compare our optimism measure, the self-reported health quality, and a number of other factors that might affect longevity with the survey respondent's assessment of future economic conditions. The SCF asks respondents how they expect the economy to fare over the next five years. Respondents can answer that they think the economy will improve, will stay the same, or will get worse. The fraction reporting that the economy will improve declines from over one-third to less than one-quarter between 1992 and 1998, but improves in 2001. In contrast, between thirty-five and forty percent of respondents in each survey report that conditions will get worse.

In Table 4, we report mean optimism and health quality for each answer to this question. The average optimism for respondents reporting that economic conditions will improve is more than twice that of the other groups. The null hypothesis that the 'conditions will improve' group is equal to the other two groups is strongly rejected, with a t-statistic of 6.61. Thus, our measure of optimism is highly correlated with respondents views of future economic conditions.

In the next column we report the average health quality for each group. Since excellent health quality is coded '1', and poor health coded '4', the t-test shows that respondents who think economic conditions

will improve are also much more likely to believe that they possess excellent health.

The remaining columns of Table 4 report variables that are likely to be correlated with unobserved health quality. The next column illustrates that smoking rates do not vary across the three categories—respondents who think the economy will improve are no less likely to smoke than respondents with a less sanguine economic outlook.

Epidemiologists and demographers have shown that parents' age at death is a strong predictor of one's own life expectancy. The SCF asks respondents if their parents are still living. This is an imperfect measure, since it suffers from truncation (the survey does not ask respondents to report their parents' age at death), but we can use this to gauge whether genetic longevity is likely to vary across groups. It does not. Roughly forty percent of respondents, regardless of their economic outlook, have a father who is still living.<sup>7</sup>

In the final column we report average years of schooling by economic outlook. Education is known to impact mortality through job choice, but there is no difference across categories in the average education level.

In sum, when we compare our measure of optimism to beliefs about future economic conditions, we find a strong positive correlation between economic outlook and biased life expectancy. This correlation carries over into self-assessments of health quality, but when we look deeper into variables that are potentially correlated with unobserved

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<sup>7</sup>The average age of a respondent is about fifty years, therefore there is reason to think that many respondents would still have living parents.

health characteristics, we find no evidence that more objective measures of health quality are correlated with economic outlook. Therefore we conclude that our measure is likely driven by optimism and not unobserved differences in health quality.

#### 4. THE LINK BETWEEN OPTIMISM AND RISK

Differences in risk tolerance have also been offered as a potential explanation for the puzzling choices entrepreneurs make. Indeed, there is a natural connection between risk and optimism: more optimistic people may be willing to take greater risks if they perceive the odds of success to be in their favor. This, in turn, suggests that attitudes toward risk may be driving the distinction between entrepreneurs and non-entrepreneurs.

**4.1. Attitudes toward risk.** In each of the four years in our sample, respondents were asked to gauge their attitudes toward financial risk.<sup>8</sup> Table 5 records responses to this question according to whether or not the respondent was an entrepreneur.

Panel A reports the fraction of each type of respondent that provided each of the four possible responses to the question of perceived risk tolerance. For both categories of respondents, the median respondent reports being willing to take average risk for average returns. However, considerably more entrepreneurs perceive themselves to be risk-takers, and considerably fewer consider themselves unwilling to take risk.

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<sup>8</sup>The exact wording of the question was as follows: 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? Respondents were allowed to choose between the following four answers: Take substantial financial risks expecting to earn substantial returns; Take above average financial risks expecting to earn above average returns; Take average financial risks expecting to earn average returns; Not willing to take any financial risks.

Roughly twice the number of entrepreneurs as non-entrepreneurs report a willingness to take substantial or above average risk for substantial or above average return. (9.86% versus 4.46% for substantial risk, 32.28% versus 17.45% for above average risk.) At the other extreme, non-entrepreneurs are three times more likely to report being unwilling to take any financial risk: 38.7% of non-entrepreneurs report being unwilling to take any financial risk, while only 12.94% of entrepreneurs report this response.

The percentages reported in Panel A are obtained by averaging across the five implicates recorded in the SCF. (This is the appropriate procedure for obtaining point estimates from multiply imputed data.) To obtain a measure of the statistical difference between the two distributions, we compute a  $\chi^2$  test of the independence of columns and rows for each implicate. The minimum  $\chi^2$  value is 991, which is highly statistically significant. If knowing that a respondent was an entrepreneur provided no information about their risk tolerance, then the rows and columns would be independent of one another and a  $\chi^2$  test would fail to reject. A value of 991 for the  $\chi^2$  test indicates a high degree of dependence in the rows and columns. Thus, there is considerable difference in the self-assessment of risk-taking for entrepreneurs and non-entrepreneurs.

**4.2. Painting a richer picture of risk-taking.** That entrepreneurs are risk-takers may come as little surprise. Many accounts of entrepreneurs in the popular press portray them as risk-takers, obsessively and single-mindedly pursuing the success of their company, willing to lay it all on the line for the success of their venture.

Is this portrait accurate? Panel B suggests not. It provides evidence that entrepreneurs are longer-range planners, and have more family

commitments than non-entrepreneurs. Thus, a better portrait of an entrepreneur might be that they are prudent risk-takers who balance work and family.

To see this, Panel B reports the response to a survey question that asks about planning horizon. This question occurs immediately before the question on attitudes toward risk.<sup>9</sup> As it shows, over 63% of entrepreneurs have planning horizons longer than five years, whereas fewer than 44% of non-entrepreneurs do. Entrepreneurs are roughly half as likely to have planning horizons of one year or less: a total of 16.5% of entrepreneurs have such planning horizons, compared with 31.8% of non-entrepreneurs. The minimum  $\chi^2$  value obtained from the five implicates is highly significant at a value of 467, indicating that the difference in distributions across types of respondents is statistically significant.

This result speaks for the idea that entrepreneurs are not simply tolerant toward risk; they approach risk with prudence. This prudence is borne out in their longer planning horizons. Of course, we are careful not to try to establish a causal link here: one could argue that a respondent with a longer planning horizon feels that they can afford to take more risk, just as one could argue that long planning horizons are a manifestation of financial sophistication. Nevertheless, the link between risk tolerance and planning horizon speaks against the notion of entrepreneurs as foolhardy risk-takers.

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<sup>9</sup>The actual text of the question reads, "In planning your family's saving and spending, which of the time periods listed on this page is most important to you?" Respondents are allowed to choose between "Next few months," "Next year," "Next few years," "Next 5-10 years," and "Longer than 10 years." We have combined the last two responses for ease of presentation.

To look at this issue further, Panel B also examines the family characteristics of respondents. If the description of the prototypical entrepreneur as work-obsessed risk-taker is correct, then we would expect entrepreneurs to have smaller families. In fact, this is not the case.

Panel B shows that entrepreneurs are much more likely to be married than non-entrepreneurs: 83% of entrepreneurs are married, whereas only 56% of non-entrepreneurs are married. (In section 7 we explore why this is the case.) Conditional on marriage, entrepreneurs have statistically larger families than non-entrepreneurs.<sup>10</sup> The spouses of entrepreneurs, however, are less likely to work in the home: the rate of employment is about three percentage points higher for the spouses of entrepreneurs than non-entrepreneurs.

Twenty-eight percent of spouses of entrepreneurs report being self-employed; only 8% of the spouses of non-entrepreneurs report self-employment. This no doubt reflects the fact that many small businesses are family run.

**4.3. Is optimism just risk-taking?** Another possible explanation for the difference in optimism between entrepreneurs and non-entrepreneurs is that our measure of optimism is correlated with attitudes toward risk. To explore the potential for risk tolerance and optimism to measure similar attitudes in individuals, we present evidence in Table 6 on the link between risk tolerance and optimism.

In Panel A, we report the mean level of optimism for entrepreneurs and non-entrepreneurs broken down by the response to the question that elicits risk preferences. The mean optimism is roughly the same across respondents who answered “above average” and “substantial,”

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<sup>10</sup>Conditioning on marriage makes this result more difficult to establish, since the average number of children for unmarried respondents is low.

but differs considerably within these categories across entrepreneurship. Entrepreneurs report slightly more than 3.7 years of optimism in these two categories, while non-entrepreneurs report between 2.15 and 2.86 years of optimism.

Optimism declines as risk-tolerance falls, but the difference across entrepreneurship categories remains present. For respondents reporting a willingness to take only “average” risk, entrepreneurs report slightly less than three years of optimism, while non-entrepreneurs report 1.34 years of optimism. Non-entrepreneurs who are not willing to bear any financial risk are more pessimistic about their life expectancy than the statistical tables indicate they should be: they have a mean optimism of negative four months. On the other hand, entrepreneurs who report being unwilling to bear any financial risk are about as optimistic (1.34 years) as non-entrepreneurs who report being willing to bear average risk for average returns.

In Panel B, we report correlations between the risk tolerance and optimism by entrepreneurship category. The simple correlation between risk tolerance and optimism is .05 for entrepreneurs and .09 for non-entrepreneurs. Both of these are highly statistically significant, but their economic significance seems small. Since the units are years for optimism and a numerical score ranging from one to four for risk tolerance, it is difficult to translate these correlations into economic magnitudes, but they do indicate that in a simple regression, variation in risk would explain almost none of the variation in optimism, and vice versa.

In sum, optimism and risk tolerance are statistically correlated in a manner that squares with intuition. People who perceive themselves to be risk takers are more optimistic than those who perceive themselves



to averse to risk. Or, since we can make no claims on causation, we could equally well say that more optimistic people are more likely to think of themselves as risk-takers than are less optimistic people. But this statistical correlation does not seem to translate into an economically meaningful relation between the two variables. Our measures of risk tolerance and optimism seem to be capturing different facets of self-perception.

## 5. OPTIMISM AND THE ENTREPRENEURSHIP DECISION

In the previous tables we have presented univariate evidence that entrepreneurs display greater tolerance toward risk and are more optimistic than non-entrepreneurs. In this section, we explore these issues deeper, and consider how optimism and risk tolerance explain entrepreneurship controlling for other factors.

Table 7 presents results from a Probit analysis, correcting for multiple imputation. The dependent variable is a dummy for whether the respondent is an entrepreneur. The key independent variables are optimism and risk tolerance, but we also include demographic controls as well as other control variables. Point estimates are reported as the change in the probability of being an entrepreneur associated with a small change in an independent variable.

The table illustrates that optimism and risk tolerance have a statistically significant effect on whether a respondent is an entrepreneur, even controlling for a range of possible correlated factors. Looking at risk-tolerance alone, or risk-tolerance paired with optimism, we see that moving up one category of response (from above average to substantial, or from average to above average) is associated with roughly a ten percent increase in the chance of entrepreneurship.

Introducing race, gender and education as controls lowers the importance of risk-tolerance but raises the explanatory power of optimism for predicting entrepreneurship. Column (3) shows that a one standard-deviation increase in optimism yields about a one percent increase in the probability of entrepreneurship, controlling for these demographic characteristics. The loading on risk tolerance drops roughly in half.

The demographic controls illustrate the fact that entrepreneurs are largely white, male, college-educated respondents. Being white as opposed to black or hispanic raises the probability of being an entrepreneur by roughly ten percent, being male, twelve to fifteen percent. The effect of college education is smaller at five percent, but still statistically significant. Controlling for family traits such as marriage and family size illustrates the importance of family characteristics in explaining entrepreneurship, but does not drive out the importance of risk tolerance or optimism. Finally, Column (5) shows also that controlling for age and net worth (as defined by the Federal Reserve Bulletin) does not drive out the importance of risk tolerance or optimism.

In sum, Table 7 illustrates that risk tolerance and optimism are important determinants of entrepreneurship, even controlling for a range of family, demographic, and wealth characteristics. Moreover, optimism and risk tolerance seem to be capturing different aspects of the decision to be become an entrepreneur, as including them in the same regression does not diminish the importance of either.

## 6. OPTIMISM AND WORK CHOICES

Given the fact that entrepreneurs seem to make peculiar labor market choices, a natural question is how labor market participation is

affected by optimism and attitudes toward risk. Table 8 explores explores this issue with three sets of regressions aimed at understanding hours worked and attitudes toward retirement.

**6.1. Current employment behavior.** The first pair of columns explores how attitudes affect current hours worked. The data include all respondents, regardless of whether they are entrepreneurs. The dependent variable is the response to a question in the SCF that asks respondents how much over the last year they worked in an average week.<sup>11</sup> As explanatory variables we include the remaining statistical life expectancy of the respondent at the time of the survey, their optimism, risk tolerance, net worth, and a dummy for whether they are an entrepreneur.<sup>12</sup> The standard errors, as elsewhere, are adjusted for the effects of multiple imputation.

The first column indicates that both optimism and risk tolerance affect hours worked. More optimistic respondents work longer hours. The magnitude of the coefficient indicates that a one-standard-deviation shift in optimism is associated with slightly more than one hour per week more of work.

The other variables in the first column indicate that respondents with greater risk tolerance work longer, and that higher net worth respondents work longer. Based on the results of the previous section, this is consistent with the interpretation that risk-takers with higher net worth

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<sup>11</sup>Similar results were obtained based on a question asking how much respondents had worked over the last few weeks, but the variance of this response was considerably higher.

<sup>12</sup>In alternative specifications available from the author, we replaced remaining life expectancy with the respondent's age and obtained qualitatively identical findings. None of the variables of interest is sensitive to this specification choice, but this specification allows us control for expected retirement affects more easily.

are running (in the case of entrepreneurs) or involved with more complex organizations that are more demanding of their time. The loading on life expectancy indicates that younger respondents work longer, and that controlling for age, longer-lived respondents also work longer. The first interpretation is a reflection of the fact that most respondents to the SCF are in the downward sloping portion of their age-earnings profiles, while the second interpretation indicates that people who expect to live longer work more so that can be better prepared for retirement. This result is consistent with theoretical predictions from Dybvig and Liu (2004).

When we include a dummy for entrepreneur in column (2), we see a very large effect on hours worked. The data indicate that entrepreneurs work roughly seventeen hours per week longer on average than do non-entrepreneurs. This speaks very clearly for the fact that entrepreneurs derive non-pecuniary benefits from work. Nevertheless, this does not drive out the significance of optimism and attitudes toward. Even accounting for the fact that entrepreneurs work much longer per week than the typical non-entrepreneur, more optimistic and more risk-tolerant individuals work longer hours.

**6.2. Attitudes toward retirement.** Not only do more optimistic and more risk tolerant people work more each week, their total expected work-life is longer. This is illustrated in the remaining columns of Table 8, which explore attitudes toward retirement.

To explore attitudes toward retirement, we use a question which asks respondents when they expect to stop working. Respondents were allowed to report the year in which they expected to retire, or they were allowed to respond, “Never stop working.”

The second pair of columns in Table 8 present regressions in which the dependent variable is a dummy for whether the respondent answered that they would never stop working. More optimistic people are more likely to report that they will work forever. Thus, not only do they work more currently, but they intend to continue doing so indefinitely. This works against the possibility that increased optimism leads to false beliefs about early retirement.

Overall, life expectancy, risk tolerance, net worth and entrepreneurship explain the no-retirement decision in much the same way that they explain the allocation of time to current work. Younger respondents and respondents with greater expected longevity are more likely to report that they will work forever. Risk-tolerant and higher net worth individuals are also more likely to continue working indefinitely. The fact that net worth increases the probability of working forever speaks against common perceptions of retiring to a life of leisure after striking it rich.

Entrepreneurship has a dramatic effect on the expected retirement decision. Converting the point estimate from column (4) into a marginal probability indicates that being an entrepreneur raises the probability of expecting to work forever by seventeen percent.<sup>13</sup> This evidence supports the view that entrepreneurs derive non-pecuniary benefits from work. But this explanation does not diminish the fact that optimism makes non-retirement more likely, since we find significant loadings on optimism even when we include a dummy for entrepreneurship.

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<sup>13</sup>In unreported tables, we have repeated this regression including demographic controls for gender, race, and education. The controls only weaken the loading on risk tolerance. Optimism and entrepreneurship are unaffected.

The third pair of columns in Table 8 present censored regressions of the time to retirement on the same set of independent variables described above.<sup>14</sup> Respondents who indicate that they expect to never stop working are treated as right-censored.

Again, we see that more optimistic respondents report that they wish to work longer, controlling for life expectancy. However, risk tolerance no longer has a role in explaining time to retirement. That the entrepreneur dummy comes in much weaker here suggests that most of the role of entrepreneurship in affecting time-to-retirement comes from obviating retirement altogether, rather than simply delaying the time to retirement.

In sum, Table 8 establishes an important link between labor market participation (both in the short- and long-run), entrepreneurship, and optimism. The table provides strong evidence in support of the idea that entrepreneurs derive substantial non-pecuniary benefits from work. Yet even when we account for this possibility, we still find that more optimistic individuals work more.

## 7. OPTIMISM AND OTHER LIFE CHOICES

In Section 4 we presented evidence that entrepreneurs are more likely to be married than non-entrepreneurs, and that they have larger families, conditional on marriage. In this section, we explore the relation between risk tolerance, optimism and life choices.

**7.1. Marriage, divorce and remarriage.** In Panel A of Table 9, we present a breakdown of marital status according to whether or not the respondent is an entrepreneur. Recapitulating Table 5, the first column

<sup>14</sup>These two columns are the only instances in which we do not report standard errors corrected for multiple imputation. Rather, we randomly select an implicate for the purposes of estimation here.

of Panel A shows that 82% of entrepreneurs are married, whereas only 56% of non-entrepreneur respondents are married. The remainder of Panel A explores where this difference comes from.

The next column shows that a commensurately lower number of entrepreneurs are currently divorced. Only 7% of entrepreneurs are currently divorced, as opposed to 12% for non-entrepreneurs. This difference is highly statistically significant, with a t-statistic of 8.36 in absolute value. Combining these columns speaks to the rate of overall marriage across the two groups of respondents: only 10% of entrepreneurs are neither currently married nor currently divorced (i.e., single and never married), whereas 32% of non-entrepreneurs fall into this category.<sup>15</sup>

Interestingly, the third column shows that there is little difference across the two groups in the overall divorce rate: roughly 28% of entrepreneurs and non-entrepreneurs alike report having been married before.<sup>16</sup> This, in turn, means that the rate of re-marriage must be higher for entrepreneurs, which is exactly what the final column of Panel A illustrates.

**7.2. Explaining the remarriage decision.** In Panel B, we explore whether the higher remarriage rate observed in entrepreneurs can be attributed to differences in attitudes and risk perceptions. Panel B reports regressions performed on the sub-sample of respondents who report having been married before. (This information is not available

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<sup>15</sup>The precise wording of the question allows persons living together but not married to count as married.

<sup>16</sup>We code this variable as a dummy equaling unity if the respondent is either currently divorced or has been married before. This may overcount divorce slightly, since it counts widowers, but this is unlikely to be an issue given the mean age of the respondents. In any case, the similarity of the divorce rate across groups puts this issue to rest.

in the 1992 survey.) The dependent variable in this probit regression is a dummy for remarriage.

The coefficients reported in Panel B are reported as the marginal change in the probability of remarriage associated with an infinitesimal change in the independent variable.<sup>17</sup> Since we know that there is a high degree of correlation between optimism, entrepreneurship, and a series of demographic characteristics (white, male, college-educated), we include demographic controls in each of the regressions. As the numbers in Panel B illustrate, these controls have a large impact on the decision to remarry: being male as opposed to female raises the probability by over 70% in each of the specifications; being white as opposed to black or hispanic raises it by over 6%. Being more educated also raises the probability of remarriage. Therefore controlling for these correlated factors is critical for establishing a link between life-style choice and optimism.

Column (1) of Panel B reports the effect of optimism on remarriage without additional controls. It shows that more optimistic respondents are much more likely to remarry. Across each specification, increased optimism raises the probability of remarriage. Given that a standard deviation in optimism is approximately ten years, this means that an individual who is one standard deviation more optimistic than the mean is about 4% more likely to remarry.

Is this an economically significant number? Ultimately this is difficult to establish, since our measure of optimism is based on a calculation that does not map directly into actions. But comparing the

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<sup>17</sup>The standard errors in the table are corrected for multiple imputation. But since marginal probabilities are a non-linear transformation of the point estimates, the reported marginal probabilities are based on regression estimates obtained from a randomly chosen implicate, rather than the multiply imputed data.



magnitude of optimism with other variables suggests that optimism is indeed important. A one-standard-deviation shift in optimism induces an increase in the probability of remarriage that is over half the effect associated with being white as opposed to black or hispanic.

The effect of optimism on the probability of remarriage hold up regardless of the other variables included in the regression. Age, for example, has a positive effect on the rate of remarriage, but including age does not drive out the significance of the optimism measure. (Note that Table 3 shows that older respondents are more biased in their life expectancies.)

Controlling for education, gender, and race, we see that risk tolerance has no statistical impact on the probability of remarriage. In unreported regressions that exclude demographic controls, risk tolerance is an important determinant of the remarriage decision, and risk tolerance increases the probability of remarriage. But this seems to capture an effect that varies primarily across demographic categories.

Finally, tying back to entrepreneurship, we see that the entrepreneurship dummy is significant for explaining remarriage even after we include demographic characteristics and the underlying attitudes that we think are responsible for entrepreneurial decisions. Even controlling for net worth, which is insignificant after other demographic controls are included, entrepreneurs are much more likely to remarry than non-entrepreneurs.

## 8. DOES OPTIMISM AFFECT PORTFOLIO CHOICE?

Thus far we have shown that optimism is correlated with self-employment, with hours worked per week and beliefs about retirement, and with the decision to remarry. In this section, we explore the role of optimism to

explain portfolio choice. We do this with probit regressions that model a respondents decision to own individual shares of equity or bonds.

The SCF reports whether an respondent owns individual shares of stock; this is distinct from other equity holdings that the respondent may own through an individual retirement account or mutual fund. In Table 10, we report probit regressions in which the dependent variable is a dummy for whether the respondent owns stock in this fashion. We explain stock ownership with optimism, attitudes toward risk, net worth, and a variety of demographic characteristics that are likely to be correlated with financial sophistication.

The table shows that optimism is highly positively correlated with stock ownership, even after controlling for a wide range of variables that might be correlated with optimism and equity participation. Optimism continues to have a strong positive relation to equity participation even after controlling for the respondent's self-assessment of risk and their net worth.

One alternative explanation is that optimism is capturing financial sophistication. To control for this, we replace the dependent variable with a dummy for bond ownership. If optimism is simply capturing financial sophistication, we would expect bond ownership to load positively on optimism. On the other hand, if optimism is a manifestation of some deeper psychological phenomenon like self-attribution bias, then we would not necessarily expect more optimistic people to own more bonds.

These results are reported in Table 11. Before we add demographic controls for financial sophistication, we do indeed see a positive relation between bond ownership and optimism. But this becomes insignificant

when we introduce net worth, an entrepreneurship dummy, and a vector of demographic controls.

Another obvious alternative explanation for our findings on stock ownership are that optimistic people think they will live longer, and therefore hold a greater fraction of their portfolio in equity because they think they are further from retirement. To guard against this possibility, we have repeated the regressions in Table 10 but changed the specification: instead of modelling the probability of owning individual stock, we instead model the level of ownership conditional on participation (i.e., among the subset of respondents who report positive stock ownership, or positive financial wealth).

In these untabulated regressions, we find that our measure of optimism has no ability to explain the level of stock ownership. It only explains participation in stock ownership, not portfolio allocation decisions. Thus, it is unlikely that our findings are being driven by differences in unobserved health quality or by mechanical relations between portfolio decisions and life expectancy.

## 9. CONCLUSION

Entrepreneurship is widely regarded as a key engine of growth in the U.S. economy, and yet the determinants of entrepreneurship are not well understood.

This paper is the first to explore the role of optimism in shaping entrepreneurial decisions. We develop a novel way of measuring optimism by comparing a survey respondent's self-reported life expectancy to their actuarial life expectancy, controlling for factors that are known to affect a person's lifespan. This measure allows us to relate optimism

to key economic choices across a large sample of individuals in the Survey of Consumer Finances.

We find overwhelming support for the idea that entrepreneurs are more optimistic than non-entrepreneurs with similar demographic characteristics. Even controlling for exogenous demographic characteristics, education, and wealth, entrepreneurs are more optimistic and more tolerant toward risk than non-entrepreneurs.

Our measure of optimism goes beyond entrepreneurship. We find that optimism affects work choices, career choices, retirement choices, portfolio choices and marital choices. This is an important finding in light of the fact that many psychologists have noted that optimism in one domain need not translate into optimism in other domains. Our findings indicate that optimism about one's life expectancy proxies for optimism in a range of other economic domains.

Our findings raise a number of important questions. To name one, the results linking optimism to portfolio choice suggest a tantalizing link between optimism, over-confidence, and self-attribution bias. Although we cannot test for these affects directly, the fact that optimistic people are more likely to own individual shares of stock, but not more likely to own a larger fraction of their wealth in the form of equities, suggests that they reckon themselves to be stock-pickers, or to somehow possess an advantage over ordinary investors. This explanation is consistent with optimism growing out of positive experiences that reinforce self-attribution bias. But ultimately this question is beyond the scope of our analysis. We are optimistic that answering these and other questions will become the focus of future research.

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TABLE 1. Frequency of self-reported entrepreneurship

In Panel A, the first row counts the total number of respondents in each year of the survey. The second row counts those whose work status is full-time employee. The third row counts those answering ‘Yes’ to the question “Do you own or share ownership in any privately-held businesses, farms, professional practices, limited partnerships or any other types of partnerships?” (Survey question x3103.) The fourth row counts appropriate responses to the question “Do you work for someone else, are you self-employed, or what?” (Survey question x4106.) The final row counts the intersection of these responses.

Panel A: Defining entrepreneurship					
Response	1992	1995	1998	2001	Total
Total respondents	2,918	3,098	3,094	3,276	12,386
Full-time employed	2,156	2,288	2,303	2,451	9,198
% of total respondents	74%	74%	74%	75%	74%
Self-employed	965	986	1,040	1,062	4,053
% of FT employed	45%	43%	45%	43%	44%
Owns privately held businesses	1,176	1,185	1,194	1,280	4,835
% of total respondents	40%	38%	39%	39%	39%
Owns & full-time self-employed	827	824	860	894	3,405
% of FT employed	38%	36%	37%	36%	37%
Panel B: Characteristics of entrepreneurs					
Non-entrepreneurs:	1992	1995	1998	2001	Total
White	78%	80%	78%	77.28%	78%
Male	74%	75%	73%	74.52%	74%
Completed college	35%	34%	34%	36.22%	35%
Entrepreneurs:	1992	1995	1998	2001	Total
White	91%	93%	93%	93.62%	93%
Male	96%	96%	96%	94.29%	96%
Completed college	66%	60%	65%	68.52%	65%





TABLE 3. Optimism, age, and health quality

Panel A reports mean optimism broken down by the respondent's self-assessment of health quality. Panel B reports mean optimism for entrepreneurs and non-entrepreneurs conditional on having reached sixty, seventy, or eighty years of age.

Panel A: Self-reported health quality and optimism			
	Excellent health	Good, fair, or poor health	
Non-entrepreneurs:	5.56	-0.981	
Entrepreneurs:	5.86	0.128	
T-(difference)	0.87	3.17	
p-value	0.38	0.00	

  

Panel B: Age and optimism			
	Age at survey:		
	> 60	> 70	> 80
Non-entrepreneurs:	1.06	1.36	1.94
	(2957)	(1639)	(531)
Entrepreneurs:	3.73	4.36	4.71
	(587)	(193)	(27)
T-(difference)	6.40	4.21	1.92
p-value	0.00	0.00	0.053

TABLE 4. What does optimism measure?

This table compares our measure of optimism and other health measures to the respondent's answer to the question "Which statement describes how you feel about economic conditions over the next five years?" The three answers were "Will improve," (n=5,199) "Will stay the same," (n=4,488) and "Will get worse" (n=7,265). Mean optimism is the average optimism, in years, for each response category. Health quality is the average health quality for respondents in that category, where excellent health corresponds to a numeric score of 1 and poor health a score of 4. The t-test reported below the response categories is a test of the null that the mean value for the 'will improve' category equals the mean of the other two categories. Standard errors are corrected for multiple imputation.

Economic conditions:	Mean Optimism	Health Quality	% who smoke	Father living?	Educ- ation
will improve	2.56	1.82	.21	.40	13.79
will stay the same	0.80	1.94	.24	.40	13.69
will get worse	1.19	1.87	.22	.40	13.74
t-test	6.61	5.44	-1.64	0.56	1.49

TABLE 5. Attitudes toward risk

In Panel A, the first set of numbers report responses to the question “In planning your saving and spending, which of the time periods listed on this page is most important to you?” Attitudes towards risk are solicited by question x3014, “Which of the following statements comes closest to the amount of financial risk you are willing to take when you save or make investments.” Responses are of the form, “TAKE X FINANCIAL RISKS EXPECTING TO EARN X RETURNS,” where X is either ‘substantial,’ ‘above average,’ ‘average;’ a fourth alternative is ‘Not Willing to take any financial risks.’ Minimum  $\chi^2$  reports the minimum value across the five implicates of a  $\chi^2$  test for independence of rows and columns of the table. Panel B reports family characteristics and work attitudes according to whether or not respondent is an entrepreneur.

## Panel A: Attitudes toward risk

	Willing to take X financial risk:				Total
	Substantial	Above Avg.	Average	Not willing	
No	4.46	17.45	39.39	38.7	100
Yes	9.85	32.28	44.93	12.94	100

Minimum  $\chi^2$ : 991

## Panel B: A broader picture of risk-taking

Entre-preneur	Which Planning Period Most Important?				Total
	Next Few Mos.	Next Year	Next Few Yrs.	More than 5 yrs.	
No	18.65	13.23	24.64	43.48	100
Yes	8.44	8.1	20.37	63.1	100

Minimum  $\chi^2$ : 467

## Family characteristics of entrepreneurs

Characteristics	Entrepreneur:			p-value
	No	Yes	$ t(diff) $	
% Married	0.55	0.82	30.18	0.00
# Kids, if married	1.01	1.17	5.66	0.00
Spouse works	37.95	40.72	3.81	0.00
Spouse self-employed	8.14	27.99	21.94	0.00

TABLE 6. The link between risk and optimism

Panel A presents tabulations of mean optimism according to the how much risk a respondent was willing to take for a commensurate amount of return. In Panel B, correlations are presented, broken down by whether the respondent was an entrepreneur.

Panel A: Optimism and Risk-taking				
Mean optimism if willing to take X financial risk:				
Entrepreneur	Substantial	Above Avg.	Average	Not willing
No	2.15	2.86	1.34	-0.33
Yes	3.72	3.76	2.96	1.34

  

Panel B: Correlations between risk and optimism				
	Entrepreneur:		Non-entrepreneur:	
	Risk	Optimism	Risk	Optimism
Risk	1.0	-	1.0	-
Optimism	.05	1.0	.09	1.0
p-value	(0.00)	-	(0.00)	-

TABLE 7. Regression analysis

The table reports probit analysis in which the dependent variable is a dummy equal to one if the respondent was full-time self-employed and owned equity in at least one privately held business. Risk tolerance is the response to the question described in Table 2. Optimism is the smoking-corrected bias in life expectancy as described in Table 3. Gender, and race are as described in Panel B of Table 1. Education takes on four values: did not attend college (1), did not graduate (2), graduated (3), post-graduate education (4). Married is a dummy variable for marital status, as described in Table 2. Number of children in the family is zero if unmarried, as in Table 2. Net worth is measured in millions of dollars. Point estimates and t-statistics (reported beneath point estimates in parentheses) are corrected for multiple imputation.

Explanatory variable:	Point estimates are $d\text{Prob}/dx$ , in percent				
	(1)	(2)	(3)	(4)	(5)
Risk Tolerance	10.46 (30.23)	9.98 (23.92)	5.24 (13.02)	5.31 (13.08)	5.17 (12.28)
Optimism		0.06 (5.53)	0.11 (4.06)	0.09 (3.65)	0.08 (3.23)
Race			9.39 (16.68)	9.41 (9.94)	8.67 (10.20)
Gender			15.90 (10.28)	11.97 (9.93)	12.36 (9.34)
Education			4.98 (17.00)	4.70 (16.01)	4.27 (14.59)
Married				7.10 (7.69)	4.90 (5.51)
Number of children				1.28 (4.49)	2.40 (7.03)
Net worth					0.12 (11.61)
Age at time of survey					0.17 (4.87)

TABLE 8. Work ethic, optimism, and entrepreneurship

Hours worked is the number of hours worked in a typical year by the respondent in their current full-time job. Never stop working is a dummy variable equaling one if the respondent answered that they never intended to retire. Remaining work is the number of years the respondent expected to continue full-time work. The t-statistics in the first two sets of columns control for multiple imputation; those in the third set of columns only use a single imputation, but corrects for right-censoring in the responses due to the respondents indicating that they never intended to stop working.

Explanatory Variable:	Dependent variable is:		
	Hours worked	Never stop working	Remaining Work
Life Expectancy	0.737 (53.44)	0.008 (7.83)	0.880 (60.499)
Optimism	0.776 (59.52)	0.011 (10.04)	0.896 (59.329)
	0.109 (6.73)	0.004 (3.68)	0.073 (5.439)
Risk tolerance	3.018 (21.79)	0.049 (6.90)	-0.493 (-2.113)
Net worth	0.015 (8.62)	0.004 (8.69)	0.037 (5.713)
Entrepreneur?	17.011 (38.50)	0.626 (18.60)	1.427 (3.813)
Observations	11,892	11,892	3,593

TABLE 9. Marriage, divorce, optimism and risk tolerance

This table uses data from the 1995, 1998, and 2001 surveys (the 1992 survey did not ask whether a respondent had been married before.) Panel A presents summary statistics for marriage, divorce, and remarriage according to whether the respondent is an entrepreneur. Panel B uses the subsample of previously divorced respondents to examine how attitudes affect the propensity to re-marry. Risk aversion runs from one to four, with one corresponding to willingness to take substantial risk, and four corresponding to no willingness to take risk. All t-statistics are corrected for multiple imputation.

Panel A: Marital status and entrepreneurship				
Entrepreneur?	Married	Divorced	Ever divorced	Re-married
Yes	0.82	0.07	0.275	0.20
No	0.55	0.12	0.278	0.13
t-(diff)	30.18	8.36	.22	8.23
p-value	0.00	0.00	0.41	0.00

  

Panel B: Probit regressions, dependent variable is remarried=1					
Explanatory variable:	Coefficients expressed in terms of $d(\text{Prob})/dx$				
	(1)	(2)	(3)	(4)	(5)
Optimism	0.42 (4.43)	0.43 (4.52)	0.39 (4.11)	0.38 (3.95)	0.38 (3.93)
Risk tolerance		1.88 (1.66)	1.20 (1.08)	1.65 (1.43)	1.80 (1.55)
Age			0.41 (4.99)	0.40 (4.92)	0.38 (4.67)
Entrepreneur?				5.89 (2.36)	5.32 (2.09)
Net worth					0.04 (1.20)
Education	2.81 (4.00)	3.10 (4.31)	2.59 (3.56)	2.30 (3.10)	2.28 (3.06)
Race=white	7.52 (2.62)	7.93 (2.77)	6.65 (2.29)	6.23 (2.15)	6.16 (2.12)
Gender=male	71.57 (22.48)	71.75 (22.61)	71.68 (22.50)	71.46 (22.23)	71.45 (22.23)



TABLE 10. Optimism, Entrepreneurship, and Stock Ownership

The dependent variable is a dummy for whether the respondent owned individual shares of stock in their portfolio of financial assets. This is distinct from ownership of equities through retirement accounts, mutual funds, and other vehicles. The dependent variables have been defined in previous tables. The variables 'Race=White' and 'Gender=Male' are dummy variables for whether the respondent is white or male, respectively.

	(1)	(2)	(3)	(4)	(5)
Optimism	0.001 (7.71)	0.001 (7.43)	0.001 (4.69)	0.001 (4.34)	0.001 (6.09)
Risk Tolerance		0.165 (20.36)	0.123 (14.43)	0.103 (12.17)	0.090 (10.64)
Net Worth			0.009 (62.54)	0.008 (50.79)	0.005 (37.59)
Entrepreneur?				0.203 (40.18)	0.077 (15.59)
Race=White					0.156 (29.20)
Gender=Male					0.057 (8.78)
Married					0.113 (22.28)
Education Level					0.057 (68.34)
Pseudo $R^2$	0.00	0.01	0.08	0.09	0.21

TABLE 11. Optimism, Entrepreneurship, and Bond Ownership

This table repeats the previous table but replaces the dependent variable with a dummy for whether the respondent owned bonds in their portfolio of financial assets.

	(1)	(2)	(3)	(4)	(5)
Optimism	0.000 (2.58)	0.000 (2.48)	0.000 (0.20)	-0.000 (0.40)	0.000 (0.67)
Risk Tolerance		0.029 (5.54)	0.000 (0.05)	-0.008 (1.69)	-0.010 (3.04)
Net Worth			0.002 (50.52)	0.001 (43.62)	0.001 (37.66)
Entrepreneur?				0.083 (27.30)	0.021 (10.05)
Race=White					0.058 (21.31)
Gender=Male					-0.002 (0.56)
Married					0.035 (14.24)
Education Level					0.019 (44.49)
Pseudo $R^2$	0.00	0.00	0.07	0.09	0.19