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**ABSTRACT**

This paper presents some of the first large-scale survey evidence linking optimism to major economic choices. We create a novel measure of optimism using the Survey of Consumer Finance by comparing a person's self-reported life expectancy to that implied by statistical tables. Optimists are more likely to believe that future economic conditions will improve. Self-employed respondents are more optimistic than regular wage earners. In general, more optimistic people work harder and anticipate longer age-adjusted work careers. They are more likely to remarry, conditional on divorce. In addition, they tilt their investment portfolios more toward individual stocks.

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## 1. INTRODUCTION

Social and medical scientists have amassed a wealth of experimental evidence indicating that dispositional optimism—having a positive general outlook in life—is important in a wide range of settings. Optimistic cancer patients face lower mortality risk (Schulz, Bookwala, Knapp, Scheier, and Williamson, 1996). Optimists experience faster recovery after coronary artery bypass surgery than pessimists do (Scheier, Matthews, Magovern, Lefebvre, and Abbot, 1989), and they adjust more smoothly to major life transitions like going to college (Aspinwall and Taylor, 1992) or failure to achieve a desired pregnancy (Litt, Tennen, Affleck, and Klock, 1992).

Similarly, optimism is posited to be at the root of many economic phenomena. For example, Gervais and Goldstein (2004) model how overconfidence in one’s own ability leads to excessive effort, resolving moral hazard problems in teams. 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. In asset pricing, optimism among a few investors may cause stock prices to exceed fundamental values in the presence of short-sale constraints (Miller, 1977). And many scholars have argued that optimism is a potential explanation behind the seemingly peculiar financial choices that the self-employed make.<sup>1</sup>

While the idea that optimism underlies many economic phenomena is compelling, there is a dearth of direct evidence on the role that optimism plays. In this paper, we present large-scale micro-level evidence linking optimism to a series of significant work and life related choices.

We ask whether optimism affects outcomes in family economics, portfolio choice, occupational choices, and beliefs about retirement. We find strong evidence that it does.

The major hurdle to amassing large-scale economic evidence on optimism is the difficulty in measuring optimism in economic survey data. To overcome this hurdle, we develop a measure of optimism using data from the Survey of Consumer Finances (SCF). The survey does not ask respondents about optimism directly, but it does ask respondents how long they expect to live. In addition, the survey tracks detailed demographic characteristics for each respondent. Using actuarial tables, 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.

Our measure of optimism correlates with beliefs about future economic conditions. Respondents who report that they think economic conditions will improve over the next five years are statistically much more optimistic according to our measure than respondents who think conditions will stay the same or deteriorate. This effect is large: those who think economic conditions will improve are almost two years more optimistic than those who do not. Demographic variables that are likely to correlate with unobserved health quality show no relation to beliefs about future economic conditions.

With a measure of optimism in hand, we next examine how it relates to significant life choices. Some of the most important economic decisions that people face occur relatively infrequently. These are the decisions that are most ripe for being influenced by attitudes and emotional disposition, since there is relatively little relevant data on which

to base an opinion. Our aim is to focus on questions such as these, including marriage decisions, retirement plans, and vocational choices. We examine the relation of optimism to the self-employment decision, retirement plans, re-marriage, and portfolio choice.

Looking at the labor market, we find evidence that self-employed people are more optimistic than regular wage earners. Also, we find that more optimistic people (regardless of their employment status) 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.

When we examine the decision to re-marry after divorce, we find that more optimistic people are more likely to remarry. This holds even after controlling for wealth, age, demographic characteristics, and after controlling for attitudes towards risk.

Optimism also affects portfolio choice. The SCF allows us to measure how much investment wealth is in equities versus other financial securities. It also further categorizes equity wealth into investments in mutual funds and individual stocks. Optimists are more likely to own individual stocks, and they own a larger fraction of their equity wealth in individual stocks. Thus, they appear to be stock-pickers. This suggests that our measure of optimism captures the idea that optimists place greater weight on more positive outcomes than pessimists do. However, there is no evidence that more optimistic people tilt their portfolios more toward equity per se. This suggests that our results do not arise mechanically from life-cycle investment decisions, such as the tendency for individuals who are at earlier points in their lifetime consumption profile to hold a greater fraction of their wealth in equity,

as suggested by Dybvig and Liu (2004) and conventional advice from personal investment counsellors.

Our findings contribute to the intersection of psychology and economics. Psychologists point out that optimism in one domain need not correlate with optimism in other domains. 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.” This biases against us finding results outside the domain of life expectancy, but our findings nevertheless suggest that optimism about life expectancy may be a good proxy for dispositional optimism suitable for use in large samples. Behavioral economics has long held the view that psychological considerations play an important role in many economic choices, but direct, large-sample evidence on this has lagged.<sup>2</sup> The evidence presented here complements recent theoretical work by Brunnermeier and Parker (2005), who develop a framework for analyzing expectations that may be biased towards optimism.

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, while in Section 4 we relate optimism to a range of socio-economic and demographic characteristics. Sections 5 through 7 present our main findings linking optimism to a range of economic choices, including entrepreneurship, labor market participation, re-marriage, and portfolio choice. Section 8 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. The survey randomly samples individuals to develop a picture of the economic health of a wide spectrum of the U.S. economy. Respondents are surveyed on a number of dimensions: employment status, whether they own their own business, retirement plans, portfolio holdings, and many other facets of financial life. And in recent years, the survey has begun to ask respondents about their beliefs regarding the outlook of the economy, their life expectancy, and attitudes toward risk, making it an ideal vehicle for observing the affect of attitudes on economic choices.

**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 non-response 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 imputates, 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>

### 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 instead mainly captures differences in individual characteristics that may be difficult to observe.

**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  $E_r(l|x)$ .

Table 1 tabulates responses to this question for each year of the survey. Each entry reports the fraction of that survey year's responses that fell in that interval: e.g., in 1995, 22.41 percent of respondents answered that they expected to live to age  $X$ , where  $X$  is an integer between 80 and 84.

[Insert Table 1 here]

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. Living to exactly 100 years old is also a fairly common response: about 8% of the sample in any given year expects to die at age 100. However, relatively few individuals report capricious answers.

As a safeguard, we checked that none of our results were sensitive to these outliers. We use unwindsorized values throughout the paper, but windsorizing at 1% and 99% has no effect on our results. In addition, we inspected the data by hand to ensure that peculiar interpretations of the question were not affecting any of our measurements. For example, if some types of individuals were 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.

**3.2. Actuarial life expectancy.** By itself, thinking that one will live longer does not constitute a valid measure of optimism, for an individual may have good reason to hold this view. Some individuals may be healthier than average, engage in fewer risky behaviors, or come

from demographic 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>4</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 Table 2. The third column in Panel B, labelled 'life table', 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, the average optimism for females in the survey is about six months, whereas the average optimism for males is over three years. This difference is highly statistically significant, even controlling for multiple imputation.

[Insert Table 2 here]

Using age, gender and race specific life tables helps to account for exogenous differences across individuals, but it still leaves this optimism measure open to many potential alternative interpretations. The most glaring alternative is that some individuals take better care of themselves, or are naturally healthier, and this 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).

As column (5) indicates, women are more likely to smoke than men. About one quarter of women in the SCF report that they smoke; only one-fifth of men do. 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 men are more likely to find themselves in more dangerous jobs absent higher education. The smoking-corrected life expectancy is reported in column (6).

#### 4. UNDERSTANDING OPTIMISM

Our optimism measure differs substantially from measures used in prior work in behavioral economics and finance. For example, Malamendier 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. While these measures shed light on important economic questions, by their very nature they lack the breadth to be applied to broader questions that go beyond CEO or managerial decisions.

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 through 5.

**4.1. The socio-demographics of optimism.** In Table 3 we regress optimism on a variety of socioeconomic and demographic measures to see which groups of people display more optimism. This also allows us to relate optimism to proxies that may be related to unobserved health characteristics.

[Insert Table 3 here]

The first column also reports OLS regressions of optimism on race, gender and education. Across specifications, white respondents are statistically less optimistic than respondents of other racial categories. Confirming a wealth of prior experimental studies on optimism, males are more optimistic by our measure, and this effect is large. Being male raises mean optimism by over two years, and this is highly statistically significant, with a standard error of a little more than four months. Likewise, more educated respondents are also more optimistic.

In the second model we add the respondent's age, their net worth, and a dummy for whether they are currently self-employed. The net worth figure is obtained from programs used to derive the Federal Reserve Bulletin's net worth calculations. Net worth, age and whether a respondent is self-employed are each important for explaining optimism.

The third column includes a vector of health measures that are likely to correlate with unobserved health quality. Smokers are statistically much more pessimistic about their life expectancy; smokers are six years less optimistic than non-smokers after controlling for wealth and other demographic characteristics. Since the life table calculation already controls for whether the respondent is a smoker, this effect is not being driven by an inappropriate choice of benchmark for smokers.

To account for a genetic predisposition towards longevity, we include variables from the SCF that proxy for parent's life-span. Ideally, the survey would ask respondents to report either their parents' current age or at what age they died. Instead, the survey asks only whether the parents are still living. While this is less informative for older respondents, the average age of a respondent is roughly fifty years, and

indeed about forty percent of respondents still had a living father at the time of the survey. Variables for whether the father and mother are still living are statistically significantly related to optimism. Having a living father raises optimism by about two years.

The final column includes two variables that are completed by the interviewer, rather than the respondent. In particular, the interviewer is asked to rate how articulate the respondent is, and whether they showed a good understanding of the questions at hand. These assessments may reflect some cognitive ability that is correlated with health, or they may measure overall success in life in a way that net worth does not. Indeed, articulate respondents are more optimistic, but there is no evidence that a good understanding of the questions is correlated with beliefs about longevity.

While many of the demographic and health-related variables are important for explaining optimism, the r-squared values reported in Table 3 suggest that nearly ninety percent of the variation in optimism is unexplained.

**4.2. Does optimism measure health quality?** To dig deeper into the relation between optimism and health quality, we explore respondents' answers to questions in the SCF about their health. The SCF asks respondents to rate their own health. They can respond with either 'excellent,' 'good,' 'fair,' or 'poor.' Since the survey contains no way to measure a respondent's health objectively, self-reported health quality likely measures some combination of optimism and unobserved health quality. Indeed, the responses tabulated in Table 4 indicate that around 80% of respondents report being in good or excellent health. This suggests that health quality could be used as an alternative measure of optimism. However, we avoid using it as such, since there is no

way to calibrate beliefs about health against a well-accepted standard based on objective characteristics such as demographics and smoking behavior.

[Insert Table 4 here]

To see whether health quality or optimism is likely to be responsible for our findings, we compare our optimism measure, 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 5, 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.

[Insert Table 5 here]

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 5 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. Nor is the fraction of respondents with a father still living different across economic outlook categories.

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 health characteristics, we find no evidence that more objective measures of health quality are correlated with economic outlook.

In the remainder of the paper, we use optimism as an explanatory variable in a range of economic settings. To ease exposition, we re-scale optimism so that it is mean zero with unit variance. While this makes interpreting point estimates in regression easier, it is intrinsically difficult to attach economic significance to the point estimates, because we ultimately do not know how to calibrate our optimism measure against the latent variable for which it proxies. Nevertheless, to ensure that our

results were not being driven by measurement error related to unobserved health quality, we re-estimated all our results replacing optimism with the error obtained by regressing optimism on socio-demographic and health characteristics, as reported in last column of Table 3. This regression-error optimism displays an identical pattern across economic outlook categories, and to each of the tables that follow. These results along with our results of correlation of our measure of optimism to positive economic outlook suggests that our results are being driven by optimism rather than unobserved differences in health quality.

## 5. OPTIMISM AND WORK CHOICES

**5.1. Optimism and the self-employment decision.** Given evidence from Hamilton (2000) that the self-employed face lower lifetime wage profiles, a natural question is how the decision to be self-employed is related to optimism. Of course, this evidence is also consistent with the self-employed displaying a greater tolerance for risk.<sup>5</sup>

To disentangle these explanations, we use variables from the SCF that gauge respondents' attitudes toward financial risk. In each year of our sample, the SCF asked: 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.

Table 6 presents results from a Probit analysis, correcting for multiple imputation. The dependent variable is a dummy for whether the

respondent is self-employed. 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 marginal change in the probability of being self-employed associated with each independent variable.

[Insert Table 6 here]

The table illustrates that optimism and risk tolerance have a statistically significant effect on whether a respondent is self-employed, 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 self-employment.<sup>6</sup>

The demographic controls illustrate the fact that the self-employed are largely white, male, college-educated respondents. Being white as opposed to black or Hispanic raises the probability of being self-employed 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 self-employment, 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 6 illustrates that risk tolerance and optimism are important determinants of self-employment, 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 become self-employed, as including them in the same regression does not diminish the importance of either.

**5.2. Allocating time to work and leisure.** Given the previous results linking self-employment to optimism, a natural question is how broader aspects of labor market participation are affected by optimism and attitudes toward risk. Table 7 explores this issue with three sets of regressions aimed at understanding hours worked and attitudes toward retirement.

The first pair of columns explores how attitudes affect current hours worked. The data include all respondents, regardless of whether they are self-employed. 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>7</sup> As explanatory variables we include the respondent's age, their optimism, risk tolerance, net worth, and a dummy for whether they are self-employed.<sup>8</sup> The p-values (reported in brackets below point estimates), as elsewhere, are adjusted for the effects of multiple imputation.

[Insert Table 7 here]

The first column indicates that both optimism and risk tolerance affect hours worked. More optimistic respondents work longer hours. This is consistent with the theoretical predictions of Gervais and Goldstein (2004), who show how optimism can alleviate shirking in team production settings, and Chacko, Chowdhry, Cohen, and Coval (2004), who also predict that optimists work harder.

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 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 self-employment in column (2), we see a very large effect on hours worked. The data indicate that the self-employed work roughly seventeen hours per week longer on average than do non-entrepreneurs. This speaks very clearly for the fact that the self-employed 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.

**5.3. 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 7, 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 7 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, age, risk tolerance, net worth and self-employment 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.

Self-employment has a dramatic effect on the expected retirement decision. Being self-employed raises the probability of expecting to work forever by seventeen percent.<sup>9</sup> This evidence supports the view that self-employed individuals 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 self-employment.

The third pair of columns in Table 7 present censored regressions of the time to retirement on the same set of independent variables described above. 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 age.

In sum, Table 7 establishes an important link between labor market participation (both in the short- and long-run), self-employment, and optimism. We find strong evidence that more optimistic individuals work more, both now and in the future.

## 6. OPTIMISM AND REMARRIAGE

Samuel Johnson called remarriage the triumph of hope over experience. In Table 8 we explore whether optimism is related to the decision to remarry.

The coefficients in Table 8 are reported as the marginal change in the probability of remarriage associated with a change in each independent variable. Since we know that there is a high degree of correlation between optimism, self-employment, and a series of demographic characteristics (white, male, college-educated), we include demographic controls in each of the regressions. As the figures 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. This effect holds 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.

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 self-employment, we see that the self-employment 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, the self-employed are much more likely to remarry than those who are not.

## 7. DOES OPTIMISM AFFECT PORTFOLIO CHOICE?

Portfolio choice provides another setting in which to gauge the economic effects of optimism. We calculate several measures of an individual's portfolio holdings. 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. Thus, we begin by creating a dummy for whether an individual owns any stock.

The SCF also draws a distinction between equity holdings and overall financial wealth. This allows us to create two additional variables of stock ownership. The first is the ratio of stock wealth to total equity wealth. The second is the ratio of equity wealth to total financial wealth. Ownership in private equity investments is not included in

either of these calculations, so these measures are not biased by correlations between optimism and self-employment.

In the first column of Table 9, we report a Probit regression in which the dependent variable is a dummy for whether the respondent owns any individual stock. 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 regression 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 has a strong positive relation to equity participation even after controlling for the respondent's self-assessment of risk and their net worth.

Is this finding important for portfolio allocation? To gauge this, we replace the stock ownership dummy with the fraction of individual stock assets to total financial assets. To rule out participation effects, we restrict the estimation to individuals who own some equity. Again, optimism is positive and significant.

The obvious alternative explanation for our findings on stock ownership are that optimistic people think they will live longer. Therefore they think they are further from retirement, all else equal, in which case our findings square with conventional advice offered by personal investment advisers (see also Dybvig and Liu (2004)). To guard against this possibility, the third column repeats the analysis but instead of modelling the probability of owning individual stock, we model the amount of equity assets as a fraction of total financial assets. In this specification, optimism is insignificant. Thus, optimism affects how equity

wealth is allocated between various equity instruments; it is not driving the portfolio allocation decision along the equity/debt dimension. 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.

Another 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 the fourth column. The relation between optimism and bond ownership is insignificant. Moreover, optimism has no impact on the ratio of bond wealth to overall financial assets.

In sum, this section illustrates that more optimistic individuals are more likely to be ‘stock-pickers’: that is, they are more likely to have equity invested in individual stocks, as opposed to mutual funds or other equity investment vehicles. Surprisingly, their portfolios are not more heavily tilted towards equity overall. Only the amount of equity allocated to individual stocks is higher. This puzzling fact speaks against the alternative explanation that we have merely captured differences in expected life-span, and indeed suggests a tantalizing link between the optimism we are measuring and self-attribution bias.

## 8. CONCLUSION

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 optimism impacts economic decision-making. We find that optimism affects work choices, career choices, retirement choices, portfolio choices and marital choices.

These 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 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." Our measure of optimism is indeed domain-based: it measures expectations in 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, even though it is domain-based, seems to capture important elements of dispositional optimism.

The fact that optimists work more, are less pre-disposed towards retirement, are more likely to be self-employed, to remarry, and to pick individual stocks suggests that optimism is a critical component

of economic decision-making, and that optimism plays an important role in economic outcomes. However, we must be cautious in drawing normative implications from these findings. Does optimism increase social welfare? We leave this question to future research.

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## NOTES

1. For example, self-employed individuals 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), and they accept lower median life-time earnings than similarly skilled wage-earners (Hamilton, 2000).
2. For more on the link between optimism and financial economics, 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.
3. 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.
4. 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-old persons may face lower mortality in 20 years than current 60 year-old persons do today. This bias has no impact on our measurements, since we are interested in cross-sectional variation in this measure.

5. In a companion paper (Puri and Robinson, 2005), we explore questions related to self-employment, private equity ownership, entrepreneurship, and risk-taking in greater detail.
6. These findings agree with those reported by Landier and Thesmar (2005), although our measures differ considerably. They use French survey data to relate entrepreneurial capital structure to optimism. They measure optimism as the miscalibration in the expectations of the success of their business. We measure optimism about one's expected life span, which seems to capture important elements of dispositional optimism and relates to many different kinds of economic choices including the self-employment decision itself.
7. 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.
8. In alternative specifications available from the authors, we replaced age with statistical life expectancy 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.
9. 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 self-employment are unaffected.

TABLE 1. Self-reported life expectancy

Survey Year	Percentage of respondents with self-reported age at death:											
	< 60	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	> 100	Total	
1995	2.73	3.15	4.7	12.14	14.28	22.41	14.64	11.9	4.62	8.76	0.67	100
1998	2.59	2.56	3.65	11.66	13.62	21.07	17.59	12.82	4.76	7.9	1.79	100
2001	1.86	2.48	3.97	10.42	12.79	22.43	16.06	15.37	4.32	8.59	1.71	100
Total	2.39	2.73	4.1	11.4	13.56	21.97	16.1	13.38	4.57	8.42	1.4	100

TABLE 2. Calculating optimism

		Life expectancy, based on age, gender, race:		Smoking/Educ. corrected:		
	Age	Self-reported	Life table	Optimism	% who smoke	Optimism
Female	51.24	82.76	82.17	0.59	26%	-0.33
Male	49.61	81.66	78.54	3.12	21%	2.00

TABLE 3. The demographics of optimism

Explanatory variable:	Dependent variable is optimism, in years			
	(1)	(2)	(3)	(4)
Constant	3.9482** [0.3587]	4.7429** [0.4689]	2.6995** [0.6834]	2.3997** [0.6893]
White?	-6.5463** [0.3554]	-6.6083** [0.3593]	-6.7608** [0.3488]	-6.8954** [0.3510]
Male?	2.8298** [0.2659]	2.5041** [0.2710]	2.3645** [0.2627]	2.3200** [0.2624]
Education	1.0084** [0.0724]	0.9162** [0.0745]	0.5389** [0.0731]	0.4932** [0.0743]
Age		-0.0151* [0.0066]	0.0334** [0.0096]	0.0345** [0.0096]
Net worth		0.0141** [0.0036]	0.0130** [0.0035]	0.0122** [0.0035]
Self employed?		1.1609** [0.2599]	0.7625** [0.2518]	0.7203** [0.2522]
Smoker?			-6.4064** [0.2620]	-6.3395** [0.2631]
Father living?			2.3692** [0.2803]	2.3712** [0.2802]
Mother living?			1.5826** [0.2765]	1.5802** [0.2764]
Articulate?				0.7619** [0.3420]
Understood well?				0.0051 [0.3432]
R-squared	0.0456	0.0495	0.1108	0.1119

OLS point estimates are reported. Standard errors are reported in brackets below point estimates and are corrected for multiple imputation. Single and double asterisks denote significance at the 5% and 1% level, respectively.

TABLE 4. Self-reported health quality

Year	Health quality is:				Total
	Excellent	Good	Fair	Poor	
1995	35.87	44.52	15.00	4.61	100.00
1998	34.63	46.23	15.17	3.97	100.00
2001	35.57	43.92	15.85	4.66	100.00
Total	35.36	44.88	15.35	4.42	100.00

TABLE 5. What does optimism measure?

	Mean	Health	% who	Father	Educ-
Economic conditions:	Optimism	Quality	smoke	living?	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

The final row reports a t-test for the null hypothesis that the mean within the “economic conditions will improve” group for each column equals the mean of the other two groups. The t-statistic is corrected for multiple imputation.

TABLE 6. Optimism and self-employment

Explanatory variable:	Dependent Variable is 1 if ever self-employed				
	(1)	(2)	(3)	(4)	(5)
Optimism	0.0235** [0.0000]	0.0161** [0.0001]	0.0146** [0.0004]	0.0130** [0.0013]	0.0133** [0.0012]
Risk tolerance	0.1103** [0.0000]	0.0579** [0.0000]	0.0588** [0.0000]	0.0535** [0.0000]	0.0593** [0.0000]
White?		0.1450** [0.0000]	0.1387** [0.0000]	0.1354** [0.0000]	0.1285** [0.0000]
Education		0.0587** [0.0000]	0.0557** [0.0000]	0.0526** [0.0000]	0.0514** [0.0000]
Male?		0.1891** [0.0000]	0.1374** [0.0000]	0.1360** [0.0000]	0.1480** [0.0000]
Married?			0.0872** [0.0000]	0.0796** [0.0000]	0.0586** [0.0000]
Children?			0.0084* [0.0103]	0.0116** [0.0007]	0.0242** [0.0000]
Net worth				0.0015** [0.0000]	0.0013** [0.0000]
Age					0.0024** [0.0000]
R-squared	0.0437	0.1159	0.1222	0.1323	0.1370

Point estimates are expressed as marginal probabilities. A constant term is estimated in each model. p-values are reported in brackets below point estimates and are corrected for multiple imputation. Single and double asterisks denote significance at the 5% and 1% level, respectively.

TABLE 7. Work ethic, optimism, and entrepreneurship

Explanatory Variable:	Dependent variable is:		
	Hours worked	Never stop working	Remaining Work
Optimism	1.0858** [0.0000]	0.7363** [0.0000]	0.6716** [0.0000]
Risk tolerance	4.2399** [0.0000]	2.4757** [0.0000]	-0.5812** [0.0017]
Age	-0.6487** [0.0000]	-0.6855** [0.0000]	-0.7773** [0.0000]
Net worth	0.0555** [0.0000]	0.0193** [0.0003]	0.0434** [0.0000]
Self employed?	17.1340** [0.0000]	0.1724** [0.0000]	1.4763** [0.0000]
R-squared	0.2746	0.3757	0.1282

The first two columns report OLS point estimates and p-values. Hours worked is the number of hours worked in a typical year by the respondent in their current full-time job. The third and fourth columns report marginal probabilities from a Probit estimation. Never stop working is a dummy variable equaling one if the respondent answered that they never intended to retire. Coefficients in this column are reported as marginal probabilities. The fifth and sixth columns report point estimates from a censored OLS regression. Remaining work is the number of years the respondent expected to continue full-time work. Respondents who indicated they never intended to stop working are right-censored. A constant term is estimated in each model. p-values are reported in brackets beneath point estimates and control for multiple imputation. Single and double asterisks denote significance at the 5% and 1% level, respectively.

TABLE 8. Marriage, divorce, optimism and risk tolerance

Explanatory variable:	Dependent variable is 1 if remarried				
	(1)	(2)	(3)	(4)	(5)
Optimism	0.0485** [0.0000]	0.0497** [0.0000]	0.0454** [0.0000]	0.0439** [0.0000]	0.0437** [0.0001]
Education	0.0263** [0.0001]	0.0291** [0.0000]	0.0250** [0.0004]	0.0224** [0.0015]	0.0221** [0.0017]
Male?	0.7078** [0.0000]	0.7096** [0.0000]	0.7095** [0.0000]	0.7075** [0.0000]	0.7074** [0.0000]
White?	0.1613** [0.0000]	0.1661** [0.0000]	0.1549** [0.0000]	0.1501** [0.0000]	0.1491** [0.0000]
Risk tolerance		-0.0189 [0.0657]	-0.0118 [0.1774]	-0.0156 [0.1124]	-0.0175 [0.0882]
Age			0.0035** [0.0000]	0.0034** [0.0000]	0.0033** [0.0000]
Self employed?				0.0478* [0.0247]	0.0428* [0.0415]
Net worth					0.0004 [0.1005]
R-squared	0.3888	0.3894	0.3938	0.3946	0.3951

Coefficients are expressed as marginal probabilities. A constant term is estimated in each model. p-values reported in brackets below point estimates and are corrected for multiple imputation. Single and double asterisks denote significance at the 5% and 1% level, respectively.

TABLE 9. Optimism and portfolio choice

Explanatory variable:	Dependent Variable is:				
	Stock Dummy	Stock/ Fin.	Equity/ Fin.	Bond Dummy	Bond/ Fin.
Optimism	0.0154** [0.0016]	0.0144** [0.0069]	0.0027 [0.2521]	0.0009 [0.3541]	0.0127 [0.0920]
Risk tolerance	0.1281** [0.0000]	0.0779** [0.0000]	0.0645** [0.0000]	0.0137** [0.0000]	0.0425** [0.0000]
Net worth	0.0043** [0.0000]	0.0014** [0.0000]	0.0002 [0.0516]	0.0006** [0.0000]	0.0018** [0.0000]
Self employed?	0.0319** [0.0017]	0.0391** [0.0001]	-0.0208** [0.0037]	0.0197** [0.0000]	0.0883** [0.0000]
Race=white?	0.1485** [0.0000]	0.0987** [0.0000]	0.0387** [0.0086]	0.0491** [0.0000]	0.3186** [0.0000]
Gender=male?	0.0540** [0.0003]	0.0498** [0.0034]	-0.0069 [0.2992]	0.0072 [0.1621]	0.0460 [0.0637]
Age	0.0059** [0.0000]	0.0068** [0.0000]	0.0000 [0.4420]	0.0029** [0.0000]	0.0119** [0.0000]
Education	0.0491** [0.0000]	0.0196** [0.0000]	0.0086** [0.0000]	0.0179** [0.0000]	0.0664** [0.0000]
Married?	0.0949** [0.0000]	-0.0075** [0.2898]	0.0127 [0.0981]	0.0223** [0.0000]	0.0851** [0.0001]
R-squared	0.2439	0.1351	0.1040	0.2349	0.2398

Stock (respectively, bond) dummy is a dummy for whether the respondent owned individual shares of stock (respectively bonds), in their portfolio of financial assets. This is distinct from ownership of equities through retirement accounts, mutual funds, and other vehicles, which comprise total financial equity holdings. Coefficients in these columns are reported as marginal probabilities. Stock/Fin. is the fraction of individual stock to total financial wealth. Equity/Fin. is the fraction of total equity to total financial wealth. These models are estimated on the subsample of respondents reporting positive equity ownership to control for participation effects. Bond/Fin. is the fraction of bond holdings to total financial wealth. A constant term is estimated in each equation. p-values are reported in brackets and are corrected for multiple imputation. Single and double asterisks denote significance at the 5% and 1% level, respectively.