OPTIMISM AND ECONOMIC CHOICE

MANJU PURI AND DAVID T. ROBINSON

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.

Date: First Draft: November 15, 2004. This Draft: July 31, 2005.

Duke University and NBER (Puri) and Duke University (Robinson). The authors are grateful for the comments and suggestions of Simon Gervais, Dirk Jenter, Ahmed Khwaja, Rick Larrick, Cade Massey, John Payne, Luca Rigotti, and seminar and conference participants at the University of Chicago, Duke, UNC, Ohio State, Carnegie-Mellon, the World Bank, ISB Hyderabad, the NY Federal Reserve and the NBER. The usual disclaimer applies.

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. 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; Chen, Hong, and Stein, 2003). 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. Indeed, many scholars have argued that optimism is a potential explanation behind the seemingly peculiar financial choices that the self-employed make.[1]

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.

[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).

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.

Our measure of optimism also correlates with scores from widely used psychological tests of optimism. In a companion paper (Puri and Robinson, 2005a), we report findings from a survey of MBA students who were administered a standard psychological optimism test, the

LOT-R (Scheier, Carver, and Bridges, 1994).[2] For these respondents, we also obtained a measure of optimism based on life expectancy miscalibration. The correlation between the two measures is over 0.45, and is robust to controls for demographics, sample selection, prior work experience, family longevity, beliefs about health quality, and proxies for intelligence.

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.

[2]The LOT-R tests measure generalized expectations that pertain more or less to the individual's entire life space and has been widely used in the psychology literature see e.g., Schulz, Bookwala, Knapp, Scheier, and Williamson (1996), Scheier, Matthews, Magovern, Lefebvre, and Abbot (1989), Aspinwall and Taylor (1992) or Litt, Tennen, Affleck, and Klock (1992).

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. Measuring dispositional optimism is an important topic in psychology. Psychologists point out that optimism in one domain need not correlate with optimism in other domains (see, e.g, Weinstein and Klein (1996)). So far, measures of dispositional optimism have been based on psychological tests, making their application to large scale samples difficult. Our findings suggest that our measure of optimism based on life expectancy miscalibration seems to capture a degree of dispositional optimism. This suggests 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.[3]

Philosophers since the time of Sophocles have argued that optimism is detrimental to human welfare.[4] It is not surprising, then, that optimism and over-confidence are often treated as synonyms used to describe a human tendency to make welfare-reducing errors in judgment. Our findings need not be interpreted along these lines. Our optimism measure could capture over-confidence about life expectancy, or it could simply reflect the fact that optimists rationally expect to live longer because they have better mental health (see, for example Danner, Snowdon, and Friesen (2001)). Either channel would lead optimism to affect economic outcomes. In that regard, the evidence presented here complements recent theoretical work by Brunnermeier and Parker (2005), who develop a framework for analyzing expectations that may be optimally 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 discusses alternative explanations for our findings, while 9 concludes.

[3]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.

[4]See Peterson (2000) for a fascinating discussion of the history of optimism.

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 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.[5]

3. Measuring optimism

Our measure of optimism involves comparing respondents' self-reported life expectancy to that implied by actuarial tables. Formally, let $\mathrm{E}_r(l|x)$ 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 $\mathrm{E}_r(\cdot)$. Similarly, let $\mathrm{E}_a(l|x)$ be the conditional expectation of l taken from an actuarial table. Our measure of optimism is then simply

$$\text{Optimism}_i = \mathrm{E}_r(l|x) - \mathrm{E}_a(l|x). \tag{1}$$

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

[5]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.

you will live?" We use the answer to this question as our value for $\mathrm{E}_r(l|x)$.

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

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

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:

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

where it is assumed that all individuals have died by some year T.[6]

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

[6]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.

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. These prior studies tend to focus on over-confidence, rather than optimism. 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 over-confidence, which is closely related to optimism about a firm's future performance. Landier and Thesmar (2005) compare ex post accounting data to entrepreneur's ex ante forecasts of success to relate entrepreneurial capital structure to optimism and over-confidence. 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 the breadth of questions that we examine here.

Before we conclude that we have uncovered an empirical proxy for optimism, we first demonstrate that our proxy for generalized expectations about the future squares with other potential measures. We do this in two ways. The first way is to compare our measure of generalized optimism with responses to forward-looking questions in the SCF. The second way is to compare our measure of optimism to other measures of optimism using out-of-sample tests.

4.1. **In-sample validity.** First, we compare our life expectancy miscalibration measure of optimism to other forward-looking variables contained in the SCF. We focus on expectations about near-term economic performance, both in general terms, and as it pertains to an individual's circumstances.

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 3, we report mean optimism 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 3 here]

One possible concern with our measure is that it may be polluted by unobserved differences in health quality, or it may simply capture past successes, which give rise to an optimistic outlook. We deal with these explanations in detail in section 8 when we explore alternative explanations for our main findings. Here, however, we focus attention on whether our measure is polluted by confounding factors such as unobserved health characteristics or past success.

The second column of Table 3 helps guard against the possibility that we are simply measuring unobserved health differences. Labelled 'Unexplained Optimism,' this column replaces our optimism measure with the regression error from a regression of optimism on demographics and proxies for genetic longevity. The independent variables in this regression are age, gender, race, education, smoking status, and dummy variables for whether a respondent's parents are still living. The residual from this regression presumably captures the portion of optimism that is not readily accounted for by demographics and family history. Unexplained optimism is also higher for those who think economic conditions will improve. This evidence that the forward-looking component of our variable is not unduly influenced by unobserved respondent characteristics.

The SCF also asks respondents whether they expect their incomes to grow over the next year. Responses to this answer are tabulated in Table 4 along with mean optimism scores for each group. Only about 3,900 respondents across the four sample years report that they think their income will grow over the next 12 months, versus almost 12,000 who expect their incomes to stay the same or decline. The mean optimism is over three years for respondents who think their incomes

will grow, whereas for the others it is a paltry 0.64 years (which is not significantly different than zero). A t-test for the difference in optimism between the two groups indicates that the difference is highly significant.

Again, in the second column we replace our optimism measure with the part of optimism that cannot be explained by demographics and family history. And once again, we see that unexplained optimism shows the same pattern as our standard optimism measure. Unexplained optimism is higher among those who expect their incomes to grow over the next year.

Another possibility is that optimism is less a forward-looking measure than a manifestation of past success. To gauge whether this is important for our measure, we turn to questions about past income growth. The SCF also asks whether a respondent's income has grown over the last five years. If expected income growth only affects optimism through its relation to past income history, then including past income growth should drive out the significance of expected income growth.

As Table 5 shows, this is not the case. Past income growth does not drive out expected future income growth. To be sure, past income growth is an important component of optimism—optimism loads positively and significantly on past income growth, indicating that respondents with prior success are indeed more optimistic. But even when we include past income growth, expected future income growth is highly significant. Thus, even when we control for past success as an alternative explanation, we still find that our measure of optimism captures forward-looking beliefs. Moreover, when we replace our dependent variable with the unexplained optimism measure discussed above, we see

that it loads on expected future income growth but not past income growth.

In sum, we find a strong positive correlation between economic outlook—both in general terms and as it pertains to an individual's income growth—and life expectancy miscalibration. It is difficult to dismiss this correlation as something that simply arises from unobserved health quality or past success. Instead, our optimism measure seems to capture generalized expectations about the future.

4.2. **Out-of-sample tests.** A second way to validate our optimism is to correlate it with other well accepted measures from psychology. Unfortunately, this comparison cannot be done within the sample of SCF resondents, since with the exception of Guiso, Sapienza, and Zingales (2005), standard economic surveys do not include well accepted psychological assessments of optimism as part of their survey design.[7]

Nonetheless, we have conducted a survey designed to calibrate our life expectancy miscalibration with an individual's score from a Life Orientation Test-Revised, devised by Scheier, Carver, and Bridges (1994) to measure dispositional optimism. A detailed analysis of the survey is contained in a companion paper (Puri and Robinson, 2005a).

The LOT-R is a series of six questions designed to elicit a respondent's outlook about uncertain future events. Respondents may give one of five answers, ranging from 'strongly agree' to 'strongly disagree.' Three of the six questions are positively oriented (e.g., 'In uncertain times, I usually expect the best') while three questions are negatively

[7]Guiso, Sapienza, and Zingales (2005) conduct a survey in Holland and Italy on the role that trust plays in determining an individual's willingness to participate in financial markets. They include one question from the LOT-R test of Scheier, Carver, and Bridges (1994) and find that their measure of trust is distinct from that.

oriented (e.g., 'If something can go wrong for me, it will'). The LOT-R is widely used as a measure of dispositional optimism in a broad range of research in psychology and psychosomatic medicine.

Our survey evidence indicates that the correlation between our life expectancy miscalibration and the LOT-R score is over 0.45. Respondents who agree or strongly agree to positively oriented questions display statistically large positive life expectancy miscalibration. Respondents who agree with negatively oriented questions display large negative life expectancy miscalibration.

Because our survey sampled weekend MBA students, we were able to use data from admissions records to control for many alternative hypotheses. The correlation between LOT-R and our optimism measure is robust to sample selection induced by survey non-response, to a measure of family longevity, to self-reported health status, to age, and to two proxies for intellectual capacity: the respondent's undergraduate GPA and their GMAT score.

These findings suggest that deviations from conditional average life expectancy capture generalized expectations about future outcomes and events. 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.

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.[8]

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]

[8]In a companion paper (Puri and Robinson, 2005b), we explore questions related to self-employment, private equity ownership, entrepreneurship, and risk-taking in greater detail.

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.[9]

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 be 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

[9]These findings agree with those reported by Landier and Thesmar (2005).

and attitudes toward risk. Table 7 explores 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.[10] As explanatory variables we include the respondent's age, their optimism, risk tolerance, net worth, and a dummy for whether they are self-employed.[11] 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

[10]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.

[11]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.

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.[12] 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

[12]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.

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. Alternative Explanations

In this section we explore some alternative explanations for our results. Our measure of optimism is based on deviations from conditional average life expectancy. Why do people think they will live longer than average? There are two possibilities. The first is that they are wrong—they are over-optimistic about their mortality. If we are capturing the first, then these people are indeed optimistic about their life expectancy. Under this explanation, our findings are related to a large literature in economics and finance on over-confidence. For example, our portfolio evidence would square with Barber and Odean (2000) or Barber and Odean (2001).

The second explanation is that optimists actually do live longer. In other words, optimists rationally forecast positive deviations from conditional life expectancy. Regarding this explanation, there is a large amount of research that suggests that optimistic people do indeed live longer (see e.g., Danner, Snowdon, and Friesen, 2001). This research suggests that positive attitudes inherent in optimistic people can actually cause them to live longer. If so, then too our measure captures optimism.

Given that optimism and life expectancy are correlated, could the economic choice decisions we observe be explained simply by the fact that people expect to live longer and not by optimism? While some of our results such as remarriage and time to retirement can perhaps be explained by increased longevity, many of our results do not easily lend themselves to such an explanation. It is difficult, for example, to construct an alternative based on life expectancy alone that explains why optimistic people have a rosier personal and general economic outlook. Likewise, our result that optimistic people work more hours

a week, and that they are stock pickers (but do not invest in more equity per se) is difficult to reconcile with a purely longevity-based explanation. As we discussed earlier rosier forecasts of the economy do not correlate with unobserved health qualities. Longer expected life span should translate into more equity holdings rather than individual stock picking. It is thus hard to explain any of these economic choices as being driven mechanically by longer expected life span.

As a final robustness check we return to unexpected optimism reported in Table 3. As we discussed earlier in Section 4, this is the regression error from a regression of our measure of optimism on a variety of socioeconomic and demographic measures such as gender, race, age, net worth, smoking status, and education.

As discussed above, this regression-error optimism displays an identical pattern across economic outlook categories, and to expected income growth categories. Indeed, as Table 10 illustrates, we obtain virtually identical results for each of our main findings when we replace the standard optimism with the regression-error optimism. To facilitate comparison between the tables, we standardized the regression error. In each of the main regressions, unexplained optimism is statistically significant, and the point estimates are roughly the same magnitude as those reported above. This indicates that most of the effects we report throughout the paper are not coming from the part of optimism that is readily explained by unobserved differences in family history, health, or demographics. Indeed, 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.

9. 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. While there is a large body of research suggesting that dispositional optimism is an important part of a person's mental make-up, there has been little in the economics literature attempting to capture dispositional optimism and relate it to economic choices. Part of the problem is the difficulty in measuring optimism. In the psychological literature, dispositional optimism has typically been measured by psychological tests which may not be appropriate in large samples. In-sample tests show our measure of optimism correlates well with expectations of how the economy will perform in the future. Interestingly, in out-of-sample tests we find our measure of optimism correlates well with the standard psychological tests. Thus our measure of optimism seems to capture important elements of dispositional optimism, and could potentially be used as a proxy on large samples favored by economists in future research.

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. Does optimistic outlook leave a person better or worse off? This is an important question that we leave to future research.

References

Aspinwall, L.G., and S. E. Taylor, 1992, Modeling Cognitive Adaptation: A longitudinal investigation of the impact of individual differences and coping on college adjustment and performance, *Journal of Personality and Social Psychology* 63, 989–1003.

Baker, Malcolm, Richard Ruback, and Jeffrey Wurgler, 2004, *Behavioral Corporate Finance: A Survey*.

Barber, Brad, and Terrance Odean, 2000, Trading is Hazardous to your Wealth: The Common Stock Investment Performance of Individual Investors, *Journal of Finance* 55, 773–806.

Barber, Brad, and Terrance Odean, 2001, Boys will be Boys: Gender, Overconfidence, and Common Stock Investment, *Quarterly Journal of Economics* 116, 261–292.

Barberis, Nicholas, and Richard Thaler, 2003, *A Survey of Behavioral Finance*Elsevier North-Holland vol. 1b of *Handbooks in Economics* chap. 18 1st edn.

Brunnermeier, Markus, and Jonathan Parker, 2005, Optimal Expectations, *American Economic Review* forthcoming.

Chacko, George, Bhagwan Chowdhry, Randolph Cohen, and Joshua Coval, 2004, Rational Exuberance: The Effects of Anticipation Utility, UCLA Working Paper.

Chen, Joseph, Harrison Hong, and Jeremy Stein, 2003, Breadth of Ownership and Stock Returns, *Journal of Financial Economics* 66, 171–205.

Danner, Deborah, David Snowdon, and Wallace Friesen, 2001, Position Emotions in Early Life and Longevity: Findings from the Nun Study, *Journal of Personality and Social Psychology* 80, 804–813.

Dybvig, Philip, and Hong Liu, 2004, Lifetime Consumption and Investment: Retirement and Constrained Borrowing, Working Paper Washington University.

Gentry, William, and Glenn Hubbard, 2001, Entrepreneurship and Household Saving, NBER Working Paper No. 7894.

Gervais, Simon, and Itay Goldstein, 2004, The effects of biased self-perception in teams, Working paper Duke University and The Wharton School.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales, 2005, Trusting the Stock Market, Working Paper, Northwestern and University of Chicago.

Hamilton, Barton, 2000, Does Entrepreneurship Pay? An Empirical Analysis of the Returns to Self-Employment, *Journal of Political Economy* 108, 604–631.

Heaton, John, and Deborah Lucas, 2000, Asset pricing and portfolio choice: the importance of entrepreneurial risk, *Journal of Finance* 55, 1163–1198.

Hirshleifer, David, 2001, Investor Psychology and Asset Pricing, *Journal of Finance* 56, 1533–1598.

Jenter, Dirk, 2004, Market Timing and Managerial Portfolio Decisions, *Journal of Finance* forthcoming.

Kinneckell, Arthur B., 2000, Wealth Measurement in the Survey of Consumer Finances: Methodology and Directions for Future Research, Working paper Federal Reserve Board of Governors Federal Reserve Board, Washington, DC.

Landier, Augustin, and David Thesmar, 2005, Financial contracting with optimistic entrepreneurs: theory and evidence, Working Paper, NYU.

Litt, M.D., H. Tennen, G. Affleck, and S. Klock, 1992, Coping and cognitive factors in adaptation to in vitro fertilization failure, *Journal of Behavioral Medicine* 15.

Little, Roderick J. A., and Donald B. Rubin, 1987, *Statistical Analysis with Missing Data*. (John Wiley and Sons New York, NY) first edn.

Malmendier, Ulrike, and Geoff Tate, 2004, CEO Overconfidence and corporate investment, *Journal of Finance* forthcoming.

Miller, Edward, 1977, Risk, Uncertainty, and Divergence of Opinion, *Journal of Finance* 32, 1151–1168.

Montalto, Catherine Phillips, and Jaimie Sung, 1996a, Multiple Imputation in the 1992 Survey of Consumer Finances, *Financial Counseling and Planning* 7, 133–146.

Montalto, Catherine Phillips, and Jaimie Sung, 1996b, SAS Code for RII Scalar Estimation, Computer program Ohio State University http://hec.osu.edu/people/shanna/scf/riiq.htm.

Moskowitz, Tobias, and Annette Vissing-Jorgensen, 2002, The Returns to Entrepreneurial Investment: A Private Equity Premium Puzzle?, *American Economic Review* 92, 745–778.

Peterson, Christopher, 2000, The Future of Optimism, *American Psychologist* 55, 44–55.

Puri, Manju, and David T. Robinson, 2005a, Dispositional Optimism and Life Expectancy Miscalibration, Duke University Working Paper.

Puri, Manju, and David T. Robinson, 2005b, Optimism, Entrepreneurship and Risk-taking, Working Paper, Duke University.

Richards, Hugh, 1999, *Life and worklife expectancies*. (Lawyers & Judges Publishing Company Tucson, AZ).

Rigotti, Luca, Matthew Ryan, and Rhema Vaithianathan, 2004, Entrepreneurial Innovation, Working paper Duke University.

Scheier, M.F., K. A. Matthews, J.F. Magovern, R.C. Lefebvre, and R.A. Abbot, 1989, Dispositional optimism and recovery from coronary artery bypass surgery: The beneficial effects on physical and psychological well-being, *Personality and Social Psychology* 57, 1024–1040.

Scheier, M. F., C. S. Carver, and M. W. Bridges, 1994, Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A re-evaluation of the Life Orientation Test, *Journal of Personality and Social Psychology* 67, 1063–1078.

Schulz, R., J. Bookwala, J.E. Knapp, M. Scheier, and G.M. Williamson, 1996, Pessimism, age and cancer mortality, *Psychology and Ageing* 11, 304–309.

Weinstein, Neil, and William M. Klein, 1996, Unrealistic Optimism: Present and Future, *Journal of Social and Clinical Psychology* 15, 1–8.

TABLE 1. Self-reported life expectancy

Survey	Percentage of respondents with self-reported age at death:											
Year	< 60	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100	> 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. Optimism and Economic Outlook

	Optimism	Unexplained optimism
Economy will improve over next 5 yrs.	2.56	1.07
Economy will stay the same	0.80	-.58
Economy will get worse	1.19	-.24
t-test	6.61	6.27

In the first column, the mean value of optimism is reported grouped according to how respondents judge future economic conditions. The second column replaces optimism with unexplained optimism, which is the regression error from regressing optimism on race, age, gender, net worth, smoking status, and dummy variables for whether a respondent's parents are still living.

TABLE 4. Optimism and the Perceived Dynamics of Income

	Optimism	Unexplained optimism
Income not expected to grow next yr. [n = 11,913]	0.64	-0.52
Income expected to grow next yr. [n = 3,918]	3.31	1.00
t-test	12.60	7.65

The dependent variable in the first column is the standardized optimism. In the second column the dependent variable is unexplained optimism, which is the regression error from regressing optimism on race, age, gender, net worth, smoking status, and dummy variables for whether a respondent's parents are still living.

TABLE 5. Optimism, Past and Future Income Growth

Dependent variable:	(1)	(2)
Income is expected to grow over the next year	.1693**	1.40**
	[0.020]	[0.219]
Income grew over the last five years	.1431**	.289
	[0.019]	[0.211]

The dependent variable in column (1) is the standardized optimism. In column (2) the dependent variable is unexplained optimism, which is the regression error from regressing optimism on race, age, gender, net worth, smoking status, and dummy variables for whether a respondent's parents are still living. p-values appear in brackets beneath point estimates. Point estimates denoted with two asterisks are statistically significant at the 1% level.

TABLE 6. Optimism and self-employment

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

	Dependent variable is:					
Explanatory Variable:	Hours worked		Never stop working		Remaining Work	
Optimism	1.0858**	0.7363**	0.0135**	0.0099**	0.6716**	0.6345**
	[0.0000]	[0.0000]	[0.0004]	[0.0051]	[0.0000]	[0.0001]
Risk tolerance	4.2399**	2.4757**	0.0275**	0.0106**	-0.5812**	-0.6902**
	[0.0000]	[0.0000]	[0.0000]	[0.0064]	[0.0017]	[0.0003]
Age	-0.6487**	-0.6855**	-0.0021**	-0.0028**	-0.7773**	-0.7946**
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Net worth	0.0555**	0.0193**	0.0009**	0.0007**	0.0434**	0.0400**
	[0.0000]	[0.0003]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Self employed?		17.1340**		0.1724**		1.4763**
		[0.0000]		[0.0000]		[0.0000]
R-squared	0.2746	0.3757	0.0228	0.0574	0.1282	0.1293

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

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

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

TABLE 10. Unexplained optimism and economic choice

	(1) Self-employed	(2) Hrs. worked	(3) Never retire	(4) Owns stock	(5) Re-married
Unexplained optimism	0.009	0.678	0.010	0.014	0.036
	(0.015)	(0.000)**	(0.000)**	(0.001)**	(0.000)**
Risk tolerance	-0.070	-2.675	-0.017	-0.138	0.015
	(0.000)	(0.000)**	(0.000)**	(0.000)**	(0.174)
Age	0.002	-0.668	-0.002	0.006	0.004
	(0.000)	(0.000)**	(0.000)**	(0.000)**	(0.000)**
Race=white	0.126	4.079	0.017	0.172	0.118
	(0.000)	(0.000)**	(0.071)	(0.000)**	(0.000)**
Gender=male	0.188	7.793	0.043	0.126	0.722
	(0.000)	(0.000)**	(0.000)**	(0.000)**	(0.000)**
Education	0.040	1.518	0.006	0.065	0.022
	(0.000)	(0.000)**	(0.001)**	(0.000)**	(0.001)**
Net worth	0.001	0.047	0.001	0.005	0.001
	(0.000)	(0.000)**	(0.000)**	(0.000)**	(0.036)*

This table repeats the main findings in the paper, but uses unexplained optimism in place of standard optimism. Unexplained optimism is the standardized residual from regressing optimism on race, age, gender, net worth, smoking status, and dummy variables for whether a respondent's parents are still living. Each regression contains 15,831 observations, except for model (5), which is limited to respondents who have been divorced before (n=4,466). p-values in parentheses.