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# Optimism and economic choice<sup>\*</sup>

Manju Puri<sup>a,b</sup>, David T. Robinson<sup>a</sup>

<sup>a</sup>*Duke University, Fuqua School of Business, Durham, NC 27708, USA*

<sup>b</sup>*National Bureau of Economic Research, Cambridge, MA 02138, USA*

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## Abstract

We create a novel measure of optimism using the Survey of Consumer Finance by comparing self-reported life expectancy to that implied by statistical tables. This measure of optimism correlates with positive beliefs about future economic conditions and with psychometric tests of optimism. Optimism is related to numerous work/life choices: more optimistic people work harder, expect to retire later, are more likely to remarry, invest more in individual stocks, and save more. Interestingly, however, moderate optimists display reasonable financial behavior, whereas extreme optimists display financial habits and behavior that are generally not considered prudent.

*Key words:* JEL: G11; D12; D14; Dispositional optimism, Psychology and economics, Household finance, Savings behavior, Self control

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mpuri@duke.edu

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<sup>2</sup> Corresponding author.

## 1 Introduction

Social and medical scientists have amassed a wealth of experimental evidence indicating that dispositional optimism—whereby one has a positive general outlook towards the future—matters for physical and psychological well-being.<sup>3</sup> Optimism is also understood to be at the root of many economic phenomena: optimism is important for financial intermediation (Coval and Thakor, 2004); it can affect corporate financial and accounting decisions (Heaton, 2002; Shefrin, 2005; Hackbarth, 2004; Ashton and Roberts, 2005; and others); it can inflate security prices in the presence of short-sale constraints (Chen, Hong, and Stein, 2003); it can be an important component of utility (Brunnermeier and Parker, 2005); and it can lead to over- and underreaction in stock returns (Barberis, Shleifer, and Vishny, 1998). Yet, in financial economics, there is relatively little direct evidence on the role that optimism plays in individual economic decision-making.

In this paper, our objective is to explore how optimism relates empirically to important individual economic decision-making. We start by proposing a novel measure of optimism. We then show evidence that optimism is related to a wide range of labor market and portfolio choice decisions. We next ask if optimism is related to prudent or irrational economic choices by linking the degree of optimism to a range of economic decisions that are commonly regarded as wise or foolish. We find, interestingly, that moderate optimism correlates to reasonably sensible economic decisions while extreme optimism correlates to seemingly irrational decisions.

The major hurdle to amassing large-scale economic evidence on optimism is measurement: direct psychometric tests of optimism are not conducted as part of large-scale economic surveys. To overcome this hurdle, we develop a measure

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<sup>3</sup> Section 3 contains a brief review of this evidence as well as a broader discussion of optimism in general.

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. This allows us to compare a person's subjective life expectancy to their actuarial life expectancy based on that person's demographic and lifestyle characteristics. Perhaps surprisingly, people on average are quite accurate at forecasting their life expectancy: the average forecast error is less than two years. Yet there is considerable variation in the accuracy of respondent's life expectancy forecasts. This life expectancy miscalibration is our measure of optimism.

The dispositional optimism literature, pioneered by Scheier and Carver (1985) and Scheier, Carver, and Bridges (1994), views optimism as generalized positive expectations about future events. We discuss the broader optimism literature, and its relation to economics, in greater detail in Section 3. An immediate question that arises is to what extent does our empirical proxy capture general positive expectations, or dispositional optimism as measured by standard psychometric tests administered by social psychologists?

To ensure that our measure captures optimism, the first part of the paper conducts two internal validity checks and an external validity check. First, we ask if our measure of optimism correlates with generalized positive expectations about the economy. It does. Respondents who think economic conditions will improve are statistically more optimistic than respondents who think conditions will stay the same or deteriorate. This effect is large. Second, we ask if our measure of optimism correlates with the individual's positive expectations of future income growth. Again, it does. Optimistic people are more likely to believe that their income will grow over the next five years, even controlling for past income growth.

In addition, our measure also correlates with scores obtained from standard psychological tests of dispositional optimism. Puri and Robinson (2006a) report findings from a survey of MBA students who were administered a standard psychological optimism test, the LOT-R (Scheier, Carver, and Bridges, 1994). The survey also measured optimism based on our life expectancy miscalibration. The correlation between the two measures is strong and highly statistically significant. Moreover, it 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, the second part of the paper examines how optimism 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, vocational choices, and portfolio choices. A brief highlight of our main results is as follows.

We find that more optimistic people work longer hours, anticipate longer age-adjusted work careers, and are more likely to think that they will never retire. This holds even after controlling for demographics, health quality, and whether the respondent is self-employed. In light of the evidence in Bitler, Moskowitz, and Vissing-Jorgensen (2004), this suggests that optimism may affect firm performance.

We find that more optimistic people are more likely to remarry conditional on divorce. (They are not less likely to have divorced, however.) This too holds after controlling for demographics, health quality, and attitudes towards risk.

We find that optimism is also related to portfolio choice and savings decisions. Optimists save more. They are more likely to own individual stocks, and they

tend to own a larger fraction of their equity wealth in individual stocks. Thus, they appear to be stock-pickers. Our portfolio choice findings are in line with the findings of Barber and Odean (2000). 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 conventional advice from personal investment counsellors.

Based on the observed relation between optimism and economic decisions, two questions immediately arise. The first question is normative: does optimism correlate with prudent decisions or foolish ones? The second question concerns causation: what is responsible for the observed relation? In the third part of the paper we attempt to address these issues in the context of our data.

To address the first question, we divide respondents according to whether they are moderately optimistic or extremely optimistic by our measure. We then relate moderate and extreme optimism to a series of relatively prudent or foolish attitudes and behaviors.

We find that there is a marked difference in the behavior of moderate and extreme optimists. Moderate optimists display prudent financial habits: they are more likely to pay their credit card balances on time, they have long planning horizons, and they report that they save because saving is a good thing to do. Extreme optimists, however, have short planning horizons and are less likely to think saving is a good thing to do. Moderate optimists save more, extreme optimists save less.

This distinction carries over into the economic choices of moderate versus extreme optimists. Moderate optimists work significantly harder and are much less likely to be day traders. Extreme optimists, on the other hand, work significantly fewer hours and hold more individual stock. These results suggest

that extreme optimism is closer perhaps to the overoptimism or overconfidence documented in finance, typically associated with financial habits and behavior that are generally not considered wise. However, our results also suggest a new dimension to optimism: a moderate amount of optimism can be positive; it is associated with good financial habits and prudent choices.

The balance of the paper is structured as follows. In Section 2, we begin with a brief discussion of the SCF and highlight some of the econometric challenges that are often overlooked when using it. Then in Section 3 we turn to the issue of optimism. First we explore the psychology and economics literature on optimism. Then we develop our empirical measure based on life expectancy miscalibration.

In Section 4 we explore the demographics of optimism and offer several validity checks of our measure. In Section 5 we present our main findings on optimism and labor market decisions and remarriage, while in Section 6 we present findings linking optimism and financial market decisions.

To explore the question of causation, Section 7 examines three hypotheses that could explain our results. Hypothesis I is that optimism causes these economic choices to be made. Hypothesis II is that optimistic people have private information about their longevity, or else actually do live longer because they are optimistic. This increased longevity then drives their decision-making. Hypothesis III is that optimism does not cause these economic choices but is correlated with other characteristics that are associated with these economic choices. We take a number of steps to address these hypotheses, and find that our main results are best explained by Hypothesis I. In particular, the dichotomy we observe between extreme and moderate optimism is hard to reconcile with Hypotheses II and III.

To explain this dichotomy, we conclude Section 7 by examining self-control differences between moderate and extreme optimists. We examine two deci-

sions, one in the financial domain, the other in the health domain. Moderate optimism is associated with a lower incidence of smoking, but extreme optimists are more likely to smoke. In addition, extreme optimists hold a larger fraction of their wealth in the form of illiquid assets, while moderate optimists hold fewer illiquid assets. These findings indicate that moderate optimists may face fewer self-control problems, and that they therefore take fewer steps to correct them. This, in turn, offers another way to distinguish the hypotheses set out above.

Section 8 concludes.

## 2 Data and econometric issues

We use the Survey of Consumer Finances (SCF) to study the relation between optimism and economic choice. 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 relation between attitudes and economic choices.

To provide the most complete data possible to the research community, the SCF uses multiple imputation to correct for missing or sensitive data.<sup>4</sup> Correctly accounting for the effect of multiple imputation is often overlooked, but

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<sup>4</sup> 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.

is critical for making appropriate statistical inference. To adjust our standard errors, we follow techniques described in Montalto and Sung (1996) and Little and Rubin (1987), averaging the standard errors from each imputation, plus adding on a term that accounts for the variation across implicates.<sup>5</sup> 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 produces large standard errors relative to the average across implicates, and the across-imputation variance were 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). All of the results in this paper are corrected for multiple imputation.

### 3 What is optimism?

#### 3.1 *Theories of optimism*

The dispositional optimism literature pioneered by Scheier and Carver (1985) and Scheier, Carver, and Bridges (1994), views optimism as generalized positive expectations about future events. The central thesis here is that while optimistic bias may vary from one setting to the next (Weinstein, 1980), dispositional optimism is a psychological trait that lies at the heart of an individual's outlook on life in general.

There is a large body of evidence in psychology and medicine that illustrates the power of dispositional optimism. For example, optimistic cancer patients face lower mortality risk (Schulz, Bookwala, Knapp, Scheier, and Williamson, 1996), and they experience faster recovery after coronary artery bypass surgery

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<sup>5</sup> Stata code for calculating imputation corrected standard errors is available from the authors at <http://faculty.fuqua.duke.edu/~davidr/code/index.html>.

than pessimists do (Scheier, Matthews, Magovern, Lefebvre, and Abbot, 1989). They also 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).

The evidence in psychology suggests that one main channel through which dispositional optimism works is through developing coping habits or behavior that is more likely to lead to desired outcomes. Thus, optimistic people at risk for skin cancer are more likely to report use of sunscreen (Friedman, Weinberg, Webb, Cooper, and Bruce, 1995); optimistic coronary artery bypass patients are more likely than pessimists to be taking vitamins, eating low-fat foods, and to be enrolled in a cardiac rehab program five years after surgery. Similarly, optimists display better ability to cope with stressful life events such as transition to college (see references above). The bulk of the evidence suggests that the channels through which optimism works is through coping habits or behavior that is more likely to lead to desired outcomes. Some recent theoretical papers in finance suggest that mildly optimistic managers ameliorate manager-shareholder conflicts (Hackbarth, 2004).

Dispositional optimism, and the larger literature in positive psychology pioneered by Seligman (2000) of which it is a part, is not the only perspective psychologists have on optimism. In particular, the literature on optimistic bias—overestimates of the probability that a favorable outcome will occur, or underestimates that a negative outcome will occur—argues that overoptimism can be foolish, dangerous, and unhealthy. For example, Weinstein (1980) and Weinstein and Klein (1996) show that many people hold wildly miscalibrated beliefs about the personal risk they face with respect to illness and mishap. This line of thinking illustrates the dangers of extreme optimism, which may lead individuals to neglect taking basic precautionary measures.

This negative view of optimism squares with the economics literature's focus on related psychological concepts such as overconfidence (especially with regard to the likelihood of future events). The prevailing wisdom in economics is that optimism must lead to suboptimal decisions, and hence to lower utility. A large number of studies in finance either illustrate that various proxies for optimism lead to behavior that might not be rationally justified. For example, Odean (1998) provides evidence on individual equity ownership, while Arabshibani, de Meza, Maloney, and Pearson (2000), Bernardo and Welch (2001), and Coelho, de Meza, and Reyniers (2004) provide evidence on entrepreneurship.

Given that our empirical measure of optimism is rooted in the dispositional optimism literature, and that we relate this measure to economic decision-making, it is fair to ask how someone could be better off by holding systematically mistaken beliefs about the future. Economic theory only admits a narrow range of possibilities. One is laid out in Brunnermeier and Parker (2005), where utility has an anticipatory component. In Brunnermeier and Parker (2005), an individual may get greater overall utility if the anticipation of good things on the horizon outweighs the ex post mistaken actions to which these beliefs sometimes lead.

Another possibility is that optimism is a form of commitment in a game against a future version of oneself. This possibility is particularly amenable to the evidence on adopting good habits, since it suggests that optimism is a strategy that changes the calculus of taking repeated, small actions in preparation of a state of the world in the distant future. The optimist overweights this future state of the world, which raises the benefit of the small actions, but does not overweight it by so much that the future state appears inevitable, in which case no preparation is necessary.

A final possibility is that the observable data upon which people make everyday decisions underidentifies the decisions of interest, and therefore rationally admits multiple points of view. In such a world, individuals are free to choose from a set of possible distributions that are consistent with observables. An optimist would be someone who has a prior distribution that places the greatest weight on desirable outcomes and the least weight on unfavorable outcomes, conditional on the data. Such a person may be led by these beliefs to make decisions that are ex post utility enhancing. (See Rigotti, Ryan, and Vaithianathan (2004) for a model of entrepreneurship along these lines.)

### 3.2 *Measuring optimism*

We use life expectancy miscalibration as our measure of optimism. This involves comparing respondents' self-reported life expectancy to that implied by actuarial tables. In this section, we provide the details behind that calculation.

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

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

First we describe how the pieces of Eq. (1) are calculated or obtained. Then we study optimism in greater detail, exploring, in particular, whether the measure captures differences in expectations, or whether instead it mainly captures differences in individual characteristics that may be difficult to observe.

### 3.2.1 *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 the indicated survey year’s responses that fell in that interval: e.g., in 1995, 22.41 % of respondents answered that they expected to live to age X, where X is an integer between 80 and 84.

Respondents were allowed to report any positive integer, but there is 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.

### 3.2.2 *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.

We draw life tables from a number of sources to create the most accurate possible estimate of a respondent's lifespan. These are also reported in Table 1. The last row of Panel A reports the distribution of the expected statistical age at death for the respondents in the SCF. The vast majority of the data cluster between 75-84 years of age. Partly, this arises because we are plotting the distribution of a mean: this is not the probability of dying between ages  $x$  and  $x+5$ , but rather the fraction of respondents whose expected age at death falls between  $x$  and  $x+5$ .

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.

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 partially 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). Of course, this is only a partial adjustment; in Section 7 we address further alternatives in greater detail.

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, Malmendier and Tate (2005) use the early exercise behavior of CEOs who hold stock options in their own firms as a proxy for overconfidence, which in their setting is closely related to optimism. Jenter (2005) uses a 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 cannot be applied to questions that extend beyond CEO or managerial decisions to the everyday economic decisions made by individuals.

### 4.1 *The demographics of life expectancy and optimism*

To ensure that our empirical proxy captures optimism, we perform a variety of validity checks on our measure of optimism. In Panel C of Table 1 we regress the self-reported life expectancy on the statistical life expectancy plus controls to see if our measure is driven by extreme bias in an individual's beliefs.

The results from the first regression indicate that raising statistical life expectancy by one year raises self-reported life expectancy by roughly nine months, and that the average difference between the two is over 20 years. As we see from the second set of regression coefficients, however, this is largely driven by the fact that underlying demographics also vary when statistical life expectancy is varied. Holding constant gender, race, and education, statistical and self-reported life expectancy vary almost one-for-one. The constant term drops to only five years, with a standard error of two years.

In Table 2 we explore how demographics are related to optimism. Whereas the dependent variable in the previous regression was self-reported life expectancy, in this table it is our main optimism measure, the difference between self-reported and statistical life expectancy. Whites underestimate their life expectancy while males overestimate theirs. Education and self-employment increase optimism, but their economic impact is smaller than that of gender and race. Smokers are more pessimistic than is warranted by their smoking-adjusted life expectancy, while those respondents with still-living parents perhaps rightly are more optimistic about their life expectancy than others. Not surprisingly, self-reports of past income growth are positively related to optimism.

The  $R^2$  from this regression is important in its own right. While the loadings on the demographics are easy to reconcile with common-sense explanations, it is important to note that these regressions explain at most around 11% of the variation in optimism. The vast majority of optimism is idiosyncratic to the individual respondent. This is important because it indicates that while there is a statistically reliable demographic component to optimism, and that some amount of optimism may be attributable to past success, much optimism is

unexplained. Therefore we are not simply repackaging demographic variables in a statistically convenient fashion in the analysis that follows.<sup>6</sup>

#### 4.2 *Optimism and macroeconomic beliefs*

We compare our optimism measure to the survey respondent's assessment of future economic conditions to see if our measure of optimism correlates to generalized expectations. 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 35 and 40% of respondents in each survey report that conditions will get worse.

First, we perform Probit regressions in which the dependent variable is a dummy for whether the respondent thinks economic conditions will improve. This is reported in columns (5) through (8) of Table 2. The coefficient magnitudes are not immediately comparable to those reported in columns (1)-(4), but the signs of the coefficients indicate that demographic characteristics affect beliefs about macroeconomic conditions in the same way that they affect life expectancy miscalibration. Even though macroeconomic optimism is coarsely defined, the similarity across the columns of Table 2 provides some cross-validation for the idea that life expectancy miscalibration captures dispositional optimism.<sup>7</sup>

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<sup>6</sup> As a robustness check, in unreported tables we replace optimism with the regression error obtained from columns (3) and (4). All our main findings hold using either of these measures of "unexplained optimism," the part of the main optimism variable that cannot be explained by demographics and income growth. This is discussed in greater detail in Section 7.

<sup>7</sup> We are grateful to the referee for suggesting this analysis.

Next, we turn to the relation between our measure of optimism and general economic expectations. In Panel A of Table 3, we report mean optimism for each answer to the question about economic outlook. 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 easily rejected, with a  $t$ -statistic of 6.61.

As another validity check we also compare our optimism measure to expectations of future income growth. The SCF asks respondents whether they expect their income to grow in the next year. This is reported in Panel B of Table 3. The mean optimism of respondents who expect income to grow in the next year is 3.31 years while the mean optimism of respondents who do not expect income to grow in the next year is only 0.64 years. In Panel C, we regress optimism on past income growth, expected future income growth, and a dummy for whether the respondent thinks the economy will improve. Each of the loadings is positive and highly statistically significant, which indicates that the relation between future expected income growth and our measure of optimism continues to be strong even after we control for past income growth and beliefs about the economy.

#### *4.3 Optimism and risk-taking*

Is optimism simply a proxy for risk taking? In order to assess this 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.”

The correlation between optimism and risk-taking is presented in the first row of correlations in Table 4. Interestingly, while optimism is significantly related to attitudes toward risk, the correlation is low, less than 10%. We control for risk tolerance in all our regressions. The remainder of the table presents raw correlations between optimism and the key variables of interest that we pursue throughout the remainder of the paper. With the exception of the day-trader dummy, discussed in Section 7, each of the raw correlations is positive and highly statistically significant.

In the remainder of the paper, we use optimism as an explanatory variable in a range of economic settings, controlling for other variables that have already been shown to co-vary with optimism. To ease exposition, we re-scale optimism so that it is mean zero with unit variance. As we can see from the top portion of Table 4, this involves subtracting off the mean value of optimism (1.31) and dividing by standard deviation (roughly ten years). While this makes interpreting point estimates in regression easier, it is intrinsically difficult to attach economic significance to the point estimates, because ultimately it is difficult to calibrate optimism in an economically meaningful way. Nevertheless, to ensure that our results are not being driven by measurement error related to unobserved health quality, in unreported tables we re-estimate all our results two ways, replacing optimism with the regression errors first from column (3) and then from column (4) of Table 2. These regression errors capture the part of optimism that cannot be explained by demographics and income growth: these regression errors display an identical pattern across economic outlook categories, and to each of the key results that follow. These results along with our results on the correlation of our measure of optimism

to a positive economic outlook suggests that our results are being driven by optimism rather than unobserved differences in health quality.

In addition, we perform an out of sample validity check on our life expectancy miscalibration measure by calibrating our measure against a standard psychometric test of dispositional optimism. This is detailed in Puri and Robinson (2006a), in which a group of 80 MBA students at Duke University were administered a standard psychological optimism test, the LOT-R (Scheier, Carver, and Bridges, 1994). This test asks respondents to report how strongly they agree with statements like “Overall, I expect more good things to happen to me than bad.” Respondents were also scored on life expectancy miscalibration. The degree of life expectancy miscalibration varies strongly with the response to each question of the LOT-R, and in fact the raw correlation between the two measures is over 0.45, which is highly statistically significant. More importantly, it is robust to controls for demographics, sample selection, prior work experience, family longevity, beliefs about health quality, and proxies for intelligence. These suggest that life expectancy miscalibration captures dispositional optimism as measured by psychologists to a large extent, and hence is a reasonable proxy for optimism.

## 5 Optimism and work/life choices

This section relates optimism to a variety of labor market decisions. First we examine how optimism relates to decisions about the labor/leisure tradeoff. Then we examine the relation between optimism and retirement decisions. Finally, we examine the relation between optimism and remarriage.

### 5.1 *Allocating time to work and leisure*

A natural question is how optimism is related to work choices. Table 5 explores work and retirement choices with three sets of regressions aimed at understanding hours worked and attitudes toward retirement.

The first pair of columns explores how attitudes relate to 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. (Similar results obtain based on a question asking how much respondents had worked over the last few weeks, but the variance of this response was considerably higher.) 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.

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 argue that optimists overestimate the marginal product of their labor and work harder, 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

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<sup>8</sup> In alternative specifications available from the authors, we replace age with statistical life expectancy and obtain qualitatively identical findings. None of the variables of interest is sensitive to this specification choice.

entrepreneurs) or involved with more complex organizations that are more demanding of their time. Younger respondents also work longer.

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 17 hours per week longer on average than do non-entrepreneurs. This speaks clearly to the fact that the self-employed derive nonpecuniary benefits from work. Nevertheless, this does not drive out the significance of optimism and attitudes toward risk. Even accounting for the fact that entrepreneurs work many more hours per week than the typical non-entrepreneur, more optimistic and more risk-tolerant individuals work more. Bitler, Moskowitz, and Vissing-Jorgensen (2004) show that more hours worked, or increased effort relates to better firm performance. Together with our results this suggests an empirical relationship between optimism and firm performance.

## 5.2 *Attitudes toward retirement*

Not only do more optimistic and more risk-tolerant people work more each week, their total expected work-life is longer. This is illustrated in the remaining columns of Table 5, which explore attitudes toward retirement.

To explore attitudes toward retirement, we use a question that 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 5 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. Being self-employed raises the probability of expecting to work forever by 17%. But in all cases the loading on optimism continues to be positive and significant.

The third pair of columns in Table 5 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 5 establishes an important link between labor market participation (both in the short and long run) and optimism. We find strong evidence that more optimistic individuals work more, both now and in the future.

### *5.3 Optimism and remarriage*

Samuel Johnson called remarriage the triumph of hope over experience. In this subsection we examine Johnson's hypothesis by exploring whether optimism is related to the decision to remarry.

To do this, we focus attention on the 4,795 respondents in the SCF who report that they have been divorced before. Within this subsample, we estimate Probits of the probability of being married as a function of optimism, risk tolerance, and key demographic variables. This is presented in Table 6.

The coefficients in Table 6 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, as does self-employment, but including age and self-employment does not drive out the significance of the optimism measure.

Risk tolerance impacts the probability of remarriage even after controlling for demographic characteristics. Intuitively, since marriage is ultimately a matching problem, having a greater tolerance for risk could produce two effects. One, it could increase the probability of being remarried, since it could make a partner more willing to sign on to the uncertainties associated with the current match. On the other hand, it could make a partner less willing to sign

on to the current match, instead preferring the uncertainties of waiting for a better match to arrive. Empirically, we see that the first effect dominates, at least in our sample. Since we measure risk-taking in the domain of financial gambles, and optimism in the domain of life expectancy, these findings are interesting because they indicate that attitudes transfer from one domain to another.

## 6 Optimism and financial decisions

In this section, we turn from the labor market to the capital market. First we examine how optimism relates to a variety of portfolio choice decisions. Then we relate optimism to savings decisions.

### 6.1 *Optimism and 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 draws a distinction between equity holdings and overall financial wealth. This allows us to create two 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 (see Puri and Robinson, 2006b).

To see if optimism is important for portfolio allocation, we first examine the fraction of individual stock assets to total financial assets. This is reported in Table 7. To rule out participation effects, we restrict the estimation to indi-

viduals who own some equity. (Optimism is highly significant for participation in the equity market.) Optimism is positive and significant.

The obvious alternative explanation for our findings on stock ownership is 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 models the amount of equity assets as a fraction of total financial assets. In this specification, optimism is insignificant. Thus, optimism relates to how equity wealth is allocated between various equity instruments; but it is not related to the portfolio allocation decision along the equity/debt dimension.

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. The bond ownership dummy is one if the respondent owns mortgage-backed, tax-exempt, government, corporate, or foreign bonds. 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 negative rather than positive, but is insignificant. Moreover, in unreported regressions we show that optimism has no impact on the ratio of bond wealth to overall financial assets.

Next we explore whether this increased equity ownership points towards day-trading. To explore this possibility more directly, we explore information in the SCF that asks respondents about their frequency of stock trading. We label a

respondent a day-trader if they report that they trade on a daily frequency. As seen in column six, optimistic people are less likely to be day-traders.

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; indeed, it suggests a tantalizing link between the optimism we are measuring and self-attribution bias. Our result on the lack of day-trading suggests however that other factors may be operating at the same time. We turn our attention to such factors in the final two columns of Table 7.

### *6.2 Optimism and savings decisions*

Next we turn to the relation between optimism and savings behavior. For this, we use the question in the SCF that asks “Would you say that your spending exceeded your income, that it was about the same as your income, or that you spent less than your income?” (question X7508). In the fifth column of Table 7, we report the results of a Probit regression in which the dependent variable is equal to one if the respondent reported spending less than their income.

We model the probability of saving as a function of optimism and the controls that we have used in our previous analysis.<sup>9</sup> A one-standard deviation shift in optimism increases the probability of savings by about 2%. In the final column of Table 7, we regress the amount of savings, measured by the ratio of wealth

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<sup>9</sup> Our results are robust to specifications that introduce nonlinearities in age.

to income, against these same variables. Optimism is statistically significant here also.

In general, the evidence in the final two columns of Table 7 indicates that optimists save more. But this evidence, coupled with the portfolio choice evidence, paints a complicated picture of optimism. Some of their decisions, like the decision to save, seem prudent, while other decisions, like picking individual stocks, seem potentially foolhardy. To explore these apparent contradictions more deeply, we next turn to hypotheses that help us to explain why optimism affects economic decision-making.

## 7 Why does optimism relate to economic behavior?

The previous sections establish an empirical relation between optimism and both financial habits and economic behavior. Optimists display different behaviors and appear to hold different beliefs across a wide range of economic settings. Understanding the fundamental source of this relation is an important question for future research. Using the SCF, we are able to take some initial steps in this direction by conducting additional tests that explore a set of potential explanations for our findings.

### 7.1 *Some exploratory hypotheses*

To organize our tests, it is useful to hypothesize potential explanations for our findings. We offer the following three hypotheses:

Hypothesis I: Optimism drives economic choices.

Hypothesis II: Optimistic people have private information about their longevity or actually do live longer because they are optimistic. Their actual longevity,

which is rationally anticipated, drives the results, as opposed to optimistic attitudes.

Hypothesis III: Optimism is correlated with other characteristics that are associated with these economic choices.

Most explanations of our results can be fit under these three hypotheses. For example, the conjecture that successful people take certain observed actions and are also optimistic fits under Hypothesis III. A wide range of psychological channels could fall under Hypothesis I. For example, optimism could arise from self-attribution bias, overconfidence, or a variety of other channels.

We employ a number of approaches to determine which of these hypotheses best fit the data. First, we note that the results of Puri and Robinson (2006a) favor Hypothesis I over the others, since those findings demonstrate a significant correlation between life expectancy miscalibration and other psychological measures of optimism, even controlling for factors that capture other explanations.

Second, in unreported regressions, we replicate our main findings using measures of unexplained optimism instead of the standard life expectancy miscalibration. For this we recover the residuals from both columns (3) and (4) of Table 2. These regression errors are, of course, the part of optimism that we cannot explain with observables that might otherwise be correlated with the outcomes of interest. We find that the main results in the paper carry through under this alternative measure of optimism. Thus, these results are generally supportive of Hypothesis I.

Third, consider some of our main results: our measure of optimism correlates well with standard psychometric tests (LOT-R) of dispositional optimism. It also correlates well with general positive expectations about the economy. This is hard to fit with both Hypotheses II and III. Even if the respondent

rationally expected to live longer, as per Hypothesis II, it is far from clear why this should translate into thinking the economy would do well since private information about one's own life-span should not influence one's expectations of the economy. Similarly, it is hard to come up with a omitted characteristic that correlates to expecting to live longer and thinking that the economy will do well, which would be needed to support Hypothesis III.

We find optimism correlates to work choices, remarriage choices, and portfolio choices. These results could be characterized by Hypothesis I. Hypothesis II suggests that rather than optimism, actual expected longevity is driving these economic choices. Some of our results would also fit with Hypothesis II. This is true for the work choices, since longer expected life span can translate into working harder today. However, other measures of optimism that are unrelated to life span are also correlated with work choices. The raw correlation between optimism about economic conditions and years of remaining work is positive. Between expected future income growth and years of remaining work the correlation is roughly 0.10 and highly statistically significant. Other results are also inconsistent with Hypothesis II. In particular, optimism relates to how equity wealth is allocated between various equity instruments, but it is not related to the portfolio allocation decision along the equity/debt dimension. These findings are difficult to reconcile with mechanical relations between portfolio decisions and life expectancy.

Finally, in the next section we discuss tests that distinguish between extreme and moderate optimists. Extreme optimists have financial habits and display economic behaviors that differ markedly from moderate optimists. This dichotomy between moderate and extreme optimists is also difficult to reconcile with Hypothesis III since we would then need an omitted variable or factor

that relates in the same way to expectations but differentially to financial habits and economic behavior.<sup>10</sup>

Ultimately, we have intriguing findings for which we can provide three explanations. Hypotheses II and III can characterize some of our findings but there are some results that are either inconsistent or do not square easily with these hypotheses. Coupling our main findings with our results on unexplained optimism, and pairing these with economic outlook and the observed dichotomy between moderate and extreme optimists, the bulk of the evidence seems to lean towards Hypothesis I.

## 7.2 *Optimism and prudent decision-making*

Given the schism that we trace in the psychology literature in Section 3 between optimistic bias and dispositional optimism, and the prevailing wisdom in financial economics, our findings immediately raise normative questions. In particular, this section is concerned with understanding whether the relation between optimism and economic choice that we document is further evidence of the benefits of optimism, as suggested by the positive psychology literature, or if instead the optimism we document is better described as imprudence.

Both the schism in the literature as well as the economic arguments for the benefits of optimism that we discuss in Section 3 suggest that a fruitful way to distinguish good optimism from bad is to consider the degree of life expectancy miscalibration. Our working hypothesis in this project is that modest amounts of optimism may be more likely to correlate with positive behaviors identified in the psychology literature, whereas extreme overoptimism may be more likely to correlate with the negative behavior identified in the economics literature.

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<sup>10</sup> Indeed, the observed nonlinearity in moderate versus extreme optimism makes alternate approaches such as an instrumental variables strategy for identifying exogenous variation in optimism particularly difficult.

To distinguish mild from extreme optimism, we take the right-most 5% of optimists to be extreme optimists. These are people who are approaching two standard deviations away from the mean and thus on average are nearly 20 years overoptimistic.<sup>11</sup>

The next step in our approach is to identify a series of financial decisions that are widely viewed as prudent or imprudent. We first look at the reasons respondents save; in particular, we examine whether they save because they think it is a good thing to do. We then focus on whether a respondent pays their monthly credit card balances in full each month, or whether they carry a high balance. We also focus on a respondent's planning horizon.

Our results indicate distinct differences between moderate optimists and extreme optimists. To facilitate the most immediate comparison with the results in the previous sections of the paper, we simply introduce the extreme optimism dummy in the same regression with the continuous optimism variable. While this makes the loading on optimism comparable across tables, it complicates the interpretation of the coefficient on extreme optimism slightly. Since the dummy equals one for those respondents roughly two standard deviations from the mean, the total economic significance of extreme optimism is obtained by doubling the coefficient on optimism and adding the coefficient on extreme optimism. One could also imagine alternative specifications that are not as readily comparable with previous tables. In unreported tables we employ specifications that break the optimism distribution into dummies that capture extreme pessimism or optimism. None of our findings hinge on the choice of one specification over another. For the sake of brevity, we focus at-

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<sup>11</sup> An alternate measure of extreme optimism is to take all responses indicating that the respondent expects to live to 100 years of age or beyond. We classify such responses as extremely optimistic, since the odds of living to 100 are small even for someone in their 90s. (Indeed, actuarially, an 85-year old should expect to be less than 93 years of age at death.) We get very similar results using this alternate measure of extreme optimism.

tention on the specification provided here, which provides the easiest way of comparing the results across tables throughout our analysis.

Moderate optimists seem to have prudent financial habits, while extreme optimists do not. These results are shown in Table 8. Moderate optimists are more likely to pay off their credit card balances and have long planning horizons. On the other hand, extreme optimists are less likely to save simply because it is a good thing to do, and have short planning horizons. This result holds after controlling for net worth, age, education, health, and other demographic characteristics. Further, moderate optimists have longer planning horizons than extreme optimists.

Of course, extreme optimists could simply be respondents offering rash, capricious answers. To guard against the possibility that we are merely picking up features of the tails of the distribution, where perhaps more capricious answers are likely, in unreported tables we compare extreme optimists to extreme pessimists (the left-most 5% of the distribution). The underlying demographics of the two sub-populations are similar, but their economic attitudes and behaviors differ considerably. Therefore it is unlikely that the results are being driven by strange features of the tails of the distribution.

To explore whether this is likely to be driving our results, we re-examine the relation between optimism and economic outlook, this time focusing on mild versus extreme optimists. In Table 9, we report the fraction of each type of optimist that holds certain views about the economy. The table illustrates that 32% of extreme optimists think economic conditions will improve, while only 28% of mild optimists do. Extreme optimists are less likely to think economic conditions will deteriorate. The differences between mild and extreme optimists are significant.

The lower portion of Table 9 reports beliefs about income growth conditional on past income growth. About the same fraction of mild and extreme optimists

think their future income will (will not) grow provided that their income did (did not) grow. For both groups, a little more than half the respondents think income will not grow based on it not growing over the past five years, and about 20% think it will grow based on it having grown.

The difference lies along the off-diagonal elements of the table. Mild optimists are more likely to think that their future income will not continue to grow, while extreme optimists are more likely to think that their future income will grow when it has not grown in the past. The fact that past income growth is self-reported probably strengthens the interpretation here. It is reasonable to think that someone who is optimistic about the future might selectively recall the positive elements of the past more readily than the negative ones, and yet these respondents think their personal economic outlook will improve even when they do not think it fared well in the past. Putting these pieces together, Table 9 indicates that extreme optimists hold similar views towards the future as do mild optimists, albeit potentially more exaggerated.

Thus, taken together, Tables 8 and 9 show that mild and extreme optimists hold roughly similar positive beliefs about future economic conditions, but differ markedly with respect to behaviors that help prepare them for the future. Which group is responsible for our results?

To explore this question, we re-estimate our main results to look at the differential effects of moderate and extreme optimists in economic choices. The results point to distinct behavioral differences between moderate and extreme optimists. These results are shown in Table 8. Moderate optimists are more likely to work harder and are less likely to be day traders. For the most part, extreme optimists display either no positive effect, or else behave in the opposite manner entirely: they work fewer hours, are less likely to save, and hold a larger proportion of individual stocks in their portfolio. Thus, our main findings seem to be arising from the seemingly reasonable behavior of mild

optimists, not from the seemingly foolish behavior of extreme optimists who display less financial prudence.

Pronounced differences between moderate and extreme optimists also exist in terms of their savings behavior. Moderate optimists save more, but this effect is more than completely undermined in extreme optimists, who save less. This nonlinearity in savings behavior speaks against the obvious alternative explanation, which is that people with greater life expectancy mechanically wish to save more. It is not completely inconsistent with a permanent income explanation; however, the results in the next section linking optimism to self-control suggest that more is going on than can be explained by such a story.

Our results on extreme optimists are consistent with evidence in finance and economics that suggest overoptimism (or relatedly, overconfidence) can lead to behavior that might not be rationally justified. For example, see Odean (1998), Malmendier and Tate (2005), Arabsheibani, de Meza, Maloney, and Pearson (2000), or Coelho, de Meza, and Reyniers (2004). However, the distinction that we uncover between mild and extreme optimists points to an important new dimension to optimism: optimism in small doses can be a good thing. This empirical finding squares with a growing body of theoretical evidence that highlights the bright side of optimism (e.g., Brunnermeier and Parker, 2005; Hackbarth, 2004; Gervais and Goldstein, 2004; or Rigotti, Ryan, and Vai, 2004).

Moreover, contrasting mild and extreme optimists also helps us to further distinguish the three hypotheses raised in the previous section. Our main findings display a nonlinearity with respect to optimism, but mild and extreme optimists hold roughly consistent views. This makes stories based on unobserved health characteristics or past success difficult to square with the data, since these stories in their simplest form implicitly predict that extreme optimists

should be more successful or healthier than mild optimists. Instead, our findings probably offer the most support for Hypothesis I.

### *7.3 Optimism and self-control*

One of the major predictions of intertemporal choice models that exhibit preference reversal is that subjects will attempt to tie their hands, putting their money in illiquid assets to prevent self-control problems from affecting their savings behavior (see, for example, Laibson, 1997; Strotz, 1955-1956). We conclude this section by briefly exploring the potential for explanations along these lines to shed light on the observed dichotomy between moderate and extreme optimism.

To see how optimism is related to self-control, we examine two decisions, one health-related, the other financial. These are reported in Table 11. The first two columns examine smoking. Moderate optimists are less likely to be smokers, while extreme optimists are more likely to be smokers. Next we examine financial liquidity. Moderate optimists hold a greater fraction of their wealth in liquid assets, while extreme optimists hold a smaller fraction. These models are estimated with controls for health quality, wealth, age, race, education, and self-employment; therefore, in view of the nonlinearity in optimism, these results are difficult to reconcile with Hypotheses II and III.

Modelling self-control as an internal dichotomy has a long tradition in economics and psychology: see Smith (1759), Freud (1986), Buchanan (1978), or Schelling (1978). Using the language of Thaler and Shefrin (1981), we can describe self-control as a battle between a Doer self, who enjoys utility in the present, and a Planner self, responsible for making decisions that provide utility for all future Doer selves. Our findings suggest that optimism plays an important role in the balance of power between the Planner self and the Doer

self. One way to interpret these findings is that optimists, because they feel that the future is likely to be favorable, tilt the balance of power more towards the Planner self, thereby setting aside more resources for future enjoyment. These people suffer from fewer self-control problems, since each periods' Doer self has diminished ability to take actions that detract from future Doer selves. This explanation would account for the lower smoking rates and higher liquid asset holdings of moderate optimists, since it predicts that they have fewer self-control problems and hence less need to take actions designed to thwart these self-control problems.

## 8 Conclusion

This paper suggests that optimism is a bit like red wine: too much is clearly bad, but a little each day can be good for one's health. Likewise, while too much optimism may be detrimental to one's economic well-being, a moderate amount of optimism is associated with better decision-making.

To argue this point, we develop a novel way of measuring optimism and then relate optimism to a wide range of economic decisions. We compare a survey respondent's self-reported life expectancy to their actuarial life expectancy, controlling for factors that are known to affect a person's life-span. 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 empirical evidence that optimism is related to economic decision-making. Optimism is significantly related to work choices, beliefs about retirement, portfolio choices, savings decisions, self control, as well as the decision to remarry. The fact that optimists work more, save more, are less pre-disposed towards retirement, are more likely to remarry, and to buy individual stocks suggests that optimism may well be a critical component of

economic decision-making. In general, optimism in moderation is associated with more prudent decisions and greater self-control, while the opposite is true for extreme optimism.

The idea that optimism can be both good and bad straddles two opposing views in the psychology literature. Our results suggest that many of the negative traits associated with behavioral biases may only be salient for those with extreme bias, and that modest amounts of behavioral bias, be it overconfidence, self-attribution bias, or optimism, may indeed be associated with seemingly reasonable decision-making.

One interpretation of our results is that optimism helps to determine how much self-control an individual possesses by affecting the balance of power between one's current and future selves. Another interpretation is along the lines of Brunnermeier and Parker (2005), who argue that expectations can be optimally biased so that the enjoyment of future outcomes increases current utility. In their model, expectations that are *too* biased lead to suboptimal decisions. In the same spirit, our findings suggest that a heightened appreciation of the future enables an individual to take ex post optimal actions that others find too costly ex ante. But overly optimistic people seem to ignore the benefits of these actions, thinking instead that the future will take care of itself.

These findings raise a number of interesting questions for future research in both economics and psychology. What is the source of optimism? Why do moderate and extreme optimists behave so differently? Exploring the ways and circumstances in which optimism can be good or bad is an also an interesting avenue for future research, one that may shed light on many puzzles in financial economics.

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Table 1

## Life expectancy and life expectancy miscalibration

Panel A reports the frequency of respondents each year whose self-reported life expectancy falls into the particular age bin. The row labelled Total is the average across all three survey years. The row labelled Statistical provides the distribution of statistical life expectancies of the respondents. Panel B provides a summary of our optimism calculation with summary statistics broken down by gender. Panel C regresses self-reported life expectancy on statistical life expectancy, with and without additional controls for demographic characteristics.

Panel A: Percentage of respondents with self-reported age at death												
Survey:	< 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
Statistical	0.00	0.00	0.00	3.80	54.85	29.95	8.63	2.37	0.40	0.00	0.00	100

  

Panel B: Calculating life expectancy miscalibration						
	Age	Life expectancy, based on age, gender, race:			Smoking/Educ. corrected:	
		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

  

Panel C: Self-reported = $\alpha_0 + \alpha_1$ Statistical + $\alpha_2$ Male + $\alpha_3$ White + $\alpha_4$ Attended College					
	Constant	Statistical	Male Dummy	White Dummy	Attended College
estimate	23.76	0.73			
(se)	(0.02)	(1.75)			
estimate	5.12	0.99	3.14	-6.66	1.67
(se)	(2.04)	(0.03)	(0.25)	(0.32)	(0.11)

Table 2  
The demographics of optimism

Columns (1)-(4) report OLS point estimates of optimism on a constant term, dummies for white race, male gender, self-employment, smoking status, whether the respondents mother and father are still living, and whether income was reported to have grown over the last five years. Age at the time of survey, net worth, and educational status are also included. In columns (5)-(8) the dependent variable is a dummy equaling one if the respondent expects economic conditions to improve over the next five years, and the point estimates are reported as marginal changes in the probability associated with the dummy equaling one. Thus, the scale of the point estimates is not comparable across the two sets of dependent variables, but the statistical significance is comparable. *p*-values are reported in brackets below point estimates and are corrected for multiple imputation.

Explanatory variable	Life expectancy miscalibration				Economy will improve			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	3.83 [0.00]	4.48 [0.00]	2.58 [0.00]	2.35 [0.00]	-0.37 [0.00]	-0.39 [0.00]	-0.30 [0.00]	-0.31 [0.00]
White?	-6.56 [0.00]	-6.63 [0.00]	-6.80 [0.00]	-6.85 [0.00]	-0.10 [0.00]	-0.10 [0.00]	-0.11 [0.00]	-0.11 [0.00]
Male?	2.85 [0.00]	2.55 [0.00]	2.38 [0.00]	2.29 [0.00]	0.02 [0.00]	0.02 [0.01]	0.024 [0.00]	0.02 [0.01]
Education	0.95 [0.00]	0.87 [0.00]	0.51 [0.00]	0.45 [0.00]	0.40 [0.03]	0.19 [0.20]	-0.01 [0.50]	-0.13 [0.29]
Age		-0.01 [0.02]	0.04 [0.00]	0.04 [0.00]		0.01 [0.23]	-0.05 [0.04]	-0.05 [0.07]
Net worth		0.01 [0.00]	0.01 [0.00]	0.01 [0.00]		0.02 [0.01]	0.02 [0.00]	0.03 [0.01]
Self-employed?		1.05 [0.00]	0.64 [0.00]	0.54 [0.01]		0.03 [0.00]	0.02 [0.00]	0.02 [0.01]
Smoker?			-6.53 [0.00]	-6.45 [0.00]			-0.02 [0.00]	-0.02 [0.00]
Father living?			2.49 [0.00]	2.49 [0.00]			-0.01 [0.225]	-0.01 [0.22]
Mother living?			1.42 [0.00]	1.40 [0.00]			-0.01 [0.16]	-0.01 [0.15]
Income grew				1.08 [0.00]				0.02 [0.00]
R-squared	0.040	0.047	0.110	0.114	0.005	0.006	0.009	0.009

Table 3  
Optimism and economic outlook

Panel A reports the mean value of optimism grouped according to how respondents judge future economic conditions. In Panel B, this exercise is repeated based on whether the respondent thinks their own income will grow over the next year. Panel C reports the results of a regression of optimism on beliefs about future growth as well as an indicator for whether the respondent's income grew over the last five years and an indicator for whether the respondent expected economic conditions to improve.

Panel A: Overall economic outlook	
	Mean optimism
Economy will improve over next five years	2.56
Economy will stay the same	0.80
Economy will get worse	1.19
t-test (improve vs. not improve)	6.61
Panel B: Personal economic outlook	
Income not expected to grow next year	0.64
Income expected to grow next year	3.31
t-test (expected to grow vs. not expected to grow)	10.22
Panel C: Regression analysis	
Independent variable	Point estimate
Income expected to grow next year	0.158
<i>p</i> -value	[0.020]
Income grew over the last five years	0.147
<i>p</i> -value	[0.020]
Economy will improve	0.145
<i>p</i> -value	[0.019]

Table 4  
Univariate analysis of optimism and economic choice

This table presents the mean and standard deviation of life expectancy miscalibration along with the pairwise correlation of this variable with the key economic choices that are analyzed throughout the remainder of the paper. Willingness to take risk is the answer to the question “How much financial risk are you willing to take?” Answers range from “Take substantial risk for substantial reward,” to “not willing to take any risk.” Hours worked is the average number of hours worked per week over the last year. Remaining work life is the expected time to retirement. These are analyzed in Table 5. Married is a dummy for whether the respondent is married. This is analyzed in Table 6. The remaining variables are defined and analyzed in Table 7. For each variable, the first number is the pairwise correlation and the second number is the  $p$ -value associated with the null hypothesis that the correlation is zero.

	Life expectancy miscalibration
Mean	1.31
Std. dev.	11.56
Correlation with:	
Risk tolerance (willingness to take x financial risk)	0.094 0.0000
Average hours worked per week	0.082 0.0000
Yrs. remaining work life	0.1142 0.0000
Marital status	0.088 0.0000
Day trader dummy	0.0004 0.9622
Ratio of individual stock to total equity	0.0349 0.0007
Ratio of equity to total financial wealth	0.0759 0.0000
Bond ownership indicator	0.0401 0.0000
Savings indicator	0.0823 0.0000
Wealth/income ratio	0.0206 0.0000

Table 5  
Work ethic and optimism

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.

Explanatory Variable	Dependent variable is					
	Hours worked		Never stop working		Remaining Work	
Optimism	0.5128	0.4708	0.0092	0.0084	0.7876	0.7700
	[0.0012]	[0.0016]	[0.0021]	[0.0032]	[0.0000]	[0.0000]
Age	-0.6569	-0.6872	-0.0017	-0.0021	-0.7606	-0.7746
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
College	2.7007	1.4682	0.0120	0.0032	-0.2619	-0.3780
	[0.0000]	[0.0000]	[0.0005]	[0.1854]	[0.1106]	[0.0418]
Excellent health	3.5682	2.3482	-0.0229	0.0135	-0.1508	-0.2083
	[0.0000]	[0.0000]	[0.0001]	[0.0097]	[0.3247]	[0.2663]
Male	7.5242	5.1456	0.0391	0.0215	0.7435	0.5287
	[0.0000]	[0.0000]	[0.0000]	[0.0013]	[0.0319]	[0.0959]
Net worth	0.0411	0.0151	0.0006	0.0005	0.0431	0.0402
	[0.0000]	[0.0010]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Risk tolerance	2.3608	1.4304	0.0142	0.0070	-0.5131	-0.5672
	[0.0000]	[0.0000]	[0.0000]	[0.0180]	[0.0068]	[0.0034]
White	4.0738	2.9806	0.0152	0.0046	1.2824	1.1429
	[0.0000]	[0.0000]	[0.0601]	[0.3182]	[0.0097]	[0.0188]
Self-employed		15.4835		0.1214		1.4264
		[0.0000]		[0.0000]		[0.0001]
R-squared	0.3172	0.3931	0.0282	0.0523	0.1229	0.1238

Table 6  
Marriage, divorce, optimism, and risk tolerance

This table restricts attention to the 4,795 individuals who report having been previously divorced and asks whether optimism determines whether they are remarried. Probit regressions are reported in which the dependent variable is one if the respondent is remarried, zero otherwise. Coefficients are expressed as marginal probabilities. A constant term is estimated in each model, but suppressed for brevity. Beneath each point estimate  $p$ -values are reported in brackets. These are based on standard errors corrected for multiple imputation.

Explanatory variable	Dependent variable is 1 if remarried				
	(1)	(2)	(3)	(4)	(5)
Optimism	0.0516 [0.0000]	0.0531 [0.0000]	0.0486 [0.0000]	0.0475 [0.0000]	0.0422 [0.0000]
College	0.0429 [0.0002]	0.0505 [0.0000]	0.0402 [0.0007]	0.0356 [0.0026]	0.0308 [0.0085]
Male	0.7169 [0.0000]	0.7190 [0.0000]	0.7195 [0.0000]	0.7178 [0.0000]	0.7182 [0.0000]
White	0.1459 [0.0000]	0.1525 [0.0000]	0.1415 [0.0000]	0.1367 [0.0000]	0.1320 [0.0000]
Risk tolerance		0.0250 [0.0118]	0.0176 [0.0580]	0.0213 [0.0301]	0.0241 [0.0175]
Age			0.0038 [0.0000]	0.0037 [0.0000]	0.0037 [0.0000]
Self-employed				0.0439 [0.0198]	0.0348 [0.0550]
Net worth					0.0005 [0.0605]
Excellent health					0.0376 [0.0391]
R-squared	0.3999	0.4008	0.4058	0.4064	0.4076

Table 7  
Optimism and portfolio choice

Stock/Equity is the amount of individual stock (excluding stock held through mutual funds) as a fraction of the total equity portfolio. Equity/Fin. is the fraction of total equity to total financial wealth. Bond indicator takes on the value of one if the respondent owns tax-exempt, mortgage-backed, government, corporate, or foreign bonds. Day trader is a dummy for whether the respondent reported buying and selling stock on a daily basis. Savings indicator takes on the value of one if the respondent spends less than they earn in a typical year. Wealth/income is the ratio of financial wealth to annual income. A constant term is estimated in each equation but suppressed for brevity. In the day-trader regression, the dummy for white race predicts the outcome perfectly, and is dropped. *p*-values are reported in brackets and are corrected for multiple imputation.

Explanatory variable	Dependent Variable is					
	Stock/ Equity	Equity/ Fin.	Bond indicator	Day trader	Savings indicator	Wealth/ Income
Optimism	0.0228 [0.0073]	0.0020 [0.567]	-0.0026 [0.1422]	-0.0011 [0.0149]	0.0217 [0.0000]	2.2567 [0.0222]
Age	0.0156 [0.0000]	-0.0001 [0.534]	0.0032 [0.0000]	0.0001 [0.0000]	0.0020 [0.0000]	0.4752 [0.0000]
College	0.0784 [0.0000]	0.0323 [0.0000]	0.0437 [0.0000]	0.0016 [0.0004]	0.0663 [0.0000]	0.3743 [0.3987]
Excellent health	0.0250 [0.0626]	0.0139 [0.033]	0.0285 [0.0000]	0.0034 [0.0002]	0.0646 [0.0000]	-1.2940 [0.2901]
Male	0.0234 [0.1637]	0.1234 [0.310]	0.0294 [0.0000]	0.0007 [0.2559]	0.1520 [0.0000]	2.3633 [0.1902]
Net worth	0.0017 [0.0000]	0.0000 [0.625]	0.0007 [0.0000]	0.0000 [0.0019]	0.0029 [0.0000]	0.5457 [0.0000]
Risk tolerance	0.0765 [0.0000]	0.0592 [0.0000]	0.0183 [0.0000]	0.0022 [0.0000]	0.0657 [0.0000]	1.1672 [0.1893]
Self-employed	0.1667 [0.0000]	-0.0170 [0.0130]	0.0199 [0.0000]	0.0018 [0.0203]	0.0579 [0.0000]	1.2817 [0.3095]
White	0.2254 [0.0000]	0.0388 [0.008]	0.0561 [0.0000]	— — — — — —	0.1525 [0.0000]	5.3720 [0.0708]
R-squared	0.0947	0.1654	0.2293	0.1137	0.1047	0.0225

Table 8

## Mild and extreme optimism and financial prudence

“Saving is good” is a dummy for the respondent answering yes to “I save because saving is a good thing to do.” “Pays off credit cards” is a dummy that equals one whenever the respondent reports that they pay their credit card balances off in full each month. “Long planning horizon” is a dummy for whether the respondent uses 10-year or longer planning horizons when making their financial decisions. Optimism is as defined elsewhere. Extreme optimism is a dummy equaling one if the respondent’s optimism places them in the right 5% tail of optimists. Demographic controls are age, marital status, education, race, and gender. These and other controls are suppressed for brevity.

	Saving is good	Pays off credit cards	Long planning horizons
	(1)	(2)	(3)
Optimism	0.0004 [0.3496]	0.0251 [0.0000]	0.0785 [0.0000]
Extreme optimism	-0.0051 [0.0857]	-0.0403 [0.0508]	-0.2778 [0.0000]
Demographics	Yes	Yes	Yes
Net worth	Yes	Yes	Yes
Self-employed	Yes	Yes	Yes
Risk tolerance	Yes	Yes	Yes
Health quality	Yes	Yes	Yes
Constant	Yes	Yes	Yes
R-squared	0.0908	0.2324	0.1095

Table 9  
Outlook of mild and extreme optimists

This table reports the fraction of mild and extreme optimists who hold various beliefs about overall economic conditions and their own wage growth. For example, in the upper panel, the column labelled “Mild opt.” reports the fraction of mild optimists who think economic conditions will improve, stay the same, or get worse. In the lower panel, mild and extreme optimists are divided according to whether they think their income will grow over the next five years, based on whether it has grown over the last five years.

Economic conditions	Proportion of type:		p(diff)
	Mild opt.	Extreme opt.	
will improve	.28	.32	0.0213
stay the same	.25	.28	0.0226
get worse	.46	.40	0.0000
<u>Income grew over last 5 yrs.:</u>			
	No	Yes	
<u>Income will not grow:</u>			
mild	.57	.14	
extreme	.55	.10	
<i>p</i> -value(diff)	0.358	0.001	
<u>Income will grow:</u>			
mild	.10	.18	
extreme	.17	.18	
<i>p</i> -value(diff)	0.000	0.633	

Table 10

## Optimism, extreme optimism, and economic choices

This table repeats the core results from the paper but adds a dummy for extreme optimism. Self-employment is a dummy for whether the respondent is self-employed; remarriage, for whether the respondent is remarried conditional on divorce. Hours worked is the number of hours worked per week on average over the last year. Stock/Equity and day trader are defined in Table 7. All standard errors are corrected for multiple imputation. Demographics include race, gender, age, and educational attainment.  $p$ -values are reported in brackets beneath point estimates.

	<u>Remarriage</u>	<u>Hours worked</u>	<u>Remaining work</u>	<u>Stock/ Equity</u>	<u>Day trader</u>	<u>Savings indicator</u>	<u>Wealth/income ratio</u>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Optimism	0.0288 [0.0000]	1.1425 [0.0000]	0.7121 [0.0001]	0.0063 [0.3071]	-0.0014 [0.0485]	0.0284 [0.0000]	3.0392 [0.0098]
Extreme optimism	-0.0311 [0.1825]	-5.6189 [0.0000]	0.6442 [0.2178]	0.0420 [0.0872]	0.0001 [0.4906]	-0.0608 [0.0029]	-6.9538 [0.1127]
Demographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Net worth	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Self-employed	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Risk tolerance	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Health quality	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	<b>0.4502</b>	0.3190	0.1229	0.0475	0.0109	0.1034	0.0226

Table 11  
Optimism and self-control

In the first two columns, we report results from a Probit regression of a smoking dummy variable on optimism, extreme optimism, and a series of controls. In the final two columns, we regress the fraction of total net worth held in liquid assets on the same variables. A constant term is estimated in each regression but suppressed for brevity.

Independent variable	Smoking indicator		Liquid wealth	
Optimism	-0.0987	-0.0987	0.0274	0.0275
	[0.0000]	[0.0000]	[0.0048]	[0.0047]
Extreme optimist	0.1899	0.1895	-0.0773	-0.0777
	[0.0000]	[0.0000]	[0.0507]	[0.0498]
Age	-0.0043	-0.0042	0.0012	0.0013
	[0.0000]	[0.0000]	[0.0112]	[0.0098]
College	-0.0961	-0.0931	0.0005	0.0018
	[0.0000]	[0.0000]	[0.4826]	[0.4412]
Excellent health	-0.0719	-0.0696	-0.0577	-0.0565
	[0.0000]	[0.0000]	[0.0012]	[0.0016]
Male	-0.0071	-0.0021	-0.0501	-0.0477
	[0.1845]	[0.3978]	[0.0113]	[0.0160]
Net worth	-0.0001	-0.0000	-0.0003	-0.0003
	[0.2343]	[0.4543]	[0.1423]	[0.1653]
Risk tolerance	-0.0234	-0.0212	0.0058	0.0068
	[0.0000]	[0.0000]	[0.3039]	[0.2767]
White	-0.0125	-0.0099	-0.0493	-0.0481
	[0.1216]	[0.1754]	[0.0539]	[0.0586]
Self-employed		-0.0365		-0.0158
		[0.0000]		[0.2252]
R-squared	0.1438	0.1449	0.0021	0.0022