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PLANNING FOR RETIREMENT? THE IMPORTANCE OF TIME PREFERENCES

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ABSTRACT

Ensuring retirement income security is a priority for individuals, employers, and policymakers. Using merged administrative and survey data for public sector workers in North Carolina, we explore how workers' characteristics and preferences are associated with planning and saving for retirement. We then assess the "quality" of a retirement plan and whether retirement behavior is consistent with these plans. The findings indicate that the way that individuals discount future consumption is associated with the extent of their retirement planning and preparedness. We find that individuals who engage in retirement planning are better prepared to meet their retirement goals upon leaving their career jobs.

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Planning for Retirement? The Importance of Time Preferences

I. Introduction

Economists have understood the importance of risk and time preferences in household decision making since Adam Smith (Ashraf, Camerer, and Loewenstein, 2005). We study the role of these preference parameters in explaining individuals' retirement planning and decisions regarding retirement saving. Understanding how individuals plan for retirement is key to determining whether they will achieve their retirement goals. In addition, this information informs the design of both government and employer policies related to retirement timing and to retirement income security.

The analysis considers multiple aspects of an individual's retirement planning behavior using data from detailed administrative records on public employees in North Carolina linked to a large-scale survey. Our results indicate that risk and time preferences are quantitatively significant determinants of an individual's retirement planning behavior. Interestingly, when explaining an individual's plans for retirement, our measures of time preferences hold more predictive power than risk preferences. Our primary measure of retirement planning is derived from self-reports on a survey. We confirm the robustness to alternative measures of planning including activities using an online retirement planning tool available to all employees. In addition, we consider other, more typical objective aspects of retirement planning such as supplemental savings contributions and wealth accumulation.

A key contribution of our work is the use of data that provide an extensive picture of retirement planning behavior along with the realization of retirement age, which is a central aspect of the retirement plan. There is an important role for time preferences in understanding decision making in regards to retirement planning and preparedness. We further exploit the

richness of our data by tracking our survey respondents in the administrative records for nearly two years after the survey closed. Planned retirement behavior, as self-reported on our survey, is predictive of actual retirement behavior. There is clear evidence that stated plans matter: planned retirement age is highly correlated with whether an individual has indeed retired and this relationship is strongest for those who had already made a retirement plan. Finally, we show that time preferences matter for actual retirement timing, but only for individuals who had already made a retirement plan. The extensive nature of our data allows us to provide evidence that self-reported plans are an important aspect of understanding retirement behavior.

There is an emerging literature on retirement planning and its effect on economic wellbeing in retirement, but less is known about public employees who may behave differently than private sector workers. Public sector employees, including state, local, and federal governmental employees, comprise approximately 18 percent of the U.S. non-farm labor force.[1] In general, public sector workers are more likely to be covered by defined benefit (DB) pension plans and retiree health insurance. The model of deferred compensation, in combination with a relatively stable size of the workforce, may attract workers who are particularly risk averse or who demonstrate more "patience" towards the timing of compensation and consumption. Because public workers seem to have different risk and time preferences (Bellante and Link, 1981) and receive very different compensation packages than their private sector counterparts, results from studies examining the retirement planning and preparedness of private sector

[1] See Bureau of Labor Statistics, Current Employment Statistics, http://www.bls.gov/web/empsit/ceseeb1b.htm, [accessed October 2, 2014].

workers do not necessarily apply to public sector workers.[2]

Lusardi and Mitchell (2014) provide a detailed review of research on financial literacy and its relationship to planning and wealth accumulation (see also Van Rooij, Lusardi, and Alessie, 2011). Lusardi and Mitchell (2007) examine survey responses from the Health and Retirement Study (HRS) and conclude that financial literacy predicts planning and that planning affects saving and wealth accumulation. These studies highlight the importance of two significant relationships: the relationship between financial literacy and planning and the relationship between planning and retirement wealth accumulation. We build on this work by emphasizing the importance of risk and time preferences in addition to financial literacy.

While risk preferences have received a lot of attention among economists, there is a growing literature that emphasizes the importance of time preferences in determining retirement planning behavior. The majority of papers that include a measure of time preferences find that they play an important role in determining retirement decision making (e.g., Petkoska and Earl, 2009, Finke and Huston, 2013, Brown and Previtero, 2014, Bradford, Courtemanche, and Heutel, 2014, Brown, Farrell, and Weisbenner, 2015, and Koehler, Langstaff, and Liu, 2015). In contrast, Ameriks, Caplin, and Leahy (2003) and Binswanger and Carman (2012) find little predictive power for time preferences in retirement planning or wealth accumulation.

Our data are derived from survey responses linked to administrative records maintained by the North Carolina Retirement System Division (RSD).[3] The sample consists of public sector

[2] We present a comparison of our sample of public workers and private sector workers in the Health and Retirement Study (HRS) in Appendix C. We confirm that the public sector workers we study are more risk averse and more patient than the private sector workers in the HRS.

workers in a large state, North Carolina, which is diverse in terms of economic activity, urbanicity, and demographic characteristics. The sample includes active workers ages 50-64. By using both administrative records and survey responses, the data have several indicators of a worker's behavior in regards to retirement planning and include both subjective and objective measures along several key dimensions. Our findings suggest several differences between subjective measures and objective measures in terms of an assessment of planning and of other types of retirement activities such as supplemental plan participation. Thus, it is important to combine subjectively and objectively measured outcomes in order to provide a fuller understanding of retirement decision making.[4]

To study the role of risk and time preferences, the survey includes items based on similar questions used in the HRS to categorize respondents as more or less risk averse and more or less patient (Barsky and Juster, 1997). Further, the survey includes questions that assess respondents' financial literacy objectively in addition to questions that elicit a self-assessed measure of financial knowledge. This study explores several aspects of planning, including subjective and objective measures of planning, supplemental plan participation and contribution levels, wealth accumulation, planned age at retirement, and plans for working after retirement from a career job in the public sector. Combining survey and administrative data allows us to include both

[3] As described in more detail in the Appendix, these data were gathered as part of a larger project titled "Challenges to Retirement Readiness in the North Carolina Public Sector Workforce." More details on the full data and project can be found at: https://sites.google.com/a/ncsu.edu/retirementstudy/

[4] Subjective measures have several disadvantages (e.g., social desirability bias and recollection errors), while objective measures have their own disadvantages (e.g., administrative data do not typically provide measures of all relevant outcomes). See the discussion in Section II.

subjective and objective measures, which provides a more comprehensive picture of retirement planning and preparedness.

II. Administrative and Survey Data on North Carolina Public Sector Workers

On most dimensions, North Carolina is broadly representative of the nation in terms of its size, the diversity of the population, and the structure of its public pension plans. Public sector jobs cover a wide range of occupations, skill levels, educational backgrounds, and levels of compensation. There are over 400,000 state and local government employees in North Carolina including doctors, lawyers, teachers and other professional employees along with clerical and other office workers, maintenance staff, construction workers, and law enforcement officers. The population including in our analysis is representative of other state and local government employees and also resembles much of the national labor force. As such, examining this large group of employees is a useful case study of how older workers plan for retirement and whether retirement plans are realized.

Full-time employees working for a state agency in North Carolina, as well as teachers employed by local public school systems, are required to enroll in the Teachers' and State Employees' Retirement System (TSERS).[5] Most municipal, county, and other local governmental employers participate in the Local Governmental Employees' Retirement System (LGERS). Both plans are defined benefit pensions and have similar characteristics. The TSERS plan formula provides a benefit equal to 1.82 percent of average salary over the high four years

[5] The major exception to automatic inclusion in TSERS is that university faculty have the option of enrolling in TSERS or participating in a defined contribution plan managed by the University of North Carolina system. Faculty electing to be in TSERS are included in our sample; however, faculty who selected the Optional Retirement Plan (ORP) are not included in the survey sample nor do we have administrative records on these individuals.

of earnings times the number of years of service, while the LGERS formula is 1.85 percent of salary times years of service. Both plans allow workers to retire with unreduced benefits after 30 years of service or at age 65 with 5 years of service.[6] A comparison of the generosity of these plans to other state and local pensions indicates that their level of generosity is near the mean of all such plans. The Retirement System Division of the Office of the State Treasurer manages both plans. Public employees in North Carolina are also covered by Social Security and Medicare.

The data are derived from a survey of public sector workers merged with corresponding administrative records maintained by the North Carolina Retirement Systems Division. The administrative records contain detailed information about each employee including earnings, job information, agency type, years of service, age, and creditable service. From these values, we impute the number of years until each individual is first eligible for retirement benefits or whether the individual is already eligible for benefits.[7] We observe basic demographic information in the administrative data, and we supplement this demographic information with responses to survey questions about race/ethnicity, education level, and marital status, as well as various questions about their spouses' characteristics (if applicable). We combined these data with records of participation in the state-managed NC 401(k) and NC 457 plans.[8]

[6] Other details of the two plans can be found at the systems websites:
https://www.nctreasurer.com/ret/Benefits%20Handbooks/TSERShandbook.pdf
https://www.nctreasurer.com/ret/Benefits%20Handbooks/LGERShandbook.pdf.

[7] Table A.2 explains in detail how years until eligible for retirement benefits is calculated.

[8] Appendix A describes the data and sample in more detail. As described there, we conducted both an email and postal mail survey. All respondents were given the option to enter a drawing for two iPad tablets ($500 value) as an incentive for survey completion. Our response rate was approximately 18%.

The first column of Table 1 presents descriptive statistics for the full sample. The average salary is $52,481, average tenure is 16.3 years, and average age at the time of the survey is 57. Over half of our sample is already eligible to retire and immediately begin receiving retirement benefits. Among those not yet eligible, the average years until retirement eligibility is 4.1. The final two columns of Table 1 are described below.

[Table 1]

Retirement planning, our main outcome of interest, is measured in several alternative ways. We include both subjectively and objectively measured variables to illustrate the robustness of our findings and to provide support that we are capturing economically important behaviors associated with retirement planning. To study retirement decision making, we consider three categories of variables: a direct self-reported measure of retirement planning, objective measures of aspects of the retirement plans, and observed results of retirement planning. Each is described below.

A. Self-Reported Retirement Planning

Our main measure of retirement planning is a 'subjective' indicator from the response to a survey question aimed at determining the extent to which a respondent has thought about retirement and formulated a retirement plan. Each respondent had the option to indicate that she: (1) has a retirement plan; (2) has thought about retirement but does not have a plan; or (3) has not thought about retirement at all. While 'thinking about' retirement is a somewhat nebulous concept, having made a retirement plan is a concrete indication of having planned. We define a measure of 'subjective planning' to be whether the individual reports having a retirement plan.[9]

[9] We describe sensitivity tests using alternative parameterizations further below and in the appendix. Our preferred definition of subjective planning (have a retirement plan) has a stronger association with preferences than a more inclusive definition.

Columns 2 and 3 of Table 1 show mean values for those that have or have not made a retirement plan, respectively. We observe that those with higher salaries, closer to retirement, more years of service, and are older are more likely to report having made a retirement plan. The final column of Table 1 presents the mean differences in each variable by whether the respondent indicated that they had a retirement plan; all differences are statistically significant.

Interestingly, men and women who are married are more likely to report having made a retirement plan. This could be due to the need to coordinate between spouses or might reflect having a spouse that has already begun the retirement process. Gustman and Steinmeier (2000), Michaud (2003), Banks, Blundell, and Casanova (2010) examine why a significant share of spouses retire within one year of each other, independently of their age difference.[10] Leisure complementarities or similar preferences and Social Security spousal benefits are responsible for a large portion of observed joint retirements (Casanova, 2010). While we do not explicitly model joint retirement behavior in this paper, results not shown demonstrate that public employees whose spouses have already retired are more likely to report having made a retirement plan and to themselves retire sooner than employees who did not report having a retired spouse.[11] We return to this comparison in a regression context below.

In Table 1, we also observe that planners are more likely to have a college degree than non-planners, are less likely to be non-white, and are more likely to own their home. Our survey was distributed by hard-copy for individuals who did not provide an email address to their employer. Thus, it is not surprising to find that print sample respondents were more likely to be

[10] Among our married sample with an already retired spouse, 16 percent plan to retire within one year.

[11] In our data, workers with a retired spouse were more likely to have a retirement plan (58 percent versus 50 percent) and an earlier planned retirement age (4.7 years until retirement versus 6.1 years).

non-planners. We explore the associations between demographic characteristics and planning further below using multivariate regression analysis.

B. Alternative Planning Measures

While making a plan is an important step in retirement preparedness, one must also engage in behaviors to achieve those goals, such as acquiring financial literacy and saving in supplemental retirement saving plans. We propose several outcomes that reflect additional aspects of an individual's retirement planning behavior. By combining survey and administrative data, we are able to construct measures for a variety of nuanced characteristics of the planning process to provide a fuller understanding of planning to go beyond our main measure discussed above.

First, we draw an objective measure of planning from the administrative data. These data indicate actions by individuals from an employee's use of the Online Retirement Benefits through Integrated Technology (ORBIT) website. ORBIT allows members of the retirement systems to access their retirement account information, including account balances in 401(k) and 457 plans, and to engage in a more intensive form of planning by requesting a "self-service estimate" of their pension benefit.[12] While technically an individual can determine their expected annual benefit using the annuity formula, the actuarial factors used by RSD in the calculation of benefits are somewhat sophisticated. The annual benefit changes with each additional year of service and with increases in annual earnings. In addition, the benefit at any given time is a function of whether the worker has achieved sufficient service for an early or

[12] In fact, staff at RSD indicate that the member services staff at RSD and the employers' human resources staff regularly refer workers to the ORBIT Self-Service Estimator to obtain estimated benefit information rather than conducting the calculation on behalf of the employee (personal correspondence with RSD staff).

normal retirement benefit. While one could make these calculations, the worker first would have to understand all of the various characteristics of the pension plan. Because of this complexity, we view accessing one's ORBIT account as a form of planning. We classify individuals as planners using two measures: (1) if they have logged into the ORBIT website within the past 12 months or (2) if they have requested a self-service estimate from ORBIT in the past 12 months.[13] We chose to use a 12-month timeframe because RSD sends communications encouraging employees to login to ORBIT to review their personal benefit account several times a year and provides an annual benefit statement that is only accessible through ORBIT. Thus, we believe that a member actively planning for retirement would likely check their ORBIT account and conduct a self-service estimate at least annually.[14]

At the top of Table 2, we see that 67.5 percent of the sample has logged into ORBIT in the past year, while 53.6 percent have also requested a self-service estimate from the website. While these numbers may seem high, the reader should remember that this is a sample of public employees aged 50-64 who are near to their planned retirement age. These "objective" measures of planning are strongly correlated to the self-reports indicating that the respondent has developed a retirement plan. Comparing Columns 2 and 3, planners are more likely to log into ORBIT and more likely to request a self-service estimate.

[Table 2]

Next, we consider two indicators of participation in supplemental retirement savings plans: (1) a self-reported measure of participation in any 401(k), 403(b), or 457 plan, drawn from the survey, and (2) an indicator of participation in the state-managed 401(k) or 457 plans, taken

[13] Our 12 month window covers the period from August 19, 2013 to August 18, 2014.

[14] Results using alternative timeframes are described in footnote 21 and Appendix Table D2.

from the administrative records. Participation in a supplemental plan is an action that illustrates an active decision as part of one's retirement planning behavior. In parallel with our two measures of retirement planning, we refer to the first measure as "subjective supplement plan participation" and the second as "objective supplement plan participation." Table 2 shows that around 74 percent of individuals responded that they participate in a supplemental retirement savings plan, which is much higher than the 44 percent participation rate we observe in the administrative data. Note that local government employers, including school districts, have the option to offer a locally-managed supplemental plan.[15] So, for employees at non-state governmental employers in North Carolina, we cannot observe objectively whether the individual is saving in a locally-managed plan. As described in Appendix B, when considering only those individuals who work at a state government agency, we still observe substantially higher self-reported participation rates. We believe this may be due to a misunderstanding among survey respondents of the difference between being enrolled the primary defined benefit plan and supplemental retirement saving plans.[16] Comparing across Columns 2 and 3, individuals who self-report having made a retirement plan are also more likely to be saving and, conditional on contributing, are saving a higher fraction of their salaries.

[15] Clark, et al. (2016) provide a detailed examination of participation in and contributions to supplemental retirement saving plans of public school personnel. Over half of the school employees who contribute to a supplemental retirement saving plan are enrolled in locally managed 403(b) and 457 plans. These contributions are not included in the administrative records from the state retirement system.

[16] Appendix B provides the exact wording of the question, which asks about participation in any "retirement savings plan with my current public employer (e.g., 401(k), 403(b), 457(b) plan)." We find that about 13% of the population incorrectly self-reports participating but are not participating according to the administrative records. Thus, we believe our survey measure may be overstating participation for all our workers.

Wealth is self-reported on the survey, where respondents choose which of a set of categories best represents their household current savings and investments. Respondents are asked to include savings, several enumerated categories of investments, account balances in any defined contribution plans, and estimated values of any business owned; respondents are asked to exclude the value of their primary residence and savings in any defined benefit plans. In these data, the reported wealth level of the average individual is just below $200,000. For comparison, using data from the 2013 Survey of Consumer Finances, Rosnick and Baker (2014) find that the median non-housing wealth of households headed by someone ages 55-64 was $89,300. In our sample of public employees in North Carolina, we observe large differences in accumulated wealth by subjective planning where planners have over $284,000 in assets compared to just $97,000 among non-planners.

Some of the measures detailed in this section are subjectively measured, while others are objectively measured. Both types of measures have important limitations. For subjectively measured outcomes, our primary concern is social desirability bias. This bias suggests that our respondents may exaggerate the extent to which they are prepared for retirement. If individuals believe that both patience and retirement preparedness are socially desirable, then patience and planning for retirement could be spuriously correlated. However, when we include a host of covariates in the model, which are also self-reported, we see a similar relationship between time preference and retirement planning. This is evidence against a spurious correlation or a substantive bias coming from perceptions of social desirability. While objectively measured outcomes overcome these limitations of subjective measures, the information available in workers' administrative records do not provide the same detail on retirement planning per se.

Our approach to these limitations is to combine the information from subjective and objective measures into a comprehensive analysis of retirement behavior.

C. Additional Aspects of Retirement Planning

In addition to the above measures of planning, the survey includes information on two key components of a retirement plan. First, the survey includes a question on planned age of retirement, that is, the age at which the respondent plans to "stop working full-time for your current employer and begin receiving retirement benefits." The average age of planned retirement is 63. About 6.4 percent of the sample did not report a planned age of retirement. Second, respondents were asked if they planned to work after retirement, which is coded as zero if an individual reported a plan to "completely retire and not work at all." Individuals indicating that they plan to work full-time or part-time were given a value of one for this measure. In these data, 73 percent of individuals plan to work after retirement. About 2 percent of the sample did not report if they intended to work or not in retirement.

Finally, we construct a respondent's perceived necessary replacement rate. The survey provides information on a respondent's expected income needed in retirement. If the respondent self-reported as married, the replacement rate is calculated by dividing expected needed retirement income by the sum of own salary and spouse's salary, both salaries reported on the survey. If the respondent did not self-report as married, only own salary is used to calculate the replacement rate. The mean perceived replacement rate is around 85 percent, which is very close to the often-discussed rule of thumb of 80 percent (TIAA-CREF, 1994), despite the fact that we asked for expected retirement income needed instead of asking for a replacement rate directly. Expected retirement income was not reported by 25 percent of respondents.

Interestingly, we find that among planners, the expected replacement is much closer to the recommended 80 percent, while non-planners have a perceived needed replacement of 88.1 percent. Planners are also less likely to leave questions on the aspects of their retirement plan blank. Non-planners were less likely to report planned retirement age, employment plans after retirement, as well as expected income needed in retirement.

III. Risk and Time Preferences

Using several aspects of retirement planning, we explore the predictive power of risk and time preferences in understanding decision making in this important setting.

A. Preference Elicitation

The literature has established the predictive power of risk and time preference in explaining the full range of economic behaviors. Our measures of risk and time preferences are adapted from questions in the HRS (Barsky and Juster, 1997).[17] On risk preferences, respondents were given a hypothetical situation in which they would choose one of two new jobs, one with a constant income and one with an income that is 100 percent higher or 20 percent lower (with the increase or decrease equally likely). As shown in Table 3, Column 1, 67.5 percent of respondents chose the safe job (more risk averse).[18]

[Table 3]

[17] See Appendix C for a detailed description of the questions and responses. Loennqvist et al. (2011) find that unincentivized survey questions outperform incentivized tasks in the measurement of preference parameters, because unincentivized survey questions are more highly correlated with actual decisions. This supports our categorization of individuals' time preferences using unincentivized survey questions.

[18] In results not shown, 19.6 percent chose the risky job (less risk averse) and 12.9 percent reported that they did not know which job they would choose. Appendix Table C3 compares responses to the HRS for those that choose either the first or second job and did not select "don't know".

We included two questions to assess a respondent's level of patience. The benefit frame asks whether a respondent, upon reaching 65 years of age, prefers $1,000 per month in Social Security benefits or $500 per month plus an up-front, lump sum payment of $80,500. The lottery frame asks whether a respondent prefers to take a $1,000 windfall gain today or wait for one year and receive $1,200 instead. On the benefit frame, 34.2 percent of individuals chose the larger monthly benefit (more patient), while 49.7 percent chose the up-front payment and the smaller monthly benefit (less patient). 16.1 percent reported "don't know" as their answer. On the lottery frame, 46.5 percent of individuals chose the larger, later payment (more patient), while 46.5 percent chose the smaller, sooner payment (less patient). Only about 7 percent of the respondents chose "don't know" with the lottery frame.

We combine our two measures of time preferences into a single binary measure equal to one if the respondent chose the more patient option on either frame. Using this combined measure, 62.7 percent of respondents are more patient. We present alternative approaches to measures respondents' time preferences in Appendix Table D1. Columns 2 and 3, Table 3, Panel A, compare these measures of risk and time preferences among those that report having made a retirement plan (Column 2) and those that have not (Column 3). Planners are around 13 percentage points more patient, a difference that is statistically significant. Planners are slightly more risk averse, but the small difference is statistically insignificant. These associations are examined further in a regression framework below.

B. Related Literature on Risk and Time Preferences and Retirement

Using these measures of risk and time preferences, we explore their role in determining an individual's retirement planning behavior. The related literature is broad, but we present a discussion of the papers that share our focus on time preferences and retirement decision making.

Finke and Huston (2013) find empirical evidence that demonstrates the importance of time preferences using a sample of college students with stated preference data on how highly students prioritized retirement savings. Their focus on time preference is similar to ours but we use data on the planning behavior of older workers linked to retirement decisions from administrative data. Similar to our survey of older workers, Petkoska and Earl (2009) survey workers 50 years and older. They find an important role for time preferences in general but mixed results on particular preference dimensions, where their measures are akin to those used in the personality literature (e.g., responses to the question "I make lists of things to do").

Brown, Farrell, and Weisbenner (2015) look at the retirement-related financial behavior of procrastinators versus non-procrastinators, where procrastinators are defined as individuals who delayed choosing a health care plan until the final day of the enrollment period. Their results show that procrastinators are 2.4 percentage points less likely to participate in a supplemental retirement plan and contribute 10 to 15 percentage points less in defined-contribution plans. Presenting a similar set of findings, Brown and Previtero (2014) measure procrastination using a five survey questions on the tendency to delay decisions. Finally, Bradford, Courtemanche, and Heutel (2014) provide evidence that time preferences are correlated with a wide range of decisions, most relevantly finding that present biasedness is positively and significantly associated with non-retirement savings and less strongly and significantly associated with having retirement savings.

In contrast to these papers (and ours), two related papers find that risk and time preferences do not have a strong association with retirement planning or wealth accumulation. Binswanger and Carman (2012) provide a nuanced measurement of retirement planning behavior by differentiating among three types of behavior: working out a formal retirement plan, using a

rule of thumb, and having neither a plan nor a reliance on a rule of thumb. The authors find that rule-of-thumb adopters behave in similar ways to planners in their savings decisions, and both types of individuals save meaningfully more than individuals who follow an unsystematic approach to retirement savings. However, Binswanger and Carman (2012) find no statistically significant association of time and risk preferences with planning behavior and wealth accumulation. Using survey data from a sample of TIAA-CREF participants, Ameriks, Caplin, and Leahy (2003) also find little predictive power for risk and time preferences.

C. Financial Literacy

Lusardi and Mitchell (2014) provide a comprehensive assessment of studies that estimate the impact of financial literacy using responses to specific literacy questions and self-reported levels of literacy. The introduction of the same questions into the Health and Retirement Survey and in other such surveys (including our own) has allowed researchers to compare the effect of literacy in many diverse situations.[19] Comparing Columns 2 and 3, Table 3, Panel B, we see that those who self-report having made a retirement plan are more financially literate, both subjectively and objectively measured. These comparisons show a clear link between financial literacy and retirement planning.

IV. Results: Retirement Planning and Individual Preferences and Characteristics

A. Subjective Planning

In Tables 1-3, we considered the differences in sample means among planners and non-planners. Our main measure of planning is subjective and is drawn from a self-report in the survey data of having made a retirement plan. In pairwise comparisons, planners are shown to

[19] The exact wordings of the three financial literacy questions are included in Appendix Table A3. The questions concern compound interest, inflation, and the tax advantages to supplemental retirement savings.

be more patient and slightly more risk averse. We now consider these associations in a multivariate regression framework holding demographic and economic characteristics constant. Table 4 presents estimates of a linear probability model regression of subjective planning on risk and time preferences, financial literacy, and a host of demographic and economic characteristics.

[Table 4]

The first column of Table 4 reports a specification that includes only risk and time preferences and financial knowledge. In our sample of older public employees in North Carolina, individuals who are more patient are 7.5 percentage points more likely to have made a retirement plan. The estimated coefficient on risk preferences is not statistically significant but is also not statistically significantly different than the estimated effect for time preferences. All specifications separately control for those who responded "don't know" to one of the time or risk preference questions (three "don't know" controls: time-benefit, time-lottery, and risk).

Financial literacy has long been shown to matter in retirement decision making, and this is the case in our results as well. In Column 1, Table 4, high financial literacy (as measured by answering all three financial literacy questions correctly), medium financial literacy (as measured by answering two financial literacy questions correctly) and self-reported financial knowledge on a scale of 1-7 are all individually associated with a higher likelihood of having made a retirement plan. Next, in Column 2, Table 4, we include economic and demographic characteristics. The variable "years until eligible for retirement" is calculated "objectively" using age at survey and years of service from the administrative records. Many individuals in the sample are already eligible for either early or normal retirement benefits, so those individuals will have zero years until retirement and a dummy indicator for being already eligible to retire. We find no evidence that individuals are more likely to plan as they near their eligibility for

retirement benefits. Note that this does not incorporate retirement expectations or self-reported plans but is calculated from age and years of service combined with information about the retirement eligibility rules. We do find that individuals are more likely to plan as they age, even conditional on years until eligible for retirement benefits.

Controlling for having a college degree, tenure, and preferences, having a higher salary is associated with a higher probability of planning. Gender and marital status are interacted to create three categories, with married females as the omitted group. Married females have the highest propensity to plan, which may be due to the retirement planning of an older spouse. In support of this conjecture, in results not shown, we find that marital status is no longer significant after controlling for spousal characteristics (age and salary). Both male and female unmarried individuals are less likely to have made a retirement plan relative to married women.

Next, homeowners are more likely to report having made a retirement plan, as are those reporting to be in excellent or very good health. Individuals with dependent children (defined as having children depend on the individual for more than half of their financial support) are significantly less likely to report having made a retirement plan, holding all else equal. Individuals who were given the print survey, rather than the online survey, are less likely to report having made a retirement plan. While this may reflect some difference in the response due to the survey type, it more likely reflects some characteristic of individuals that caused them to be excluded from the email sample. Any individual in the administrative records for which an email address was available was sent the email survey. The final column of Table 4 adds

controls for individuals' agency of employment and type of job.[20] Overall, time preferences and financial literacy are important in understanding retirement planning behavior.

B. Subjective Planning and Time Preferences: Heterogeneity

Above, we found a significant association between subjectively measured retirement planning and elicited preferences towards time where the more patient were also more likely to plan. Next, we explore this link further by comparing the association for different subsets of the population. Table 5 considers heterogeneity in the effects of time preferences on subjective planning. First, Column 1 repeats the specification in Table 4, Column 3 for reference. Note that the specification is identical but not all covariates are reported here.

[Table 5]

Table 5, Column 2 considers the number of years until the individual's objectively-measured time until retirement, with a zero implying already eligible for retirement benefits. The further from retirement eligibility is associated with a weaker link between patience and planning, although the estimated coefficient on years until eligible for retirement benefits is not statistically significant. Next, Column 3 of Table 5 asks whether the relationship between time preferences and retirement planning differs by gender and marital status, which are interacted to create four categories. Here we see that for married women (the omitted category), being more patient is associated with a 6.5 percentage point higher likelihood of planning. The estimated

[20] We classify the employees in six agency categories and nine job categories. Agency categories are: city, county, public school, general government, Department of Transportation, and other. Job classifications are: safety/rescue officers, executives/management, education professionals, educational support, health care professionals, professionals, trades and technical, social service professionals, and university. None of the estimated coefficients on agency categories are statistically significant. Of the job categories, only the estimated coefficient for social service professionals is statistically significant, where social service professionals are more likely to plan.

coefficients on the interaction terms for married and single men are both positive and large, but not statistically significant. However, we do see that single women are statistically significantly different such that patience does not predict planning for single women.

Table 5, Column 4 considers educational attainment by gender, separating individuals who have less than a college degree from those with a college degree. We observe no statistically significant relationship between patience and planning for the non-college educated. The relationship between patience and planning is only statistically significant for men with a college degree. Together, these findings suggest that the relationship found between time preferences and retirement planning is concentrated among more highly educated men and is not found at all for those without a college degree or for college educated women. Highly educated men may have more assets and a greater need for retirement planning.

Finally, Table 5, Column 5 explores the potential for interactions between risk and time preferences. Andersen, et al. (2008) and Jamison, Karlan, and Zinman (2012), among others, show that eliciting both sets of preferences jointly is important for a full understanding of their role. Some of these papers have found that risk and time preferences interact in complex ways, but the evidence is mixed. While we find that the estimated coefficient on time preferences is indeed larger for individuals who are more risk averse, the coefficient on the interaction term is not statistically significant. This suggests that our measures of risk and time preferences do not provide sufficient statistical power to estimate their interactive effects.

C. Alternative Measures of Planning

We next consider a series of objectively and subjectively measured alternative proxies for retirement planning behavior. In Table 6, each column includes a parallel regression to the specification in Column 3, Table 4, with different dependent variable to consider alternative

measures of planning. The measures were described in more detail above in Section II.B. In Table 2, we saw that these alternative planning measures were all positively related to the subjective planning measure but are perhaps also capturing other aspects of planning. Our main objective measures of planning rely on administrative records indicating activities on the ORBIT website. The first column of Table 6 considers whether an individual has logged in to the retirement system's benefit website in the past 12 months, while the second column considers further whether the individual used the retirement system's benefit website to receive an estimate of their benefit upon retirement (i.e., a "self-service estimate").[21]

[Table 6]

Considering ORBIT activity, there is no statistically significant relationship between planning and either the time or risk preference measures. Individuals with higher financial literacy are more likely to request a self-service estimate. The remaining columns of Table 6 include the following additional components of the planning process, described earlier in Section II.B: supplemental plan participation (subjective and objective), supplemental plan contribution level, and log of self-reported non-housing wealth. We recognize the host of interrelated factors that jointly determine retirement planning, retirement savings, and wealth accumulation. As a result, the analysis considers wealth because it is an observable characteristic of individuals that is (in part) associated with planning. Across the four aspects of retirement planning behavior presented in Columns 3-6 of Table 6, risk aversion has no significant association with these

[21] Appendix Table D.2 provides estimates for a 6-months window and for a two-year window. The results are relatively consistent with those shown in Table 6: self-reported financial knowledge is consistently found to be statistically significant, while the coefficients on risk and time preferences and objective financial knowledge are not consistently statistically significant.

outcomes. Time preferences are only statistically significantly related to retirement planning for wealth accumulation.

Financial literacy and self-reported financial knowledge are associated with having obtained an ORBIT self-service estimate in the past 12 months and the amount of accumulated wealth. Financial literacy does not have a strong association with the supplemental plan participation measures, with the exception that self-reported financial knowledge is positively associated with self-reported plan contribution rates conditional on participation. When considering time until eligible for retirement, being further from objectively measured retirement eligibility is associated with a lower probability of requesting a self-service estimate and of objectively measured plan participation. For three out of four measures of planning in Columns 3-6, we observe that higher earners are more likely to be planning for retirement.

D. Reverse Causality

Our results have documented an association between time preferences and retirement planning. We interpret this finding as telling us that more patient individuals are more willing to engage in planning activities today that have delayed rewards (e.g., more income security in retirement) because of the fundamental way that time preferences affect intertemporal tradeoffs. An alternative explanation is a causal link in the reverse direction: individuals who chose to engage in planning activities change their time preferences toward higher levels of patience. One justification for a reverse causality story is that planning teaches individuals to be willing to delay consumption. This subsection presents evidence that this reverse relationship is not driving our results.

We have referred to an individual as more patient if she chose the delayed reward on either of our hypothetical choice survey question. This includes a lottery frame ($1,000 windfall

gain today or $1,200 in one year) and a benefit frame ($500 per month in Social Security benefits plus an up-front, lump sum payment of $80,500 or $1,000 per month). We conjecture that reverse causality is more of a concern for a time preference framing in the context of retirement planning and less of a concern in the context of lottery windfalls. That is, it is more likely that prior retirement planning might "teach" an individual to be willing to forgo a lump sum in order to maintain a high level of pension benefits. But it is less likely that planning would subsequently affect responses on a preference for the timing of windfall gains.

Behavioral economics has presented a substantial amount of evidence that individuals treat gains differently depending on the stakes and depending on whether the gains are anticipated. These differences affect which "mental account" individuals perceive them as belonging to (Thaler, 1990). Our benefit frame involves high stakes payments of anticipated gains, while the lottery frame involves a lower stakes payment of windfall gains. We provide evidence against reverse causality by exploring whether the association between patience and planning holds if we only consider the lottery frame of our time preference elicitation.

Table 7 reruns the regressions of subjective planning (Column 3, Table 4) and the additional aspects of planning (Columns 1-6, Table 6) with time preferences measured with the lottery frame only. In Column 1 of Table 7, patience has a smaller association with planning (around four percentage points). But the basic pattern of more patient individuals engaging in more planning continues to hold to a degree that is economically and statistically significant. Columns 2 and 3 consider ORBIT activity and, as with the results in Table 6, show no association of patience with planning as measured with ORBIT log-ins or benefit estimates. Next, we reanalyze supplemental plan participation and contributions in Columns 4-6 using only the lottery frame. The results suggest a stronger association between planning time preferences

as measured in the lottery frame, relative to our main specification of patient on either frame. This runs counter to a reverse causality explanation. Finally, Column 7 of Table 7 finds a similar association of time preferences and planning using the lottery frame as we saw with the results using either frame.

Time preferences elicited with a lottery frame are more robustly associated with retirement planning relative to our combined time preference measure.[22] We prefer to remain agnostic about which framing is more appropriate for studying retirement planning. However, finding that patience as measured in a lottery frame is robustly associated with retirement planning provides evidence that reverse causality is not the sole explanation for our findings.

V. Plan Realizations

Thus far, we have documented a key role for time preferences and financial literacy in determining retirement planning behavior. Given the importance of planning for lifetime income security, these planning results have strong implications for public policy as well as individual behavior. However, we can say more by connecting retirement planning to actual retirement timing. For this exercise, we exploit our rich data, which link administrative records and survey responses. Do plans made for retirement predict behavior that is eventually implemented? Further, are the associations we have documented consistent with a causal link from time preferences to retirement timing decisions via the link from time preferences to retirement planning? That is, do we see evidence of time preferences affecting retirement planning which in turns affects retirement timing decisions?

[22] Similarly, Anderson and Mellor (2009) find that risk preferences elicited from a question involving windfall gains has more predictive power than those from a question involving anticipated gains.

The administrative data provide us with a snapshot of work status as of April 2016, which can be compared with our survey data on active employees collected between April and June of 2014.[23] We present two sets of results: Table 7 considers planned retirement age as self-reported on the survey and Table 8 considers whether individuals have retired as of April 2016.[24] For this exercise, we focus on individuals who reported their planned retirement age.[25] We analyze whether time preferences are associated with planned retirement age and whether time preferences are associated with actual retirement timing, controlling for planned retirement age. Our focus is on whether the association of time preference and retirement timing is mediated by retirement planning. If so, this suggests that time preferences affect retirement timing because time preferences affect retirement planning that in turn affects retirement timing.

Table 8 suggests that an individual who is more patient reports a planned retirement age that is around four months later, all else equal. The effect of patience on planned retirement age is similar when subjective planning is included. As noted in Table 2, planners have earlier planned retirement ages; this also holds in the full regression specification controlling for age, years of service, and time until eligible for retirement benefits. More risk averse individuals plan to retire slightly later but the standard error on the estimated coefficient is large. There is not a

[23] We received our first email survey response on April 1st, 2014 and our last email survey response on June 17th, 2014. The last retirement date we observe in the administrative data is July 1st, 2016. Therefore, we observe retirements approximately two years after completion of the survey.

[24] See Table 2 for summary statistics of planned retirement age. Only 6% of respondents did not report a planned retirement age. The sample also excludes eleven deceased individuals.

[25] The survey asked respondents their anticipated retirement *age,* not date. Using the administrative data, we calculate the age of respondents at time of survey. We calculate the difference between self-reported planned retirement age and their imputed age at the time of the survey.

statistically significant relationship with objective financial literacy, while self-reported financial knowledge is associated with a small decrease in planned retirement age.

[Table 8]

Having documented the relationship between time preferences and planned retirement age, we now turn to retirement behavior. The dependent variable in Table 9 equals one if the individuals retired between the time of the survey and April 2016. The specification controls for planned retirement age and finds a large and statistically significant estimated coefficient; those with older planned retirement ages are significantly less likely to have retired by April 2016. Thus, we find that stated plans are highly predictive of actual behavior, which supports our focus on retirement planning behavior in the earlier parts of the paper. More importantly, controlling for planned retirement age, time preferences affect retirement behavior. From Column 1 of Table 9, more patient individuals are around three percentage points more likely to have retired. Risk aversion has a small and statistically insignificant estimated relationship with retirement behavior. Objective financial literacy is associated with large reductions in retirement propensity, while self-reported financial knowledge is not significantly related.

[Table 9]

The remaining columns in Table 9 explore our mediation hypothesis: time preferences affect retirement behavior because they affect retirement planning. Column 2 adds subjective planning to the specification in Column 1. The coefficient on patience is only slightly reduced, which is inconsistent with an effect of time preferences on retirement timing that is mediated by planning. However, in Columns 3 and 4, we rerun the specification in Column 1 for only planners (Column 3) and only non-planners (Column 4). Time preferences are predictive of retirement timing but only for planners. This is consistent with our mediation hypothesis. The

difference between the effect of patience on retirement for planners and its effect for non-planners is large (5.90 percentage points) and statistically significant (standard error of the difference = 3.36, p-value = 0.08). We conclude that time preferences matter more for planners than for non-planners in their determination of retirement behavior.

VI. Conclusion

We study the predictive power of risk and time preferences in the determination of retirement planning behavior, including subjective and objective measures of planning, supplemental savings plan contributions, wealth accumulation, planned age at retirement, and plans for working after retirement from a career job in the public sector. After demonstrating the importance of financial literacy, we show that our measures of time preferences have an association with retirement planning that is more robust, in quantitative and statistical terms, than the association of planning with our measures of risk preferences. It is intuitive that planning for lifetime income security over a long horizon will be heavily dependent on an individual's time preferences but the literature has been more focused on risk preferences.

We show the importance of financial literacy and time preferences using a new data set that is well suited for understanding retirement planning and preparedness. By combining survey data and administrative reports, the analysis considers retirement decision making from a broad perspective. Further, our survey allows us to classify individuals as more or less patient based on their reported preference between hypothetical intertemporal income patterns. In addition to being more likely to report having formulated a retirement plan, more patient individuals participate in supplemental plans more often, contribute to supplemental plans at higher levels, and plan to retire at older ages. These results suggest that behavioral aspects of decision making tell us something important about how individuals prepare for retirement.

The richness of our data allows us to explore multiple facets of retirement planning behavior and outcomes associated with retirement plans. By combining a large-scale survey with detailed administrative records, we provide unique insights into older workers transitions out of career employment into full retirement. An additional feature of our data is the ability to exploit longitudinal data for multiple years after our initial survey. We track our survey respondents in the administrative records for two years. Our final analysis explores individuals' retirement propensity during these two years. We find that stated plans matter, which demonstrates why it is important to study planning behavior. Further, planned retirement age and actual retirement timing are associated with time preferences. But, conditional on planned retirement age, time preferences only have an association with actual retirement timing among individuals with a retirement plan. For non-planners, the association of time preferences and actual retirement timing is estimated to be very close to zero and statistically insignificant. In total, our results highlight the important role played by time preferences in understanding retirement planning and actual retirement behavior.

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Table 1: Descriptive Statistics

	Full Sample	Subjective Planning		Difference
		Yes	No	
	(1)	(2)	(3)	(4) = (2)-(3)
Number of Observations	2,024	954 (47.1%)	1,070 (52.9%)	
Salary	$52,481	$57,718	$47,811	9,907 ** (1,078)
Earned years of service	16.34	17.26	15.52	1.74 ** (0.40)
Eligible to retire	53.11%	59.22%	47.56%	11.66% ** (2.20)
Years until eligible if not yet eligible	4.10	3.92	4.23	-0.31+ (0.17)
Age at survey	56.76	57.21	56.35	0.86 ** (0.18)
Married female	45.16%	48.85%	41.87%	6.98% ** (2.21)
Single female	23.67%	19.39%	27.48%	-8.09% ** (1.87)
Married male	24.31%	26.42%	22.43%	3.99% * (1.91)
Single male	6.87%	5.35%	8.22%	-2.87% * (1.11)
College degree	63.14%	70.65%	56.45%	14.20% ** (2.11)
Non-white	22.78%	18.03%	27.01%	-8.98% ** (1.84)
Home Owner	86.22%	92.56%	80.56%	12.00% ** (1.48)
Print sample	22.58%	14.47%	29.81%	-15.34% ** (1.80)
Self-reported healthy	61.12%	69.50%	53.64%	15.86% ** (2.13)
Dependent children	37.06%	34.28%	39.53%	-5.25% * (2.14)

Notes: Data are from merged administrative and survey data of public sector workers in North Carolina. Means of continuous variables and percentages of dichotomous variables are presented. Subjective planning is defined as self-reporting having made a retirement plan. For details on the variable definitions, see Appendix A. + $p<0.10$, * $p<0.05$, ** $p<0.01$.

Table 2: Retirement Planning and Aspects of the Retirement Plan

	Number of Obs.	Full Sample	Subjective Planning: Yes	Subjective Planning: No	Difference
		(1)	(2)	(3)	(4) = (2)-(3)
Number of Observations (Full Sample)	2,024		954 (47.1%)	1,070 (52.9%)	
Alternative Planning Measures:					
ORBIT Log-in past 12 months	2,024	67.49%	77.04%	58.97%	18.07%** (2.03)
ORBIT Self-Service Estimate past 12 months	2,024	53.56%	63.84%	44.39%	19.45%** (2.17)
Subjective supplemental plan participation	1,948	73.72%	82.10%	66.28%	15.82%** (1.94)
Objective supplemental plan participation	2,024	44.17%	50.31%	38.69%	11.62%** (2.20)
Self-reported contribution level among participants	1,085	8.98%	11.18%	6.31%	4.87%** (0.73)
Self-reported non-housing wealth	1,548	$190,019	$284,021	$97,224	$186,797** (13,123)
Additional Aspects of the Retirement Plan:					
Planned retirement age	1,895	62.75	62.23	63.23	-1.00** (0.19)
Blank planned retirement age	2,024	6.37%	4.93%	7.66%	-2.73%* (1.07)
Plan to work after retirement	1,992	73.04%	70.26%	75.55%	-5.29%** (1.99)
Blank planned work after retirement	2,024	1.58%	0.94%	2.15%	-1.21%* (0.54)
Imputed expected replacement rate	1,508	84.57%	80.99%	88.13%	-7.14%** (2.45)
Blank on expected income or salary information	2,024	25.49%	21.38%	29.16%	-7.78%** (1.92)

Notes: Data are from merged administrative and survey data of public sector workers in North Carolina. Means of continuous variables and percentages of dichotomous variables are presented. Subjective planning is defined as self-reporting having made a retirement plan. For details on the variable definitions, see Appendix A. + $p<0.10$, * $p<0.05$, ** $p<0.01$

Table 3: Preferences, Knowledge, and Retirement Planning

		Subjective Planning		
	Full Sample	Yes	No	
	(1)	(2)	(3)	(2)-(3)
Number of Observations (Full Sample)	2,024	954 (47.1%)	1,070 (52.9%)	-5.80%
Panel A: Risk and Time Preferences				
More patient	62.65%	69.39%	56.64%	12.75%***
				(2.13)
More risk averse	67.49%	68.34%	66.73%	1.61%
				(2.08)
Panel B: Financial Literacy				
High financial literacy: 3 of 3 correct	30.73%	36.79%	25.33%	11.46%**
				(2.05)
Moderate financial literacy: 2 of 3 correct	46.39%	47.06%	45.79%	1.27%
				(2.22)
Self-reported financial knowledge	4.23	4.68	3.83	0.85**
				(0.05)

Notes: Data are from merged administrative and survey data of public sector workers in North Carolina. Means of continuous variables and percentages of dichotomous variables are presented. Subjective planning is defined as self-reporting having made a retirement plan. For details on the variable definitions, see Appendix A. + $p<0.10$, * $p<0.05$, ** $p<0.01$

Table 4: Linear Probability Model Estimates of Subjectively Measured Planning

	(1)	(2)	(3)
More patient	0.075**	0.063**	0.064**
	(0.023)	(0.023)	(0.023)
More risk averse	0.030	0.027	0.025
	(0.027)	(0.026)	(0.026)
Financial literacy: High	0.125**	0.051	0.051
	(0.030)	(0.032)	(0.032)
Financial literacy: Medium	0.086**	0.047+	0.044
	(0.027)	(0.028)	(0.028)
Self-reported financial knowledge	0.118**	0.102**	0.103**
	(0.008)	(0.008)	(0.008)
Eligible for retirement		0.025	0.023
		(0.040)	(0.040)
Years until eligible for retirement		0.005	0.005
		(0.007)	(0.007)
Earned years of service		0.003	0.002
		(0.002)	(0.002)
Annual 2013 salary (10 k)		0.010*	0.014*
		(0.005)	(0.006)
Married male		-0.051+	-0.056*
		(0.026)	(0.028)
Single female		-0.083**	-0.081**
		(0.027)	(0.027)
Single male		-0.141**	-0.153**
		(0.043)	(0.045)
College degree		0.048+	0.019
		(0.024)	(0.028)
Non-white		-0.028	-0.024
		(0.026)	(0.026)
Home owner		0.112**	0.109**
		(0.032)	(0.032)
Print sample		-0.117**	-0.119**
		(0.026)	(0.027)
Self-reported healthy		0.076**	0.077**
		(0.022)	(0.022)
Dependent children		-0.047*	-0.049*
		(0.022)	(0.022)
Agency fixed effects	No	No	Yes
Job fixed effects	No	No	Yes
Adjusted R squared	0.124	0.184	0.185

Notes: In all columns, the dependent variable is subjective planning, which is defined as a self-report of having made a retirement plan. Mean of subjective planning is 0.4713 and number of observations is 2,024. Coefficients are estimated using a linear probability model. All regressions include indicators for answered don't know when asked the risk and time preferences questions and a dummy for those that did not answer the dependent children question. Standard errors are in parentheses. + p<0.10, * p<0.05, ** p<0.01.

Table 5: Heterogeneity in the Link between Patience and Retirement Planning

	Baseline	Years until Retirement	Gender x Married	Gender x Education	Risk Aversion
	(1)	(2)	(3)	(4)	(5)
More patient	0.064**	0.093*	0.065*	0.024	0.021
	(0.023)	(0.037)	(0.032)	(0.035)	(0.039)
More patient * Years until retirement		-0.004			
		(0.005)			
More patient * Married Male			0.066		
			(0.053)		
More patient * Single Female			-0.093+		
			(0.053)		
More patient * Single Male			0.101		
			(0.090)		
More patient * Female * College				0.040	
				(0.047)	
More patient * Male * College				0.139*	
				(0.061)	
More patient * Risk Averse					0.061
					(0.046)
More risk averse	0.025	0.030	0.027	0.027	-0.016
	(0.026)	(0.027)	(0.026)	(0.026)	(0.041)
Financial literacy: High	0.051	0.034	0.051	0.047	0.052
	(0.032)	(0.033)	(0.032)	(0.032)	(0.032)
Financial literacy: Medium	0.044	0.033	0.046+	0.043	0.044
	(0.028)	(0.029)	(0.028)	(0.028)	(0.028)
Self-reported financial knowledge	0.103**	0.101**	0.103**	0.103**	0.103**
	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)
Eligible for retirement	0.023	0.006	0.021	0.021	0.023
	(0.040)	(0.041)	(0.040)	(0.040)	(0.040)
Years until eligible for retirement	0.005	0.016*	0.005	0.005	0.005
	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)
Earned years of service	0.002	0.001	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Annual 2013 salary (10 k)	0.014*	0.014*	0.014*	0.014*	0.014*
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Adjusted R squared	0.183	0.200	0.186	0.184	0.185

Notes: In all columns, the dependent variable is subjective planning, which is defined as a self-report of having made a retirement plan. Mean of subjective planning is 0.4713 and number of observations is 2,024. Coefficients are estimated using a linear probability model. The specification is identical to Table 4, Column 3 and includes agency and job fixed effects, indicators for answered don't know when asked the risk and time preferences questions, and a dummy for those that did not answer the dependent children question. Standard errors are in parentheses. + p<0.10, * p<0.05, ** p<0.01.

Table 6: Additional Aspects of Planning

	ORBIT log-in	ORBIT self-service estimate	Self-reported supplemental plan participation	Objective supplemental plan participation	Self-reported contribution rate for participants	Log (Self-reported non-housing wealth)
	(1)	(2)	(3)	(4)	(5)	(6)
More patient	0.013	0.000	0.032	0.027	0.833	0.220**
	(0.019)	(0.021)	(0.022)	(0.022)	(0.808)	(0.064)
More risk averse	0.032	0.023	-0.030	-0.032	-0.175	-0.081
	(0.022)	(0.025)	(0.025)	(0.025)	(0.891)	(0.073)
Financial literacy: High	0.036	0.068*	-0.002	0.040	1.201	0.345**
	(0.027)	(0.030)	(0.031)	(0.031)	(1.135)	(0.091)
Financial literacy: Medium	0.030	0.050+	-0.005	0.001	-0.147	0.159+
	(0.023)	(0.026)	(0.027)	(0.027)	(1.043)	(0.082)
Self-reported financial knowledge	0.027**	0.024**	0.008	0.013	1.217**	0.239**
	(0.007)	(0.008)	(0.008)	(0.008)	(0.308)	(0.024)
Eligible for retirement	0.046	-0.038	-0.022	-0.056	1.743	0.315**
	(0.033)	(0.037)	(0.038)	(0.038)	(1.416)	(0.114)
Years until eligible for retirement	0.004	-0.017*	-0.005	-0.004	0.090	0.036+
	(0.006)	(0.007)	(0.007)	(0.007)	(0.256)	(0.021)
Earned years of service	0.004**	0.007**	0.002	0.011**	-0.170*	-0.010+
	(0.002)	(0.002)	(0.002)	(0.002)	(0.068)	(0.006)
Age: 55 to 59.5	-0.000	0.014**	0.017**	0.003	0.150	0.082**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.172)	(0.016)
Age: over 59.5	0.095**	0.082**	-0.034	-0.016	0.699	0.289**
	(0.028)	(0.031)	(0.032)	(0.032)	(1.153)	(0.096)
Annual 2013 salary (10 k)	0.000	0.014**	0.017**	0.003	0.137	0.084**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.171)	(0.015)
Mean	0.675	0.536	0.737	0.442	8.977	194,122
Adjusted R squared	0.345	0.280	0.074	0.238	0.104	0.314
Observations	2,024	2,024	1,948	2,024	1,085	1763

Notes: The dependent variable is indicated in the column header. ORBIT log-in (Col. 1), ORBIT self-service estimate (Col. 2), and participation in a state-managed supplemental plan (Col. 4) are all derived from administrative records. Participation in any supplemental retirement saving plan (Col. 3), contribution rate among participants (Col. 5), and non-housing wealth (Col. 6) are all self-reported in the survey data. Coefficients are estimated using a linear probability model (Columns 1-4) or OLS (in Columns 5-6). All regressions include a parallel set of coefficients to Table 4, Column 3 with several covariates not reported here for brevity. Standard errors are in parentheses. + p<0.10, * p<0.05, ** p<0.01.

Table 7: Lottery Frame Only

	Subjective planning	ORBIT log-in	ORBIT self-service estimate	Self-reported supplemental plan participation	Objective supplemental plan participation	Self-reported contribution rate for participants	Log (Self-reported non-housing wealth)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
More patient: Lottery	0.043^{+}	-0.006	-0.003	0.054**	0.040^{+}	1.286^{+}	0.244**
	(0.022)	(0.018)	(0.020)	(0.020)	(0.020)	(0.745)	(0.060)
More risk averse	0.027	0.025	0.018	-0.009	-0.032	-0.270	-0.098
	(0.026)	(0.018)	(0.020)	(0.021)	(0.021)	(0.769)	(0.062)
Financial literacy: High	0.050	0.039	0.067*	-0.001	0.034	0.968	0.336**
	(0.032)	(0.026)	(0.030)	(0.030)	(0.030)	(1.118)	(0.091)
Financial literacy: Medium	0.045	0.031	0.050^{+}	-0.000	-0.002	-0.248	0.169*
	(0.028)	(0.023)	(0.026)	(0.026)	(0.026)	(1.022)	(0.081)
Self-reported financial knowledge	0.103**	0.028**	0.024**	0.007	0.012	1.194**	0.237**
	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)	(0.307)	(0.024)
Eligible for retirement	0.022	0.046	-0.038	-0.024	-0.056	1.731	0.312**
	(0.040)	(0.033)	(0.037)	(0.038)	(0.038)	(1.412)	(0.114)
Years until eligible for retirement	0.005	0.004	-0.017*	-0.005	-0.004	0.080	0.036^{+}
	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)	(0.255)	(0.021)
Earned years of service	0.002	0.004**	0.007**	0.002	0.011**	-0.167*	-0.009^{+}
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.068)	(0.006)
Annual 2013 salary (10 k)	0.014*	-0.000	0.014**	0.016**	0.003	0.146	0.078**
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.172)	(0.016)
Mean	0.471	0.675	0.536	0.737	0.442	8.977	194,122
Adjusted R squared	0.183	0.345	0.280	0.076	0.240	0.108	0.315
Observations	2,024	2,024	2,024	1,948	2,024	1,085	1,763

Notes: The dependent variable is indicated in the column header. ORBIT log-in (Col. 2), ORBIT self-service estimate (Col. 3), and participation in a state-managed supplemental plan (Col. 5) are all derived from administrative records. Subjective planning (Col.1), participation in any supplemental retirement saving plan (Col. 4), contribution rate among participants (Col. 6), and non-housing wealth (Col. 7) are all self-reported in the survey data. Coefficients are estimated using a linear probability model (Columns 1-5) or OLS (in Columns 6-7). All regressions include a parallel set of coefficients to Table 4, Column 3 with several covariates not reported here for brevity. Standard errors are in parentheses. + p<0.10, * p<0.05, ** p<0.01.

Table 8: Planned Retirement Age

	(1)	(2)
More patient	0.268^{+}	0.321*
	(0.157)	(0.156)
Subjective planning		-0.858**
		(0.156)
More risk averse	0.171	0.193
	(0.185)	(0.183)
Financial literacy: High	-0.025	0.004
	(0.223)	(0.221)
Financial literacy: Medium	-0.007	0.020
	(0.196)	(0.194)
Self-reported financial knowledge	-0.258**	-0.167**
	(0.060)	(0.062)
Eligible for retirement	-0.227	-0.217
	(0.276)	(0.274)
Years until eligible for retirement	0.498**	0.504**
	(0.051)	(0.050)
Earned years of service	-0.130**	-0.128**
	(0.013)	(0.013)
Annual 2013 salary (10 k)	-0.011	0.002
	(0.039)	(0.038)
Adjusted R squared	0.481	0.489

Notes: The sample size is 1,885 respondents reporting a planned retirement age. In all columns, the dependent variable is the planned retirement age, which has a mean of 62.765. All regressions include an identical set of control variables to the specification in Table 4, Column 3 with several not reported here for brevity. Standard errors are in parentheses. + p<0.10, * p<0.05, ** p<0.01.

Table 9: Plan Realizations

	Full Sample	Includes Retirement Plan	Planners	Non-Planners
	(1)	(2)	(3)	(4)
More patient	0.031^{+}	0.028^{+}	0.060*	0.001
	(0.017)	(0.017)	(0.028)	(0.021)
Subjective planning		0.040*		
		(0.017)		
Planned retirement age	-0.037**	-0.036**	-0.054**	-0.023**
	(0.003)	(0.003)	(0.004)	(0.003)
More risk averse	-0.007	-0.008	-0.020	0.010
	(0.020)	(0.020)	(0.031)	(0.025)
Financial literacy: High	-0.069**	-0.070**	-0.102*	-0.058^{+}
	(0.024)	(0.024)	(0.040)	(0.030)
Financial literacy: Medium	-0.038^{+}	-0.040^{+}	-0.057	-0.046^{+}
	(0.021)	(0.021)	(0.036)	(0.025)
Self-reported financial knowledge	-0.002	-0.006	-0.009	-0.003
	(0.006)	(0.007)	(0.011)	(0.008)
Eligible for retirement	0.094**	0.094**	0.094*	0.081*
	(0.030)	(0.030)	(0.047)	(0.037)
Years until eligible for retirement	0.037**	0.036**	0.044**	0.028**
	(0.006)	(0.006)	(0.009)	(0.007)
Earned years of service	0.010**	0.010**	0.012**	0.007**
	(0.001)	(0.001)	(0.002)	(0.002)
Annual 2013 salary (10 k)	-0.002	-0.003	-0.010^{+}	0.011^{+}
	(0.004)	(0.004)	(0.006)	(0.006)
Mean	0.196	0.196	0.261	0.135
Adjusted R squared	0.321	0.323	0.378	0.247
N	1,885	1,885	903	982

Notes: The sample size is 1,885 respondents reporting a valid planned retirement age. In all columns, the dependent variable is retired as of April 2016 defined as terminating employment and receiving a pension benefit. Coefficients are estimated using a linear probability model. All regressions include an identical set of control variables to the specification in Table 4, Column 3 with several not reported here for brevity. Standard errors are in parentheses. + p<0.10, * p<0.05, ** p<0.01.

Online Appendix

Planning for Retirement? The Importance of Time Preferences

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Appendix A: Data Appendix

The data used in this paper are part of the North Carolina Retirement Transitions Study-Active Workers (NCRTS-A). These data were gathered as part of a larger project, "Challenges to Retirement Readiness in the North Carolina Public Sector Workforce," funded by Sloan Foundation Grant Number 2013-10-20. This appendix describes the sample used in this paper only. For more information about the full project, please see the website: http://go.ncsu.edu/publicsectorretirement.

Table A1 illustrates the construction of the sample used in this paper. The target survey population is workers that were ages 50-64, actively employment in March 2014, and have valid 2013 salary information indicating an active membership (N=138,790). Those with an email address were eligible for the email sample (N= 82,503), while the remaining workers were eligible for the print survey (N = 56,287). We sent a survey to the final target population of 13,884 (8,293 and 5,591 surveys sent for the email and print sample, respectively). As an incentive to complete the survey, we advertised that participants could enter into a drawing to win a free iPad. We received 2,480 responses (1,953 and 527 for email and print, respectively) for an overall response rate of about 18 percent. When including only those with valid survey responses to the main demographic characteristics (marital status, education, and race) and those that answered the key economic questions on retirement planning, risk and time preferences, and self-reported financial knowledge, the final data set used for analysis includes 2,024 workers

(1,567 email and 457 print). We return to sample representativeness in Appendix Table A4 below.

Definitions of key variables are presented in Table A2. Of note, there are several types of service that could be important in our analysis. First, there is membership service, which should approximate the actual tenure of the employee minus any transferred or withdrawn service. We use membership service for our measure of job tenure. However, to be eligible for retirement benefits, individuals may also have purchased non-contributory (e.g., sick leave and vacation time) service. To account for these latter types of service for all employees, we include an additional 0.71 years of service in our calculation of eligibility for retirement benefits. We include any other purchased service reported while working in the total years of service when calculating eligibility (e.g., transferred or military service). Finally, Table A3 shows the responses to the financial literacy questions.

Table A4 explores the representativeness of the respondents relative to the information available on the full population. The samples for Columns (1)-(3) are described in Table A1 above. The analysis sample is roughly similar to the full population. Respondents are more likely to be female, are slightly older, higher earning and have fewer years of service. Importantly, respondents are 9 percentage points less likely to be already eligible for retirement benefits than the full population. Among those not yet eligible to retire, the analysis sample is about 3 months closer to eligible to retire. Not surprisingly, we observe that our respondents are substantially more likely to have engaged in objectively measured retirement planning activities.

To compare our analysis sample to the full population in terms of more detailed demographic characteristics, we extract from the American Community Survey (ACS) using

2008-2012 ACS 5-year Public Use Microdata Samples.[26] The sample is full time federal, state, or local government employees, defined as individuals who worked at least 30 hours for 14 or more weeks in the past year. Individuals with missing demographics (age, gender, marital status, and income) were excluded. We include data from North Carolina only and from the entire United States for comparison. The comparison to the ACS confirms the findings above. The analysis sample is more female, older, and higher earning relative to the average population. In addition, respondents are more likely to be married, have a college degree, and to be white. Thus, our findings should be interpreted as relating to a somewhat selected sample of survey respondents.

[26]U.S. Census Bureau; American Community Survey, 2010 American Community Survey 5-Year Estimates, using American FactFinder; <http://factfinder2.census.gov>; [November, 2014].

Table A1. Data set construction

	Full	Email	Print
Aged 50-64 in the administrative records	138,790	82,503	56,287
Surveys Sent	13,884	8,293	5,591
Survey Responses	**2,480**	**1,953**	**527**
Marital status reported	2,253	1,739	514
Education and race reported	2,226	1,718	508
Retirement plan question answered	2,210	1,710	500
Risk and time preferences question answered	2,052	1,583	469
Self-reported financial knowledge	2,040	1,578	462
Own home	2,024	1,567	457
Final Sample	**2,024**	**1,567**	**457**

Notes: The full NCRTS-A data contains responses for workers ages 50-70 in 2014. The first row indicates the number of workers ages 50-64 with valid employment status and gender in the administrative records. Of these, 13,884 were sent a survey and 2,480 responded (response rate is 18 percent). The remaining rows indicate the restrictions placed on the analysis sample for a final sample size of 2,024 respondents.

Table A2: Key variables

Variable	Source	Definition
Demographics		
Earned years of service	Administrative	Years of contributory service. Does not include any service purchased. Excludes transferred or withdrawn service. This measure is used to proxy for tenure.
Age at survey	Administrative	Age of respondents as of April 1, 2014.
Annual 2013 salary	Administrative	Sum of total salary in 2013 across all memberships. If employee was hired in 2013, annual salary is imputed from 2013 reported salary in the administrative data and number of days hired (calculated using membership begin date).
Print sample	Administrative	Survey respondents who that did not provide an email address to their employer.
Agency	Administrative	Employees belong to one of the following agencies: city, county, public school, general government, Department of Transportation, or other.
Job categories	Administrative	Employees belong to one of the following job categories: safety/rescue officers, executives/management/government, education professionals, educational support personnel, health care professionals, professionals, trades and technical, social service professionals, or university.
Self-reported healthy	Survey	Self-reported health: Excellent or very good.
Dependent children	Survey	Self-reported having children depending on her for more than half of their financial support.
Planning Measures		
Subjectively measured planning	Survey	Self-reported having a plan on the survey.
Orbit log-in	Administrative	Logged into orbit between August 19th, 2013 and August 18th, 2014.
Orbit self-service estimate	Administrative	Logged into orbit between August 19th, 2013 and August 18th, 2014 and requested a self-service estimate.
Self-reported supplemental plan participation	Survey	Self-reported currently participating in a supplemental retirement saving plan with her current public employer (e.g., 401(k), 403(b), or 457(b) plan)
Objective supplemental plan participation	Administrative	Indicator for participating in either NC 401(K) or NC 457.
Self-reported contribution rate for participants	Survey	Self-reported contribution rate for those participating in supplemental retirement saving plans. If annual dollar amount provided, contribution rate is imputed using annual 2013 salary from the administrative records.
Self-reported non-housing wealth	Survey	Self-reported category of household's current savings and investments. Median of category is used in regression except the last category, "1 million or more" where 1.2 million is used.
Planned retirement age	Survey	Self-reported age at which she plans to stop working full-time for current employer and begin receiving retirement benefits.

Financial literacy: High	Survey	Answered 3 out of 3 financial literacy questions correctly
Financial literacy: Medium	Survey	Answered 2 out of 3 financial literacy questions correctly
Imputed Variables		
Expected replacement rate	Survey	Dividing expected income needed in retirement for survey respondent (and spouse if applicable) by self-reported salary on survey (and self-reported spouse salary if applicable).
Retired and claiming benefits	Administrative	Calculated as of April 19, 2016. Claimed benefits under full or early retirement
Years until eligible for retirement	Administrative	Calculated as of April 1, 2014. Minimum number of years before an employee can qualify for retirement when considering all the combinations of age at survey and years of service by which an individual can qualify. Indicator for those already eligible for retirement.

Calculating years until eligible for retirement:

TSERS and LGERS members are eligible to retire with an unreduced service retirement benefit after reaching (1) age 65 and 5 years of membership (creditable) service (2) age 60 and 25 years of creditable service (3) 30 years of creditable service at any age. Local law enforcement officers that are members of LGERS are also eligible to retire with an unreduced service retirement benefit after reaching age 55 and 5 years of creditable service.

TSERS and LGERS members are eligible to retire with a reduced benefit after reaching: (1) age 50 and 20 years of creditable service, or (2) age 60 (age 55 if the employee is a firefighter or rescue squad worker) and 5 years of creditable service. Local law enforcement officers that are members of LGERS are eligible to retire with a reduced service retirement benefit after reaching age 50 and 15 years of creditable service.

While the years of creditable service used to determine eligibility can include purchased service and unused sick leave (converted to creditable service at retirement), we do not generally observe these latter types of service since our sample includes only active workers. To get a better approximation for time until eligible for retirement, we include an additional 0.71 years of non-contributory membership service for all workers. This number is the median difference between the measure of creditable years of service observed at retirement and the actual creditable years of service claimed at retirement using data from a sample of recent retirees.

Table A3: Financial Literacy Questions

Survey Question	Answers (%)
Compound Interest	
If you have $100 in your savings account and the annual interest rate is 2%, how much money will you have in your account after 5 years?	
1. More than $102	**83.99**
2. $102	4.40
3. Less than $102	3.75
4. Do not know	6.27
Blank	1.58
Inflation	
If the current interest rate on your bank deposit is 1% per year and the inflation rate is 2% per year, how much do you think you will be able to buy with your money a year from now?	
1. A larger amount than you can buy now	1.93
2. Exactly the same as you can buy now	3.51
3. A smaller amount than you can buy now	**82.11**
4. Do not know	10.77
Blank	1.68
Tax Advantage	
Assume you are in the 25% tax bracket (you pay $0.25 in tax for each additional dollar earned) and you contribute $100 more pre-tax to a retirement saving plan (e.g., 401(k), 403(b), 457(b), IRA). Your take-home pay (what is in your paycheck after all taxes and other payments are taken out) will:	
1. Decline by $100	17.44
2. Decline by $75	**34.09**
3. Decline by $50	5.19
4. Remain the same	9.24
5. Do not know	23.07
Blank	10.97

N=2,024

Table A4: Comparison of key variables across population and survey responses

	Population (1)	Target Sample (2)	Valid/Included Responses (3)	Difference between sent sample and responded (4) = (3) –(2)
Admin data				
N	138,790	13,884	2,024	
Male	35.50%	34.21%	31.18%	-3.03%**
				(1.13)
Age at survey				
Mean	56.39	56.40	56.75	0.35**
				(0.09)
50-54.99	41.69%	41.54%	37.75%	-3.79%**
				(1.17)
55-59.99	36.72%	36.80%	37.94%	1.14%
				(1.15)
60-65.15	21.58%	21.65%	24.31%	2.66%**
				(0.98)
Salary				
Mean	$46,549	$45,586	$52,481	$6,895**
				(547.20)
Less than $30,000	24.44%	25.05%	14.82%	-10.23%**
				(1.00)
$30,000 to $49,999	39.69%	39.92%	37.50%	-2.42%*
				(1.16)
$50,000 to $74,999	26.89%	26.65%	33.60%	6.95%**
				(1.06)
$75,000 to $99,999	6.20%	5.86%	9.49%	3.63%**
				(0.58)
$100,000 to $149,999	2.14%	2.13%	4.05%	1.92%**
				(0.36)
$150,000 and above	0.64%	0.39%	0.54%	0.15%
				(0.15)
Earned years of service	14.72	14.64	16.34	1.70**
				(0.21)
Eligible to retire	44.22%	44.05%	53.11%	9.06%**
				(1.18)
Years until eligible to retire for those not yet eligible	4.35 (N=77,412)	4.36 (N=7,768)	4.10 (N=949)	-0.26**
				(0.09)
ORBIT log-in past 12 months	48.33%	47.93%	67.49%	19.56%**
				(1.19)
ORBIT self-service estimate past 12 months	35.82%	35.40%	53.56%	18.16%**
				(1.15)
Objective supplemental plan participation	38.79%	37.42%	44.17%	6.75%**
				(1.16)

Table A5: Comparison of key variables across population and survey responses

	NCRTS-A	ACS (NC)	ACS (All)
	(1)	(2)	(3)
Admin data			
N	2,024	11,105	376,040
Married female	45.16%	39.09%	35.27%
Married male	24.31%	31.53%	33.21%
Single female	23.67%	20.93%	20.89%
Single male	6.87%	8.46%	10.63%
College degree	63.14%	47.18%	30.52%
Non-white	22.78%	29.06%	27.05%
Age at survey			
Mean	56.75	55.73	55.84
50-54.99	37.75%	42.79%	42.12%
55-59.99	37.94%	36.35%	36.23%
60-65.15	24.31%	20.86%	21.65%
Salary			
Mean	$52,481	$49,994	$58,901
Less than $30,000	14.82%	25.65%	19.20%
$30,000 to $49,999	37.50%	32.69%	26.17%
$50,000 to $74,999	33.60%	28.32%	30.98%
$75,000 to $99,999	9.49%	7.46%	12.87%
$100,000 to $149,999	4.05%	4.33%	8.43%
$150,000 and above	0.54%	1.54%	2.36%

Notes: Column 1 includes the analysis sample drawn from the North Carolina Retirement Transition Study-Active Workers (NCRTS-A) survey data conducted March 2014. Columns 2 and 3 report means for the American Community Survey (ACS) data pooled 2008-2012 5-year PUMS

Appendix B: Supplemental plans

Survey question on supplemental plan:

2.1 Are you (and your spouse) currently participating in any of the following supplemental retirement saving plans?

Yes No N/A

a- Retirement savings plan with my current public employer (e.g., 401(k), 403(b), 457(b) plan)

b- Individual Retirement Account (IRA)

c- Retirement savings plan with your spouse/partner's current employer

Table B.1: Administrative records and survey supplemental plan participation rate:

			(1) Administrative Records				(2) Survey Responses (2.1a)			
		N	(a) Only 401k	(b) Only 457	(c) Both	(d) Neither	(a) Yes	(b) No	(c) N/A	(d) Blank
Full sample	All records	139,172	31.46%	3.43%	3.92%	61.20%				
	Responded to survey	2,024	36.02%	3.31%	4.84%	55.83%	70.95%	23.67%	3.75%	3.75%
Only eligible to participate in the Prudential NC401(k)/NC457	All records	25,875	23.46%	14.36%	12.02%	50.16%				
	Responded to survey	384	28.91%	13.28%	17.19%	40.63%	69.79%	24.48%	1.56%	4.17%

Notes: Column 1(a) defined as having an account balance in the NC 401k as of 7/17/2014. Column 1(b) defined as having an account balance in the NC 457 as of 7/17/2014. Only eligible to participate in the Prudential plans is based on the revised list of agencies that offer the NC401k/NC457 plans exclusively. Observations with no agency information or having worked for both exclusive and none exclusive agencies are part of the nonexclusive sample.

Table B.2: Comparison for those with access to NC plans only

	Survey Response (2.1)				
	Yes	No	N/A	Blank	TOTAL
Admin Records:					
Only 401k	27.60%	0.52%	0.26%	0.52%	111
Only 457	12.76%	0.52%	0.00%	0.00%	51
Both	16.15%	0.52%	0.52%	0.00%	66
Neither	13.28%	22.92%	0.78%	3.65%	156
TOTAL	268	94	6	16	384

Appendix C: Time and Risk Questions

In this appendix, we present additional detail on our measures of risk and time preferences. We consider three issues: (1) the correlation of time preferences from our two frames, (2) the interaction of time and risk preferences, and (3) a comparison of our sample's responses relative to the sample in the HRS.

First, Table C1 provides pairwise cross-tabulations of various preferences measures as well as their correlations. The measure of time preferences used in the main text equals one if the respondent chose the delayed reward on either the lottery frame or the benefit frame. Here, we refer to this measure as patient on either frame. We consider three additional measures: patient on the lottery frame, excluding the benefit frame; patient on the benefit frame, excluding the lottery frame; and patient on both frames.

Our two frames of the time preference questions provide measures of patience that are positively correlated. But the correlation of 0.07 is small, which suggests that the two frames provide measures that offer independent variation. Considering a given time preference measure and our measure of risk preferences, each pairwise correlation is small in absolute value. The patience measure providing the strongest correlation with risk aversion is the lottery frame, which has a correlation of -0.09 with our measure of risk preferences. Further, patience on the benefit frame also has a small correlation with risk aversion and, differently than the lottery frame, is positively correlated with risk aversion. While we find that our time preference questions offer measures that offer independent variation, we prefer to remain agnostic about which framing is more appropriate for studying retirement planning. As such, we use a single measure for patient on either frame as our main measure of patience.

Next, Table C2 provides additional analysis of the interactions of risk and time preferences in the determination of retirement planning behavior. Column 1 of Table C2 reproduces Column 5 of Table 5 in the main paper for comparison, where the dependent variable is subjective planning and patience and risk aversion are interacted. Columns 2-4 use different measures of time preferences: patient on the lottery frame, excluding the benefit frame; patient on the benefit frame, excluding the lottery frame; and patient on both frames. In Column 2 (lottery frame) and Colum 3 (benefit frame), we find that, unlike in Column 1, risk and time preferences have no interactive effects in terms of the size of the estimated coefficient on the interaction term. In Column 4 (patient on both frames), we find that, unlike in any of the other specifications, time preferences are strongly related to planning for less risk averse individuals but are much less strongly related to planning for more risk averse individuals. Given the lack of robustness in this analysis, we refrain from drawing firm conclusions regarding the ability of our measures of risk and time preferences to speak to the interactive effects of patience and risk aversion.

Table C3 provides a comparison of our survey respondents drawn from the North Carolina Retirement Transitions Study-Active Workers (NCRTS-A) to a sample drawn from the Health and Retirement Study (HRS) in terms of the risk preference question and the two time preference questions. Column 1 provides the tabulations in our sample, conditional on having answered the question. The remaining columns consider data from the HRS, where we match our answers as closely to those in the HRS. See each panel's note for a full discussion of how closely the exact dollar amounts match between our questions and those the HRS. We restrict the sample of HRS respondents to only include active workers aged 50-64, which matches our workers of interest. Column 2 includes the restricted HRS sample with only private sector

workers (active workers aged 50-64 who report working in an industry other than public administration). Column 3 includes the restricted HRS sample with only public sector workers (active workers aged 50-64 who report working in the public administration industry).

For statistical inference, we are limited by the very small sample of public sector workers in the HRS. Few public sector workers are covered in the HRS, yet much of what has been studied in the retirement literature uses the HRS. This is one of our motivations for studying the retirement planning and decision making of public sector workers. The small sample issue with public sector workers in the HRS is especially evident on the time preference questions (11 public sector workers responding to the lottery frame question and 10 public sector workers responding to the benefit frame question). In the discussion below (not reported in the table), we make formal statistical comparisons only between our respondents and respondents in the HRS who are active private sector workers aged 50-64 (Column 1 versus Column 2).

Our sample of public workers is more risk averse than private sector HRS respondents. The difference is 11.44 percentage points, which is statistically significant (standard error of the difference = 1.18, p-value = 0.00). This is consistent with the general intuition regarding public versus private sector workers and with past empirical evidence (Bellante and Link, 1981). Considering time preferences, our sample of public workers is more patient than private sector HRS respondents, irrespective of which frame is used (lottery frame difference = 12.24 percentage points, standard error of the difference = 2.40, p-value = 0.00; benefit frame difference = 19.73 percentage points, standard error of the difference = 2.45, p-value = 0.00). This is consistent with the fact that public sector workers have self-selected into jobs with more delayed compensation (lower salaries but higher DB pension benefits, relative to similar private

sector jobs). However, we do not know of empirical evidence on the comparison of time preferences between public and private sector workers in a representative sample.

Because of these differences between our sample of public workers and the private sector workers in the HRS, results from studies examining the retirement planning and preparedness of private sector workers do not necessarily apply to public sector workers. Further, given the limited coverage of public sector workers in the HRS, our data from North Carolina offer new insights not possible by considering the HRS alone.

Table C1: Cross-Tabulations and Correlations of Preference Measures

Panel A: Time preferences

	Patient: lottery	Impatient: lottery	Dk: lottery
Patient: benefit	18.08%	15.17%	0.94%
Impatient: benefit	22.88%	25.20%	1.63%
Dk: benefit	5.58%	6.13%	4.40%

Notes: Number of observations is 2,024.
Correlation (conditional on answering both questions): 0.0668

Panel B: Patient either and risk

	Risk averse	Risk seeking	Dk: risk
Patient: either	43.08%	13.44%	6.13%
Not "Patient: either"	24.41%	6.18%	6.77%

Notes: Number of observations is 2,024.
Correlation (conditional on answering both questions): -0.0373

Panel C: Benefit frame and risk

	Risk averse	Risk seeking	Dk: risk
Patient: benefit	24.85%	6.47%	2.87%
Impatient: benefit	34.19%	11.26%	4.25%
Dk: benefit	8.45%	1.88%	5.78%

Notes: Number of observations is 2,024.
Correlation (conditional on answering both questions): 0.0480

Panel D: Lottery frame and risk

	Risk averse	Risk seeking	Dk: risk
Patient: lottery	31.08%	11.02%	4.45%
Impatient: lottery	33.89%	7.95%	4.64%
Dk: lottery	2.52%	0.64%	3.80%

Notes: Number of observations is 2,024.
Correlation (conditional on answering both questions): -0.0857.

Panel E: Patient both and risk

	Risk averse	Risk seeking	Dk: risk
Patient: both	12.85%	4.05%	1.19%
Not "Patient: both"	54.64%	15.56%	11.71%

Notes: Number of observations is 2,024.
Correlation (conditional on answering both questions): -0.0103

Table C2: Interactions of Risk and Time Preference for Subjective Planning

	Either	Lottery	Benefit	Both
	(1)	(2)	(3)	(4)
More patient	0.021	0.036	0.060	0.116*
	(0.039)	(0.038)	(0.041)	(0.050)
More patient * More risk averse	0.061	0.010	0.004	-0.072
	(0.046)	(0.045)	(0.047)	(0.058)
More risk averse	-0.016	0.021	0.019	0.038
	(0.041)	(0.035)	(0.031)	(0.029)
Financial literacy: High	0.052	0.050	0.056+	0.053+
	(0.032)	(0.032)	(0.032)	(0.032)
Financial literacy: Medium	0.044	0.045	0.045	0.046
	(0.028)	(0.028)	(0.028)	(0.028)
Self-reported financial knowledge	0.103**	0.103**	0.104**	0.104**
	(0.008)	(0.008)	(0.008)	(0.008)
Eligible for retirement	0.023	0.022	0.026	0.026
	(0.040)	(0.040)	(0.040)	(0.040)
Years until eligible for retirement	0.005	0.005	0.005	0.006
	(0.007)	(0.007)	(0.007)	(0.007)
Earned years of service	0.002	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Annual 2013 salary (10 k)	0.014*	0.014*	0.015**	0.013*
	(0.006)	(0.006)	(0.006)	(0.006)
Adjusted R squared	0.185	0.183	0.184	0.184

Notes: In all columns, the dependent variable is subjective planning, which is defined as a self-report of having made a retirement plan. Mean of subjective planning is 0.4713 and number of observations is 2,024. Coefficients are estimated using a linear probability model. Column 1 measures patience with a single measure that equals one if the respondent chose the delayed reward on either frame (the measure from the main text); Column 2 uses the lottery frame, excluding the benefit frame; Column 3 uses the benefit frame, excluding the lottery frame; and Column 4 uses a single measure that equals one if the delayed reward was chosen on both frames. All regressions include dummies for those that answered don't know when asked the risk and time preferences questions and a dummy for those that did not answer the dependent children question. Standard errors are in parentheses. + p<0.10, * p<0.05, ** p<0.01.

Table C3: Comparison to the HRS of Risk and Time Preference Questions

Panel A: More risk averse Answered "First job" to the risk preference question

Risk Preference	NCRTS-A	HRS, private workers 50-64	HRS, public workers 50-64
Suppose that you are the only income earner in the family. Your doctor recommends that you move because of allergies, and you have to choose between two possible jobs. The first would guarantee you an annual income for life that is equal to your current income. The second is possibly better paying, but the income is also less certain. There is a 50-50 chance the second job would double your income and a 50-50 chance that it would cut your income by 20%. Would you take the first job or the second job?			
First job	**77.48%**	**66.04%**	**66.97%**
Second job	22.52%	33.96%	33.03%
Number of observations	1,763	5,674	302

Notes: NCRTS-A refers to the North Carolina Retirement Transitions Study of Active Workers data as described in the main paper and in Appendix A. HRS 1992 asks a series of income questions. The income cut in the first question is a third and the income cut in the second question is 20 percent. We use both questions to group individuals in bins similar to the ones used in NCRTS-A. HRS refers to the Health and Retirement Study age eligible cohorts, without any other sample restrictions. The sample of HRS responses with restrictions includes active workers aged 50-64, shown separately for private sector and public sector workers. The HRS results are weighted using respondent level weights.

Panel B: More patient: Lottery frame Answered "Wait one year and claim $1200" to the time preference question

Time Preference [Lottery Frame]	NCRTS-A	HRS, private workers 50-64	HRS, public workers 50-64
Suppose that you won a prize that is worth $1,000 if you take it today. Alternatively, you could wait one year to claim the prize and be guaranteed to receive $1,200. Would you claim the $1,000 dollars today, or would you wait one year for $1,200?			
Claim $1000 today	49.97%	62.21%	43.78%
Wait one year and claim $1200	**50.03%**	**37.79%**	**56.22%**
Number of observations	1,883	533	11

Notes: HRS 2004 asks a series of lottery questions. The pay out in the first question is 1,100 and the payout in the second question is 1,200. We use both questions to group individuals in bins similar to the ones used in NCRTS-A. See the notes to Panel A of Table C3 for more details.

Panel C: More patient: Benefit frame Answered "Take the $1000 monthly benefit" to the time preference question

Time Preference [Benefit Frame]	NCRTS-A	HRS, private workers 50-64	HRS, public workers 50-64
Imagine you are 65 years old, and you currently receive $1,000 per month in Social Security benefits. Suppose you were given the choice to lower that benefit by half, to $500 per month. This one-half benefit reduction would continue for as long as you live. In return, you would be given a one-time, lump-sum payment of $80,500. Would you take the $1,000 monthly benefit for life, or the lower monthly benefit combined with the lump sum payment?			
Take the $1000 monthly benefit	**59.25%**	**39.52%**	**52.08%**
Take the lower benefit and the lump sum	40.75%	60.48%	47.92%
Number of observations	1,698	522	10

Notes: The amount in the HRS 2004 survey is $87,000 for married individuals and $80,000 for single individuals. See the notes to Panel A of Table C3 for more details.

Appendix D: Sensitivity checks

Table D.1: Patience frameworks

	Subjective planning	ORBIT log-in	ORBIT self-service estimate	Self-reported supplemental plan participation	Objective supplemental plan participation	Self-reported contribution rate for participants	Log (Self-reported non-housing wealth)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
More patient: Both frameworks	0.099**	0.024	0.012	0.064*	0.050+	0.419	0.374**
	(0.031)	(0.025)	(0.028)	(0.029)	(0.029)	(1.026)	(0.086)
More patient: Only lottery	0.045+	-0.006	-0.011	0.045+	0.031	1.575+	0.231**
	(0.027)	(0.022)	(0.024)	(0.025)	(0.025)	(0.915)	(0.073)
More patient: Only benefit	0.068*	0.036	0.004	-0.005	-0.006	-0.534	0.129
	(0.031)	(0.025)	(0.028)	(0.029)	(0.029)	(1.107)	(0.087)
More risk averse	0.023	0.023	0.017	-0.009	-0.032	-0.203	-0.108+
	(0.026)	(0.018)	(0.021)	(0.021)	(0.021)	(0.771)	(0.062)
Financial literacy: High	0.050	0.037	0.067*	-0.001	0.034	1.028	0.327**
	(0.032)	(0.026)	(0.030)	(0.030)	(0.030)	(1.119)	(0.091)
Financial literacy: Medium	0.044	0.029	0.049+	-0.000	-0.002	-0.198	0.159+
	(0.028)	(0.023)	(0.026)	(0.026)	(0.026)	(1.026)	(0.081)
Self-reported financial knowledge	0.103**	0.027**	0.024**	0.007	0.011	1.216**	0.235**
	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)	(0.308)	(0.024)
Eligible for retirement	0.025	0.048	-0.037	-0.024	-0.055	1.694	0.318**
	(0.040)	(0.033)	(0.037)	(0.038)	(0.038)	(1.412)	(0.114)
Years until eligible for retirement	0.005	0.004	-0.016*	-0.005	-0.004	0.073	0.037+
	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)	(0.256)	(0.021)
Earned years of service	0.002	0.004*	0.007**	0.002	0.011**	-0.166*	-0.009+
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.068)	(0.005)
Annual 2013 salary (10 k)	0.014*	-0.000	0.014**	0.016**	0.003	0.153	0.078**
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.172)	(0.016)
Mean	0.471	0.675	0.536	0.737	0.442	8.977	194,122
Adjusted R squared	0.185	0.346	0.280	0.075	0.239	0.108	0.316
Observations	2,024	2,024	2,024	1,948	2,024	1,085	1,763

Table D.2: Alternative Planning Measures

	Thought about retirement	ORBIT log-in: 6 months	ORBIT self-service estimate: 6 months	ORBIT log-in: 2 years	ORBIT self-service estimate: 2 years
	(1)	(2)	(3)	(4)	(5)
More patient	0.003	0.022	0.007	0.002	-0.007
	(0.016)	(0.022)	(0.022)	(0.014)	(0.020)
More risk averse	-0.019	0.045^{+}	0.030	0.008	0.000
	(0.018)	(0.025)	(0.025)	(0.016)	(0.023)
Financial literacy: High	0.040^{+}	0.023	0.051	0.011	0.064*
	(0.022)	(0.030)	(0.031)	(0.020)	(0.028)
Financial literacy: Medium	0.044*	0.026	0.048^{+}	0.015	0.057*
	(0.019)	(0.026)	(0.027)	(0.017)	(0.024)
Self-reported financial knowledge	0.051**	0.032**	0.030**	0.013*	0.019*
	(0.006)	(0.008)	(0.008)	(0.005)	(0.007)
Eligible for retirement	0.027	0.112**	0.022	0.002	-0.055
	(0.028)	(0.038)	(0.039)	(0.025)	(0.035)
Years until eligible for retirement	0.004	0.013^{+}	-0.004	0.001	-0.017**
	(0.005)	(0.007)	(0.007)	(0.005)	(0.006)
Earned years of service	0.001	0.006**	0.007**	0.003*	0.008**
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Annual 2013 salary (10 k)	-0.000	-0.001	0.011*	0.001	0.016**
	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Married male	-0.041*	-0.024	-0.026	-0.037*	-0.032
	(0.020)	(0.027)	(0.027)	(0.018)	(0.025)
Single female	-0.009	-0.008	-0.011	0.013	0.013
	(0.019)	(0.026)	(0.026)	(0.017)	(0.024)
Single male	-0.071*	-0.106*	-0.064	-0.034	-0.025
	(0.031)	(0.043)	(0.044)	(0.028)	(0.039)
College degree	0.053**	0.032	0.005	0.020	-0.010
	(0.019)	(0.026)	(0.027)	(0.017)	(0.024)
Non-white	-0.045*	-0.044^{+}	-0.063*	-0.018	-0.062**
	(0.018)	(0.025)	(0.025)	(0.016)	(0.023)
Home owner	0.081**	0.049	0.052^{+}	0.010	0.019
	(0.022)	(0.030)	(0.031)	(0.020)	(0.028)
Print sample	-0.076**	-0.446**	-0.389**	-0.701**	-0.548**
	(0.019)	(0.025)	(0.026)	(0.017)	(0.023)
Self-reported healthy	0.016	0.019	0.018	0.007	0.015
	(0.015)	(0.021)	(0.021)	(0.014)	(0.019)
Dependent children	-0.013	0.007	-0.009	0.007	-0.036^{+}
	(0.016)	(0.021)	(0.022)	(0.014)	(0.020)
Mean	0.871	0.567	0.460	0.776	0.599
Adjusted R squared	0.106	0.249	0.225	0.539	0.342

Notes: Column 1 dependent variable is whether the individual had thought about or made a retirement plan. The remaining columns involve use of the ORBIT website within either 6 month or two year time intervals. N= 2,024.