Navigating Complex Financial Decisions at Retirement:

Evidence from Annuity Choices in Public Sector Pensions

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Abstract:

Choices regarding the disposition of wealth at retirement can have substantial implications for retirement income security. We analyze the factors determining annuity payout option choices within the context of a public sector defined pension plan with no default annuity option. Using combined administrative records and survey data, we explore the role of individual and household characteristics as well as risk preferences, time preferences, and financial literacy. We also document retiree well-being and satisfaction with retirement decision making. The evidence is consistent with predictions over which households might benefit most from each annuity option. Comparing retirees who chose different types of annuities, we find that these groups of retirees report very different levels of well-being in retirement. All retirees report lower levels of retirement income security over time, with strong differences among those who chose different types of annuities.

JEL Codes: G2, H7, H8

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I.   Introduction

At retirement, pension participants must decide the type of pension distribution that they believe will maximize their utility over the rest of their lifetime. Private sector defined benefit pension plans are regulated by the Employee Retirement Income Security Act (ERISA), which specifies how various distribution options are priced and requirements concerning the choice of annuities. In general, public sector plans are not covered by ERISA, so government agencies have greater flexibility in determining the provisions of their retirement plans. Moreover, state and local government employees often retire in their 50's because public sector defined benefit plans typically allow career retirees to begin benefits at relatively young ages. Thus, state and local employees must select the payout method that maximizes their well-being over 30 or more years of retirement. In this environment, retirees face a complex decision in choosing the most appropriate annuity option that will maximize their lifetime utility. Poor choices based on insufficient information or knowledge may result in unanticipated outcomes and cause retirees to express regret about their pension decisions later in retirement.

This paper analyzes annuity choices by pension participants using administrative records and survey data on North Carolina public sector retirees from 2009-2014. The estimation follows a nested logit regression model, which allows a flexible correlation structure for the unobserved factors affecting annuity choice. In a sample of married retirees, we find important roles for gender, race/ethnicity, own and spouse's life expectancy, and age and spouse's relative age in determining who benefits most from each payout option. Overall, our results are

consistent with theoretical predictions regarding the salient forces at work with each of the annuity options that are available in the North Carolina public plans.

Prior research, focusing primarily on choices by retirees in private sector plans, has explored the tendency of individuals to under-annuitize wealth.[1] In sharp contrast to pension distributions chosen by private sector workers, retirees in the public sector rarely select lump sum distributions because of the way they are typically priced.[2] Public sector retirees generally have the option of selecting from a menu of lifetime annuities or a lump sum distribution. Under ERISA, private sector plans must have a default annuity option of a joint and survivor benefit with at least 50 percent of the joint benefit payable to the survivor and the pricing of annuity options must meet certain requirements.[3] In the public sector, there is not typically a default annuity option and often annuity options are priced so that they are present value neutral to the retirement system based on assumed rates of return to the system's assets and the mortality experience of the system. Thus, it is important to understand why retirees select one type of annuity over others that are offered by the plan and how these decisions affect well-being throughout retirement.

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[1] For example, see Benatzi, Previtero, and Thaler 2011; Brown et al. 2008; Brown 2001; Chalmers and Reuter 2012; and Butler and Teppa 2007.

[2] Lump sum distributions in public plans tend to be based solely on employee contributions and accrued interest and retirees often lose the option of remaining in retiree health plans if they select the lump sum distributions.

[3] The initial 1974 ERISA legislation required that pension plans offer at least a 50 percent J&S annuity and that it be the default distribution option in the plan; however, retirees could simply request a single life annuity when claiming benefits. The Retirement Equity Act of 1984 required a spouse to sign a notarized consent form waiving her right to the J&S before the retiree could receive a single life annuity. See Part 4, Chapter 72, Section 9 of the *Internal Revenue Manual* for further detail on current law: https://www.irs.gov/irm/part4/irm_04-072-009.

This study uses the North Carolina Retirement Transitions Study-Benefit Claimants (NCRTS-BC) data, which consists of administrative records merged with survey data for state and local government retirees in North Carolina who initiated retirement benefits between 2009 and 2014. We focus on married retirees (including individuals who reported being married or living with partner), which allows us to study the role of spousal characteristics in annuity choice. Our approach is best suited for cases when a married individual's spouse would be their beneficiary had they chosen a J&S annuity option. While we cannot directly test this assumption, we find evidence that is consistent with spouses as the vast majority of beneficiaries for married individuals.[4] For these married retirees, the spousal characteristics are drawn from a retirement decision-making survey conducted in 2015 (one to six years after the claiming decision for these retirees). Finally, we study retirement well-being, including satisfaction with choices upon retirement and income security in retirement. This analysis uses a subset of our main estimation sample who responded to a follow-up survey in 2017. This provides a snapshot of perceived well-being several years into retirement. Combining administrative records and responses to two surveys, our data provide a comprehensive picture of annuity choice among public sector retirees in North Carolina.

II.   Background on North Carolina Retirement Plans and Annuity Options

We examine the provisions of public retirement systems of North Carolina and the annuity choices of recent retirees. The retirement plan for teachers and state employees and the state-managed pension plan for local employees in North Carolina are typical of state and local pension plans across the country. Teachers and state employees in North Carolina are covered

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[4] The initial survey asked respondents whom they chose as their beneficiary. Among married individuals who indicated that they chose J&S, 93.3 percent reported that their spouse/partner was their beneficiary.

by the Teachers' and State Employees' Retirement System (TSERS), while local government

workers participate in the Local Governmental Employees' Retirement System (LGERS).[5]

Almost all participants in both plans are also covered by Social Security and TSERS pension

annuitants are also allowed to remain in the state health plan.[6]

The parameters of TSERS and LGERS are very similar.[7] In order to qualify for normal

or unreduced benefits, the employee must have satisfied one of three criteria: reached age 65

with 5 years of membership service; reached age 60 with 25 years of service; or have attained 30

years of service at any age. Early retirement with reduced benefits are available to those who

have reached age 50 and completed 20 years of creditable service and those who have reached

age 60 and completed 5 years of service. Thus, for many public employees in North Carolina,

these plans provide a strong economic incentive to retire in their 50's, well before qualifying for

Social Security at age 62.

Upon termination and achieving the age and service requirements, retirees must request

from the retirement system that their benefits begin and the annuity option they desire. This is a

one-time option and no benefits are paid until the benefit request has been finalized. In other

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[5] The important characteristics of TSERS and LGERS are described in:
https://www.nctreasurer.com/ret/Benefits%20Handbooks/TSERShandbook.pdf and
https://www.nctreasurer.com/ret/Benefits%20Handbooks/LGERShandbook.pdf

[6] Also see Clark and Cowell (2017), who reviewed the annuity options of 85 large state-managed public plans which cover teachers, state, and/or local employees.

[7] Both plans have five-year vesting, the same eligibility and retirement requirements, and are managed by the Department of State Treasurer. There is a slight difference in the generosity of the two plans in that the benefit formula for LGERS is 1.85 percent of final average salary per year of service while the TSERS formula is 1.82 percent of final average salary per year of service. Final average salary is determined by the four highest consecutive years of earnings.

words, there is no default benefit, retirees must submit a request for benefits to be paid, and a choice of payout must be made. Both plans have the same six annuity options, which include a single life annuity (called the maximum benefit), a 100 percent J&S, a 50 percent J&S, Social Security Leveling, and two additional J&S options with a pop-up provision if the retiree's beneficiary dies first. Plan actuaries set the terms of all annuity options so that they are considered present value neutral to the system.[8]

There is also an option to take a lump sum withdrawal. Public sector retirement plans are not subject to ERISA rules regarding the calculation of a lump sum distribution or the requirement that joint and survivor annuities be the default annuity option. Similar to most public defined benefit plans, in TSERS and LGERS lump sum distributions are based solely on employee contributions plus accrued interest. Most benefit claimants with long careers who have attained retirement eligibility find that the present value of the annuity greatly exceeds the lump sum distribution amount (Clark, Morrill, and Vanderweide, 2014).

III. Annuity Options in the North Carolina Retirement Plans

In this section, we present a more detailed discussion of the annuity options, how the State prices each of the options, and the resulting monthly benefits associated with each option. The benefit formula in the plan indicates the monthly retirement benefit that a retiree would

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[8] In this context, present value neutral to the retirement system means that the discounted value of the maximum benefit from retirement to death is expected to be equivalent to the discounted value of lifetime benefits of all J&S options and the two benefits from Social Security Leveling using the assumed rate of return to the plan assets. The discounted value is calculated assuming no cost-of-living adjustments. Historically, the North Carolina General Assembly has awarded cost-of-living adjustments to retirees in both systems that averaged close to the annual increase in CPI; however, in recent years, there have been few increases in benefits.

receive from claiming until death. As discussed earlier, the retirement benefit is a function of years of service and final average salary. This benefit is called the maximum benefit and is a single life annuity, i.e., benefits cease with the death of the retiree.[9] Once a worker has satisfied the conditions for unreduced retirement, the benefit is not a function of age. Thus, holding career variables constant, individuals retiring at younger ages will receive greater lifetime benefits.

The stated objective of the retirement system is to offer a menu of annuity options that are present value neutral from the perspective of the system. The first step in determining the monthly benefit for other annuity options is the calculation of the expected present value of the maximum benefit. First, define PV[A] to be the present value of a $1 per year benefit payable in equal monthly payments for the life of an individual age A, the formula for which can be written as:

$$PV[A] = \sum_{a=A+1}^{120} \frac{Survival_A^a}{(1 + r_i)^{a-A}} + CtsAdj$$

where Survival is the probability of survival from age A to age a, r_i is the assumed interest rate, and CtsAdj is the industry-standard 11/24ths adjustment for monthly payment. Then the present value of the monthly maximum benefit, B_{MAX}, can be written as:

$$PV_{MAX}[A] = B_{MAX} * 12 * PV[A]$$

This calculation is based on the mortality experience of the system and the assumed rate of return on the pension fund. Prior to 2012, the interest rate was 7.5 percent; however, the rate

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[9] However, if the worker dies before paid benefits exceed lifetime employee contributions, a lump sum is paid to the designated survivor. This benefit is equal to the difference between contributions plus interest and benefits paid.

was changed to 7.25 percent in 2012. Thus, for individuals with the same career history, the present value of the maximum benefit decreases as age of claiming increases and there will be a small increase in present values for those claiming benefits after 2012.

Having calculated the present value of the maximum benefit, the retirement system then calculates a monthly benefit for each of the other five annuity options using the same basic assumptions. We begin by calculating the benefit levels associated with J&S annuities and then present results for the Social Security Leveling annuity option.

a. *Joint and Survivor Annuities*

The state provides four J&S options that provide for the continuation of benefits after the death of the retired worker that are paid to the survivor until his or her death. The first option offered by the North Carolina retirement plans is a 100 percent J&S benefit, which results in the retirement benefit being the same as long as either the retiree or survivor is alive. For the present value of this annuity to be the same as that of the maximum benefit, monthly benefits must be lower. The price of this insurance for a lifetime benefit, or the magnitude of the reduction in monthly benefits, depends on the age of the retiree and the age of the survivor. To calculate the present value of the J&S benefit, first define the present value of a $1 per year benefit payable in equal monthly payments if and only if both annuitants are living:

$$PV_{Joint}[A, S] = \left(\sum_{a=A+1, s=S+1}^{a=120, s=120} \frac{Survival_{A,S}^{a,s}}{(1 + r_i)^{a-A}} \right) + CtsAdj$$

where Survival is the joint probability of the retiree surviving from age A to age a and the spouse surviving from age S to age s. Then the present value of the monthly J&S benefit, B_{J&S}, can be written as:

$$PV_{J\&S}[A, S] = B_{J\&S} * 12 * \left[PV[A] + PctJ\&S * (PV[S] - PV_{Joint}[A, S]) \right]$$

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where PctJ&S is either 50% or 100% depending on the option chosen.

To illustrate how the price varies across retirees, we present hypothetical monthly benefits for several scenarios in Table 1. The mean age for married retirees in our sample is 60 years old upon claiming and the retiree's spouse is on average one year older.[10] Panel A shows the monthly benefit for a 60 year old claimant whose maximum benefit is fixed at $2,000 per month. Panel A assumes that the retiree's spouse is 61 years old. For such a retiree, the 100 percent J&S benefit is $1,813 per month, while the 50 percent J&S benefit is $1,902 per month. Since the benefit after the death of the retiree is lower with the 50 percent J&S option, the benefit while the retiree is alive is greater than the 100 percent J&S. The popup J&S options increase the benefits for the retiree if the beneficiary dies prior to the retiree. Relative to the standard J&S option without a popup provision, the monthly benefit will be lower if the popup option is selected: $1,785 and $1,887 per month for 100 percent popup and 50 percent popup J&S, respectively.

[Table 1]

One third of all North Carolina retirees between 2009 and 2014 chose one of the J&S options with the 100 percent option and the 100 percent with pop-up provision being the most popular J&S annuity with about 11 percent of retirees selecting each of these distribution options. When limited to married retirees in our survey, 44 percent of retirees select one of the J&S options. Is the finding that less than half of married retirees choose a J&S annuity surprising? One benchmark is to consider annuity choice prior to the passage of ERISA making

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[10] This positive age difference follows from the observations that women represent the majority of public sector workers and that in general, women tend to be married to older men. In our sample of married retirees, two thirds of the retirees are women (see Table 2).

a 50 percent J&S annuity the default benefit option. Myers et al. (1987) examined the annuity decisions of married males using the Retirement History Study for individuals who were employed in 1969. They reported that 28 percent of retirees with a pension selected some form of survivor option. Kotlikoff and Smith (1983) report a similar proportion of retirees selected survivor options in the pre-ERISA years.

Thus, the observed incidence of J&S choices for North Carolina retirees is about 15 percentage points higher than that reported for pension retirees prior to ERISA. More recent studies find an increase in the use of J&S options over time, an increase in the proportion of retirees selecting a J&S benefit in response to the passage of ERISA, and then a further increase after the passage of the Retirement Equity Act (Holden and Nicholson, 1998; Aura, 2005). Johnson et al. (2005) report that over 70 percent of pension retirees select a J&S option in the post Retirement Equity Act period.

The J&S benefit amount declines with younger spouses and increases when the spouse is older. Panels B and C show the effect of own and spouse age on the 100 percent and 50 percent J&S monthly benefit, respectively. The middle cell in Panels B and C corresponds to the entries in Panel A because 60 is the average retiree age and 61 is the average spouse age in our sample. Moving right in a given row shows the benefit increase associated with an older beneficiary. Moving down in a given column shows the benefit decrease associated with an older retiree. Remember that these calculations are gender neutral so that the differences in monthly benefits are based on calculations using a blend of male and female mortality probabilities at each age.

b. *Social Security Leveling*

The final annuity option is called Social Security Leveling.[11] Retirees selecting this option receive a higher monthly benefit prior to age 62 when an individual is first eligible to claim Social Security benefits and in return, the pension benefit is lower after age 62. The benefits before and after age 62 are calculated by the system, using the same assumptions as described before, so that the expected present value of the two Leveling benefits is the same as the present value of the maximum benefit.[12] To calculate the present value of the Leveling benefit, first define the present value of a $1 per year benefit payable in equal monthly payments that begin at age C for a retiree currently age A:

$$PV[A, Def\ C] = \left[\left(\sum_{a=C+1}^{120} \frac{Survival_C^a}{(1+r_i)^{a-C}}\right) + CtsAdj\right] * \frac{Survival_A^C}{(1+r_i)^{C-A}}$$

Next define F[A,C] as follows:

$$F[A, C] = PV[A, Def\ C]/PV[A]$$

Then the formula for the present value of the Leveling benefit is:

$$PV_{LEV}[A] = B_{MAX} * 12 * PV[A] + SS * F * 12 * PV[A] - SS * 12 * PV[A, Def\ C]$$

where SS is the monthly benefit estimate obtained from the Social Security Administration.

Returning to Table 1, the hypothetical retiree shown claimed benefits at age 60 and was eligible for a maximum benefit of $2,000. The retiring worker reports to the retirement system that her expected Social Security benefit at age 62 is $1,200. Using this information and the

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[11] A comprehensive assessment of Social Security Leveling is provided by Clark, et al. (2018).

[12] One third of all state defined benefit plans whose participants are also covered by Social Security have a Social Security leveling option. Most of these plans also use age 62 for leveling; however, some use 65 or allow the retiree to select the age for leveling (Clark, et al. 2018). Note the work on Bronshtein, et al. (2016) and Shoven and Slavov (2014a, 2014b) on the timing decision for Social Security claiming, in particular whether delaying past age 62 is optimal in low interest rate environments.

leveling factor based on the system's mortality experience and the assumed interest rate, the system would calculate the benefit prior to age 62 and the benefit from age 62 through the rest of the life of the retiree. In this example, the retiree would receive a monthly benefit of $2,996 each month prior to age 62 and $1,796 each month beginning at age 62. Together with a Social Security benefit of $1,200, the post-62 total retirement income is "level" at $2,996. Thus, the leveling benefit provides retirees the option of receiving the same total retirement benefit (pension plus Social Security) from leaving public employment until death. With the exception of Clark, et al. (2018), we know of no study that has examined the incidence of the choice of Social Security Leveling by retirees.

IV. Theoretical Predictions Regarding Saving and Borrowing in Retirement

How do married retirees decide on what type of annuity to select? Is this an individual decision or a family decision? ERISA requires that private sector retirees consult with their spouse and receive written approval if they want a single life annuity. Thus, the choice of an annuity is, to some extent, a family decision. Since state and local pensions are not subject to ERISA, there is no mandatory consultation with one's spouse in making this choice.[13] While a household bargaining model for annuity choice is beyond the scope of this paper, we now offer several predictions for various individual and household characteristics that may influence the annuity decision.

We hypothesize that the initial choice is between a single life annuity (maximum benefit or Social Security Leveling) and a J&S annuity (any of the four options offered by the system).

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[13] While state and local plans are not covered by ERISA, some public plans have adopted the requirement that a J&S is the first option so that retirees need to consult with their spouses. North Carolina does not have such a requirement.

We have limited the sample to married individuals so that every retiree has a spouse to consider when deciding how to receive their pension. The most striking observation is that only about one third of all retirees select any J&S benefit, which is much lower than is found for private sector pension claimants. Does this mean that the ERISA regulation concerning spousal benefits is a determining constraint for many retirees? Alternatively, annuity choices in the public sector may differ due to labor force and household characteristics that differ significantly compared to private sector retirees. To further explore annuity choices, we estimate the annuity decision using retiree and spousal variables from our survey.

Individuals with higher personal discount rates place greater value on money in the early retirement years. Thus, they are expected to favor a single life annuity instead of a J&S annuity and among those requesting such a benefit, Social Security Leveling should be more appealing than the maximum benefit. Given that the retiree prefers a single life annuity, those with lower life expectancies will be more likely to choose leveling. Between the single life annuity and J&S annuity, retirees will be more likely to choose a J&S annuity if they have low life expectancy and are married to spouses with high life expectancy, holding age constant. Since the retirement system prices the annuity options based on a blended life expectancy between men and women, the leveling option is relatively more favorably priced for men with average life expectancy than for women with average life expectancy.

The work history of the spouse is expected to directly influence the annuity choice. If the spouse is currently working, retirees selecting a single life annuity are predicted to be less likely to choose leveling due to a lower need for current income. If the spouse has been a career worker and expects to receive a pension in his or her own right, the retiree is predicted to be less likely to request a J&S benefit since the spouse expects to receive this benefit after the death of

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the retiree. Other employer-provided benefits earned by the spouse or the retiree or purchased by the household, such as retiree health insurance, long term care insurance, or life insurance, should also should define the optimal annuity choice. Life insurance could be considered a substitute for J&S benefits, i.e. similar to the lower benefit required by J&S in that individuals pay a premium for life insurance to provide funds for the beneficiary.

The predicted effect for years of service on the annuity choice is ambiguous. On the one hand, longer tenure is generally associated with higher pension benefits, which may reduce the demand for higher income immediately after retirement. This reduces the desire for leveling and makes lower benefits associated with any of the J&S options easier to accommodate the new retirement lifestyle. However, shorter tenure might be related to retirement at younger ages and represent an endogenous choice to retire early and pursue a second career before ultimately leaving the labor force.

As shown in Appendix Table B3, men are much more likely to choose a J&S annuity compared to women. We note that gender is highly correlated with many of the other variables that affect annuity choice and as such, gender may serve as a proxy for other characteristics. For example, the spouse of a female retiree is generally more likely to have been working long term for pay in the labor market and is more likely to be eligible for a pension based on their own work history. Thus, the estimated effect of male in the subsequent results should be interpreted with caution.

To the extent that the benefit level is correlated with household finances, we expect that those with higher benefits are more likely to have alternative sources of liquidity. Moreover, higher earners have a longer life expectancy, on average (Galama, et al. 2018). As such, they may be more willing to defer some of their pension income by selecting one of the J&S options.

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Similarly, those without a college degree tend to have lower life expectancies, so lower educated retirees may be more likely to choose leveling due to shorter life expectancy. And, to the extent that race/ethnicity correlates with life expectancy, we expect that non-Hispanic blacks are more likely to choose leveling than non-Hispanic whites.

There is no clear prediction regarding age at claiming. Empirically, we fix the age at claiming benefits and so are comparing only individuals at the time when they are making the claiming choice. And, individuals who retire at younger ages might be more likely to plan to work in retirement. Holding constant mortality expectations, personal discount rate, and the absolute level of benefits, we find no clear prediction on the relationship between age at claiming and annuity option choice. Note that the age of the retiree and the spouse determines the reduction in benefits associated with a J&S annuity. Next, while individuals in poor health may have lower life expectancies, even controlling for years spent in retirement, the prediction for the relationship between poor health and annuity choice is ambiguous (McGarry, 2014). Individuals may require additional funds for medical expenditures if they are in poor health. Or, individuals may want to consume more during a period of good health.

Among those who prefer a single life annuity, risk aversion could manifest itself in a preference for leveling if near-term consumption shocks are predominant in one's decision process. However, if mortality risk (i.e., dying young) is predominant, then one is likely to prefer immediate consumption and therefore choose leveling. If instead an individual is worried about longevity risk (i.e., outliving one's savings), the individual is less likely to prefer leveling so that the benefit in later years is higher. The age and health of one's spouse affect the probability the spouse's death compared to the retiree's. Thus, the prediction on risk preferences is ambiguous. Risk aversion also has complex effects on the choice between a single life and

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J&S annuity because the predominant factor in determining the value of J&S is the risk of financial hardship of the surviving spouse after the retiree's death.

It is important to remember that the annuity choice is a difficult and complex decision, which will influence well-being throughout the retirement years. Knowledge concerning the annuity choices, how the benefits are calculated, and how they may change over time and in response to specific events are crucially important (Chan and Stevens, 2008). However, we have no prediction on how financial literacy might affect which of the annuity options is superior for a particular retiree.

V.   Regression Analysis of Annuity Choice

We now examine the annuity choices of recent retirees in North Carolina using a combination of administrative and survey data. The administrative records on individuals who first claimed pension benefits between 2009 and 2014 are from the North Carolina Retirement Transitions Study – Benefit Claimants (NCRTS-BC) data.[14] These data include retirees from the North Carolina Teachers' and State Employees' Retirement System (TSERS) and Local Governmental Employees' Retirement System (LGERS). These data are merged with survey responses to two surveys. The first survey was conducted in spring 2015 and the follow-up survey was conducted in spring 2017.

The administrative records contain detailed information about each retiree including earnings, job information, years of service, creditable service, year of retirement, annuity option chosen, and benefit amount. The surveys gathered information about race/ethnicity, education level, household income and wealth, work status after claiming retirement benefits, and marital

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[14] For more information on these data and a copy of the survey instrument, please see: https://sites.google.com/site/publicsectorretirement/.

status, along with questions about their spouses' characteristics (if applicable). In addition, the surveys included questions on retiree well-being and satisfaction with retirement-related decisions.[15] The first set of survey responses were received in 2015, which is one to six years after the retiree had made their annuity choice. Thus, some answers (such as wealth and health) may differ from those the individual might have given at the time of the retirement decision.

To illustrate the pattern of annuity choice by age, Figure 1 plots the annuity type chosen by age at benefit claiming for all persons who retired and claimed benefits between 2009 and 2014. Here the annuity types are grouped in three categories: (1) Maximum Benefit, (2) Social Security Leveling, or (3) any Joint and Survivor Option. We can see that the ratio of single life to J&S options is relatively constant in age. Figure 2 plots the annuity type chosen over time, shown by quarter of the year from 2009 to 2014. The proportion of retirees choosing J&S increases over time, with a small but noticeable jump in 2012. This is consistent with the annuity pricing changes in 2012 discussed earlier.

[Figure 1]

[Figure 2]

Table 2 presents summary statistics from the administrative records (Column (1)), the first survey respondents (Column (2)), and the first survey respondents who reported being married or living with partner (Column (3), where we refer to both groups simply as married). The survey was sent to 27,434 individuals from the population in Column (1). Our estimation sample includes 5,515 useable responses, which represents a survey response rate of roughly 20

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[15] Appendices B and C provide detail on the data and survey instrument.

percent.[16] Comparing Columns (1) and (2), our survey sample is reasonably representative of the population of interest. Some notable differences are that the survey respondents tended to have higher final average salary and maximum initial benefit amounts, and they were more likely to have more than 30 years of service at retirement.

[Table 2]

From Column (2) to (3), we restrict the sample to survey respondents who are married. Our focus is individuals who consider both a single life and J&S annuity; for married individuals considering a J&S annuity, their spouse represents a focal beneficiary. While unmarried individuals do choose J&S, their rates are much lower.[17] Further, the survey data provide information on spousal characteristics for married individuals and this information allows us to reconstruct the annuity benefit associated with each annuity option, assuming the spouse would have been the beneficiary. Comparing Columns (2) and (3), the restriction to married respondents changes the sample in relatively minor ways. There are a larger proportion of males in Column (3) and, consistent with the arguments above, a larger proportion of men choose J&S.

The first column in Table 3 reproduces the last column of Table 2, while Columns (2)-(4) of Table 3 split the married respondent sample among the three annuity options. For all married survey respondents in Column (1), the average retiree is around 60 years of age upon retirement. Around 48 percent of all retirees are teachers, 19 percent are local government employees, and 18 percent are state government employees. In general, the public sector tends to be majority

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[16] The survey is part of a larger project and covers all benefit claimants from 2009 to 2014. Our overall response rate on the survey was 22 percent. For more detail on the larger project, please see our website: https://sites.google.com/site/publicsectorretirement/. Note that Column 4 excludes two survey respondents who met all other criteria but who have both a TSERS and LGERS account.

[17] 5.8 percent of unmarried individuals in our sample chose one of the J&S annuity options.

female and the North Carolina data are consistent with this observation, as 66.8 percent of the married respondents are women. 40.2 percent of married respondents retired with 30 or more years of service, while the average final salary is $62,754.32 and the initial benefit check had the retiree chosen the Maximum Benefit annuity option is $2,433.50 on average.

[Table 3]

Comparing Columns (2)-(4), the characteristics of those choosing the three annuity options are quite different along several dimensions. Those choosing leveling tended to be younger at retirement (which is intuitive because leveling is only possible for those retiring under 62), had lower salaries, and had more years of service. Those choosing J&S tended to have higher salaries and were eligible for more from the retirement system in the form of higher benefits had they chosen the maximum benefit. A meaningfully higher proportion of men chose a J&S annuity relative to women (which is shown more directly in Appendix Table B3). These are univariate differences along correlated dimensions, so now we conduct a regression analysis to explore ceteris paribus associations.

Our main regression analysis is estimated using data from married respondents to the first survey, as shown in Column (1), Table 3. As mentioned above, we include individuals who reported that they are married or living with partner and simply say married. The survey of retirees provides us with the opportunity to examine the annuity choice process utilizing personal information that is not available in the administrative records. Tables 4 and 5 present regression estimates from a nested logit regression model (McFadden, 1981).[18] A nested logit model is a

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[18] In addition to the covariates shown in the table, the regression also includes an indicator for having multiple benefit accounts. Individuals have the option to combine accounts or to claim them separately. If an account has been combined, we only observe the merged account in the data. The baseline specification also includes controls for five agency categories and for the year of benefit claiming.

generalized multinomial logit model with less restrictive assumptions regarding the independence of the error terms affecting choice among each annuity option. Choice is assumed to be nested and the error terms for annuity options in the same nest are allowed to be correlated. In our setting, there are two nests: single life and J&S. The single life nest includes the Maximum Benefit option and Social Security Leveling, while the J&S nest includes the four J&S options (two 100 percent J&S options and two 50 percent J&S options).

Our nested logit regression analysis is broken into two parts: Table 4 shows estimates at the "top level" of the nesting structure (choice of J&S versus single life), while Table 5 shows estimates at the "bottom level" of the nesting structure (choice of a specific annuity option). For Table 4, the coefficients reflect the effects of observable characteristics on the choice of J&S, with single life as the baseline. For Table 5, they reflect the effects of observable characteristics on the choice of leveling, 100 percent J&S, or 50 percent J&S, with maximum benefit as the baseline. The two variants of a 100 percent J&S are collapse together in Table 5 and likewise for 50 percent.[19] These results are related to those from a multinomial logit regression model; we show nested logit results because specification tests favor our nested logit regression model over

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[19] We have also estimated the bottom level nested logit regression model without collapsing the two variants of a 100 percent J&S into one or the two variants of a 50 percent J&S into one. This considers all six annuity options separately and provides five sets of regression coefficients. We focus on the four option version because it is more parsimonious. Further, statistical tests among the 100 percent J&S coefficients relative to the 100 percent popup J&S coefficients, and likewise for 50 percent, only find statistically significant differences for the gender coefficients. There, we find that males are statistically significantly more likely to choose 100 percent popup relative to 100 percent and 50 percent popup relative to 50 percent. This is an interesting "hedging" approach, where men are more likely than women to choose J&S in general but are also more likely to choose J&S while allowing for more benefits if they outlive their spouse (despite women's longer life expectancy on average).

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this alternative.[20] Further, an analysis of the choice of leveling, among those individuals who chose a single life annuity, is in Clark, et al. (2018), so our nested logit approach allows us to focus on the choice of J&S in Table 4.

[Table 4]

The results in Table 4 are regression coefficients, which reflect the sign and statistical significance of the associations. In the discussion that follows, we mention marginal effects when discussing effect sizes. Column (1) includes the baseline covariates, Column (2) adds spousal characteristics, and Column (3) adds financial literacy and risk/time preferences. Given that the results for the baseline characteristics are relative consistent across the three columns, we focus on Column (3).

The first covariate is the only alternative-specific covariate in the model (i.e., varies across individuals and annuity options), which ensures identification of the nested logit model. In our setting, this is the annuity factor, defined as the initial benefit amount the individual would have received from choosing this annuity option divided by initial maximum benefit amount. This necessarily equals one for the maximum benefit option, is necessarily greater than one for leveling, and is necessarily less than one for each J&S option (though the factor differs for different J&S options). Because of this construction of the factor variable, the factor coefficient is not our focus: a negative effect of annuity factor implies that leveling is less preferred on average. However, the earlier analysis is more informative on that point. Here, we want to control for annuity factors in order to ask how observable characteristics affect annuity choice.

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[20] Results from multinomial logit regression models are presented in Appendix Table B4.

Men are more likely to choose J&S, with a large effect size of 18.9 percentage points.[21] This is consistent with the fact that men have shorter life expectancies, on average, which implies that the survivor benefit is valued more by men than women.[22] Non-Hispanic black retirees choose J&S at a 10.1 percentage point lower rate. Later age at claiming lowers the propensity to choose J&S, an effect of around 1 percentage point for five years older at claiming. We account for spousal age by constructing two age difference variables, the number of years the retiree is older if the difference is positive and separately the number of years younger if negative. Larger age gaps among spouses are associated with less choice of J&S, with 1.2 percentage points per year of difference if positive and 0.5 percentage points per year of difference if negative. The negative effect of age difference for retirees who are younger than their spouse might reflect the fact that the survivor benefit is less valuable to a retiree who is much younger. As shown in Panels B and C of Table 1, younger spouses are associated with a lower J&S benefit, relative to maximum benefit, which probably explains the effect of age difference if positive.

Next, reporting being in good health is associated with a 2.6 percentage point lower rate of choosing J&S; reported spousal good health also lowers J&S choice, but neither the level effect nor the interaction with spousal health is statistically significant. A retiree's perception of their life expectancy and his or her perception of their spouse's life expectancy both have the

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[21] Johnson, et al. (2005) also report substantial differences in the choice of a J&S benefit between men and women. Examining married households in the Health and Retirement Survey, they find that 28 percent of male retirees opt for a single life annuity compared to 69 percent of women.

[22] Appendix Tables B4-B7 reestimate Tables 4 and 5 separately for females and males. The gender-specific results are broadly consistent with the aggregated results. One interesting finding from Tables B4-B7 is that the negative effect of spousal pension is concentrated among males: the deterrent effect of one's spouse having a pension on the choice of J&S is stronger for males than females.

expected effect (while the interaction is not significant). Expecting a long life is associated with 9.1 percentage point lower rate of J&S choice, while expecting one's spouse to live a long life is associated with 6.3 percentage point higher rate of J&S choice. The survey also asked retirees whether they and/or their spouse had life insurance (LI) and long-term care insurance (LTCI) as well as whether their spouse had access to a pension from their current or previous employer (either currently receiving pension benefits or eligible to receive in the future).

While the results suggest that life insurance is not associated with J&S annuity choice, the decision to have purchased long-term care insurance has a strong effect. Retirees with long-term care insurance are 5.2 percentage points less likely to have chosen J&S, which suggests that these two products are substitutes. There is an effect of spousal long-term care insurance, but it interacts with whether both own and spouse have long-term care insurance. Spousal pension also affects the choice of J&S: retirees whose spouse has their own pension are 2.8 percentage points less likely to choose J&S.

There is a monotonic effect of years of service, such that those retiring with less years of service are less likely to choose J&S. Each $1,000 additional in a retiree's initial benefit amount is associated with 5.6 percentage points higher rate of J&S choice. This is consistent with the means shown in Table 3. Finally, the measures of financial literacy and preferences toward risk and time are elicited from the survey.[23] High levels of objective financial literacy (as measured by answering both questions correctly) are associated with a choice of J&S at a rate that is 5.9 percentage points higher relative to a single life annuity. Time preferences are not associated

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[23] The wording of these questions is included in Appendix C. We have two questions respectively for eliciting risk and time preferences: one question asks respondents to choose between pension benefits and one asks respondents to choose between lottery prizes.

with J&S annuity choice on average. Risk preferences reveal one statistically significant association, where those who are measured as being risk averse on the pension frame chose J&S at a rate that is 11.3 percentage points lower. However, the risk results on the lottery prize frame and from retirees who answered consistently across both frames are opposite signed relative to the pension results. This suggests that the framing of our pension question, rather than something specific about risk preferences may be at work here.

Turning to Table 5, we focus on results that provide new insights relative to the factors that affect the choice of J&S versus single life. The covariates in Table 5 follow Column (3) from Table 4. Table 5 presents three columns of results, each showing the effect of covariates on the choice of a given type of annuity relative to maximum benefit. As noted above, 100 percent and 100 percent popup J&S are collapsed into one option and likewise for 50 percent and 50 percent popup. For gender, males are least likely to choose the maximum benefit, with the strongest tendency to choose J&S annuities followed by leveling. Note that the difference between the effect of gender on the choice of 100 percent J&S relative to its effect on the choice of 50 percent J&S is relatively large in magnitude, but it (and all of the differences between results for 100 percent J&S and 50 percent J&S) are statistically insignificant. The effect sizes for 100 percent J&S and 50 percent J&S relative to maximum benefit are 36.5 and 26.3 percentage points, respectively.

[Table 5]

Non-Hispanic black retirees are more likely to choose leveling relative to maximum benefit (11.9 percentage points) and less likely to choose either J&S option relative to maximum benefit, as found in Table 4. The effect of age at claiming on J&S is statistically insignificant in Table 5 (where it was statistically significant in Table 4), but its effect on the choice of leveling

is negative (younger claimants favor leveling relative to maximum benefit). High subjective life expectancy was previously found to negatively affect the choice of J&S and Table 5 finds expecting to live past 80 years of age is also negatively associated with the choice of leveling; this is an intuitive reflection of the front-loaded nature of the leveling benefits. Further, those retirees who bought long-term care insurance are less likely to have chosen leveling and J&S, relative to maximum benefit and, as in Table 4, the spousal variable and its interaction have strong effects. Spousal pension also has a large effect but only for J&S such that retirees are 9.1 and 5.3 percentage points less likely to choose 100 percent and 50 percent J&S annuities, respectively, if their spousal has their own pension (though only the 100 percent J&S annuity coefficient is statistically significant).

Retirees with large age differences relative to their spouse are more likely to choose leveling and less likely to choose J&S and the effect is in the same direction in its effect on a given annuity choice irrespective of the sign of the age difference. Age differences are clearly important for J&S, where survivor motives and annuity pricing are clearly affected by age differences. For leveling, the driving force behind the importance of age differences is less obvious. Finally, for financial literacy, risk, and time preferences, the results in Table 5 are generally inconsistent with those in Table 4. When considering the annuity options separately, we find that objective financial literacy has relatively large effects on annuity choice, but only one estimate is statistically significant (positive association between high financial literacy and choosing 100 percent J&S). As with Table 4, risk and time preferences do not have consistently statistically significant effects on the choice of J&S, but we find consistent evidence that retirees who are more impatient and more risk averse favor leveling. Both effects for leveling are large

in magnitude (impatient on both frames increases leveling choice by 6.4 percentage points, while risk averse on both frames increases leveling choice by 8.1 percentage points).

In total, we find that retirees choose among annuity options in ways that are consistent with predictions over which individuals might benefit from each annuity option. J&S is more likely to be chosen by individuals for whom survivor motives are more salient (e.g., those with lower life expectancies such as males, those with low subjective life expectancy, and those whose spouse does not have alternative sources of retirement incomes such as a pension or long-term care insurance). Leveling is more likely to be chosen by individuals whose near-term retirement income needs are more salient (e.g., those with low subjective life expectancy and those whose time preferences are consistent with impatience). To provide additional evidence on the outcomes in retirement for individuals who chose different annuity options, we now analyze self-reported retirement well-being.

VI.   Well-being in Retirement

Is the choice of annuity an important determinant of well-being in retirement? Our surveys of retirees provide information on several measures of well-being in retirement, which we group into two sets of measures. The information measures are retirees' satisfaction with their retirement choices and the information available upon annuity choice. The income security measures are retirees' satisfaction with their standard of living, belief that they saved enough, and confidence in not outliving their savings. Each measure takes a positive value when the individual "agrees" or "strongly agrees" with statements about retirement information and income security.[24]

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[24] The wording of these questions is included in Appendix C. Results are similar using only "strongly agree" as the well-being measure.

Table 6 presents means along each dimension of information and income security, shown separately using responses to the first survey in 2015 and from the follow-up survey in 2017 (S2015 and S2017, respectively). The sample in this, and the subsequent tables, is married individuals who claimed benefits between 2009 and 2014 who responded to both surveys.[25] First, we focus on the initial responses in 2015 and then turn to the follow-up responses in 2017. Among all married individuals in the first survey, we observe high rates of agreement with having made the best decisions regarding annuity choice and having had enough information upon retirement (both rates are over 90 percent). For income security, 82.6 percent of respondents are satisfied with their standard of living in retirement, while only 62.3 percent of respondents believe they saved enough and 69.5 percent are confident in not outliving their savings. Overall, we interpret these figures as being consistent with high rates of well-being in retirement but with magnitudes that vary with the framing of the question.

[Table 6]

Individuals report lower levels of satisfaction with information and income security, on average, two years after the original survey. Table 7 presents additional information on changes between the two surveys, but it is clear that the means are lower in 2017 along every dimension. Comparing responses across individuals who chose different annuity options, J&S annuitants are similar to maximum benefit annuitants with the exception of satisfaction with annuity choice, where J&S is associated with 2.9 percentage points higher satisfaction. Relative to J&S or maximum benefit, leveling is associated with less satisfaction in terms of information and

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[25] Appendix Table B9 presents a comparison between the estimation sample in Tables 6-8 (those who responded to both the initial and the follow-up surveys) and estimation sample in Tables 4-5 (those who responded to the initial survey).

income security. Those who chose leveling are particularly unlikely to report belief in having

saved enough and unlikely to report having confidence in not outliving their savings.

Table 7 reports the proportion of individuals who increased or decreased along each

dimension from the original survey to the follow-up survey. The statistical test results shown in

Panel A are from tests of whether changes are equally likely to be increases and decreases. For

each cell, the proportion of decreases is statistically significantly larger than the proportion of

increases (condition on changing reported satisfaction between the two surveys). Thus,

perceived retirement well-being decreases for these individuals. Panel B compares measures

across annuity options, where the statistical test results are from tests of whether the proportion

of individuals reporting less satisfaction is different across annuity options.

[Table 7]

Relative to maximum benefit, individuals who chose J&S are similar with the exception

of belief in having saved enough, where J&S is associated with a larger decrease in satisfaction

(5.0 percentage points). Relative to maximum benefit, for individuals who chose leveling, the

decrease between the two surveys is statistically significantly larger for leveling in terms of

having made the best annuity choice decision, satisfaction with standard of living, and

confidence in not outliving their savings. Overall, we find small differences among maximum

and J&S annuitants, but large differences between leveling annuitants and others. Those

choosing leveling are less satisfied and more likely to report lower satisfaction over time. This

result should not be surprising since many of those that selected leveling will have reached age

62 and would have had their pension benefit reduced by the specified formula.[26]

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[26] The retirement system reports that they receive calls from many retirees who selected leveling who
seem surprised that their monthly pension benefit has been reduced. Perhaps due to this reaction, a bill

Finally, Table 8 presents a regression analysis of these five measures using the responses to the follow-up survey in 2017, which is three to eight years after the claiming decision for these retirees. Using the follow-up survey responses allows us to measure retirement well-being several years into retirement. Each column presents the results from a linear probability model. J&S is similar to maximum benefit on some measures, but J&S is associated with statistically significantly less satisfied with their standard of living in retirement (6.7 percentage points) and less likely to believe they saved enough (6.8 percentage points). Consistent with the comparison of means, leveling is generally associated with less satisfaction than maximum benefit: 4.8 percentage points less satisfied with annuity choice decision, 12.6 percentage points less satisfied with having saved enough, and 12.6 percentage points less confident about not outliving their savings. In total, leveling is associated with less perceived well-being in retirement, with large effect sizes.

[Table 8]

The results in Table 8 reinforce the message from Tables 6 and 7 that individuals choosing maximum benefit and J&S are generally similar in their satisfaction with their retirement well-being, while individuals choosing leveling are less satisfied. The other covariates in Table 8 provide additional insights regarding the characteristics associated with well-being in retirement. Males are much more confident in not outliving their savings than females, but they do not believe they saved enough at higher rates and are not more satisfied with their standard of retirement living. This inconsistency could reflect men's lower life expectancy (despite a control for perceived life expectancy) or the general finding of differences in

was introduced in the 2018 legislative session to eliminate this option (HB 1055). The bill has not become law during the 2018 session of the North Carolina General Assembly.

overconfidence among men and women (Croson and Gneezy, 2009). Non-Hispanic black retirees report less satisfaction along all dimensions, with large effect sizes. Hispanics also report less satisfaction, but the point estimates are measured with a lot of noise (likely due to our small sample of Hispanics). Individuals with at least a BA degree report more satisfaction, as do those who claimed at older ages. Interestingly, those with higher initial benefit checks report more satisfaction with their well-being in terms of income security, but they are no more likely to report satisfaction in terms of having made the best annuity choice decision or having had enough information.

The results in Table 8 do not provide causal interpretations because these covariates are correlated with a host of unobserved factors that limit precise interpretations. However, controlling for these observed factors, we find that individuals who chose different annuities upon retirement report different levels of satisfaction in retirement. J&S annuitants are somewhat less satisfied than maximum benefit annuitants in terms of income security (standard of living and saved enough). Leveling annuitants are less satisfied than maximum benefit annuitants in all five measures, with statistically significant differences for three measures.

VII.   Conclusions

Using combined administrative records and survey data, we analyze how individuals choose among annuity options at retirement. Several findings are particularly relevant to policymakers. First, only 44% of North Carolina public sector retirees select a J&S annuity. This is much lower than the rate exceeding 70 percent found in the Health and Retirement Study (Johnson, et al. 2005). Some portion of the difference between our finding and those from the HRS may be due to differences among the private sector workers in the HRS and our public sector workers.

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However, we conjecture that there is an important role played by ERISA regulations for a J&S default annuity, which does not cover the plans we study.

Second, as has been found previously, males are much more likely than females to choose a J&S annuity. Our regression analysis controls for a large set of individual and household characteristics and holding these constant, the results suggest that men value survivor benefits more than women. Men are also more likely to choose J&S when their spouse does not have access to a pension of their own, while a spouse's pension plays a less important role for women in the choice of annuity. We conclude that annuity choice is a household decision that involves bargaining between household members in ways that consistent with predictions over which households might benefit most from each annuity option.

Our final analysis exploits the panel nature of our survey data to track self-reported well-being several years into retirement. We find that retirees who made different annuity choices report very different levels of well-being in retirement and changes in well-being also differ markedly. The Social Security Leveling annuity option (which provides a level retirement income before and after age 62) is associated with substantially less retirement income security, relative to the Maximum Benefit or a J&S annuity. J&S annuitants are relatively similar in their self-reported well-being with respect to those who chose the Maximum Benefit, but there is some evidence that the Maximum Benefit is associated with slightly higher levels of retirement income security. In total, we find that which type of annuity an individual chooses matters a lot for their outcomes in retirement.

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Figure 1. Age Pattern of Annuity Choice
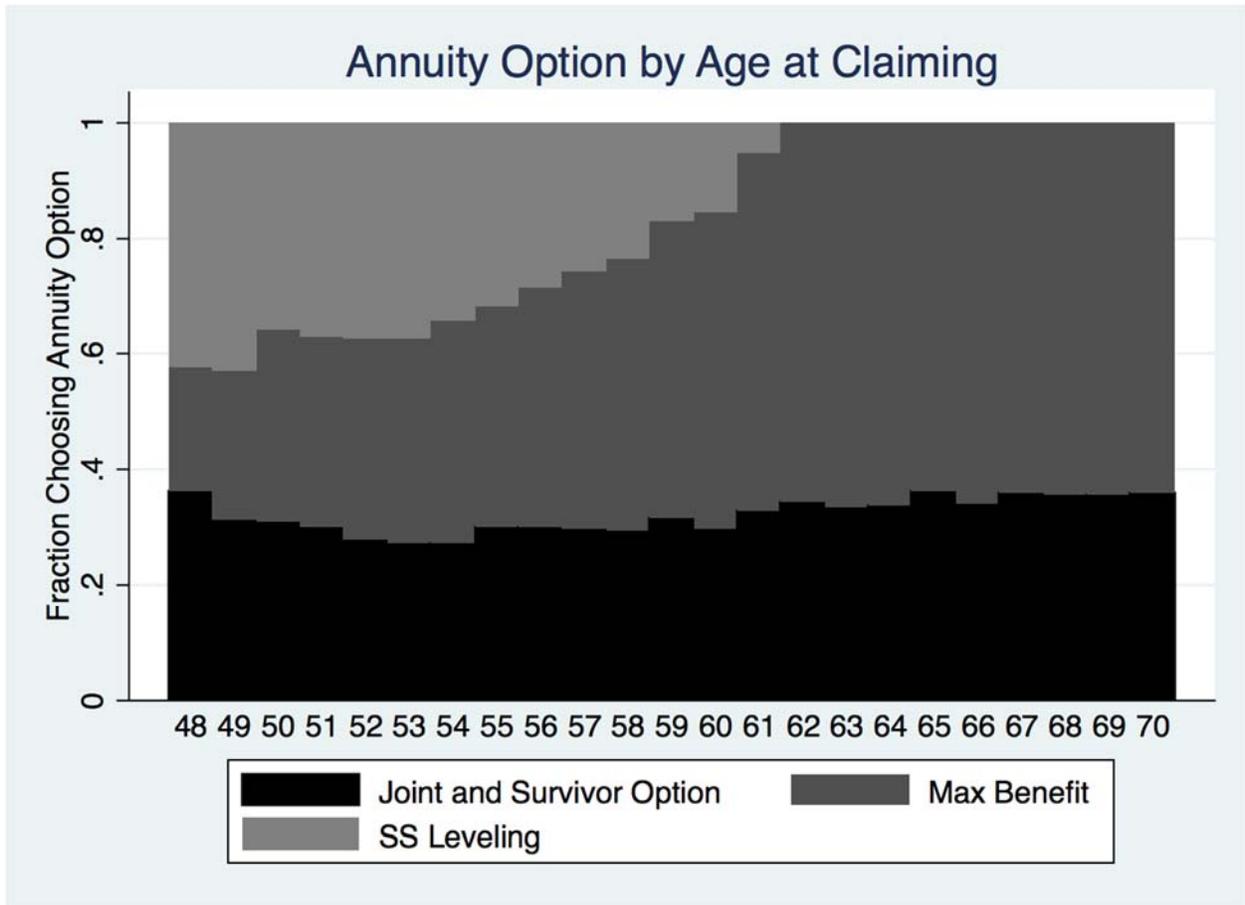
Notes: The sample is all benefit claimants from 2009 to 2014 as in Table 2, Column (1). Individuals claiming before age 48 or after age 70 are omitted for clarity. Data are from the administrative records provided by the retirement system.

Figure 2. Quarter of Claiming and Pattern of Annuity Choice
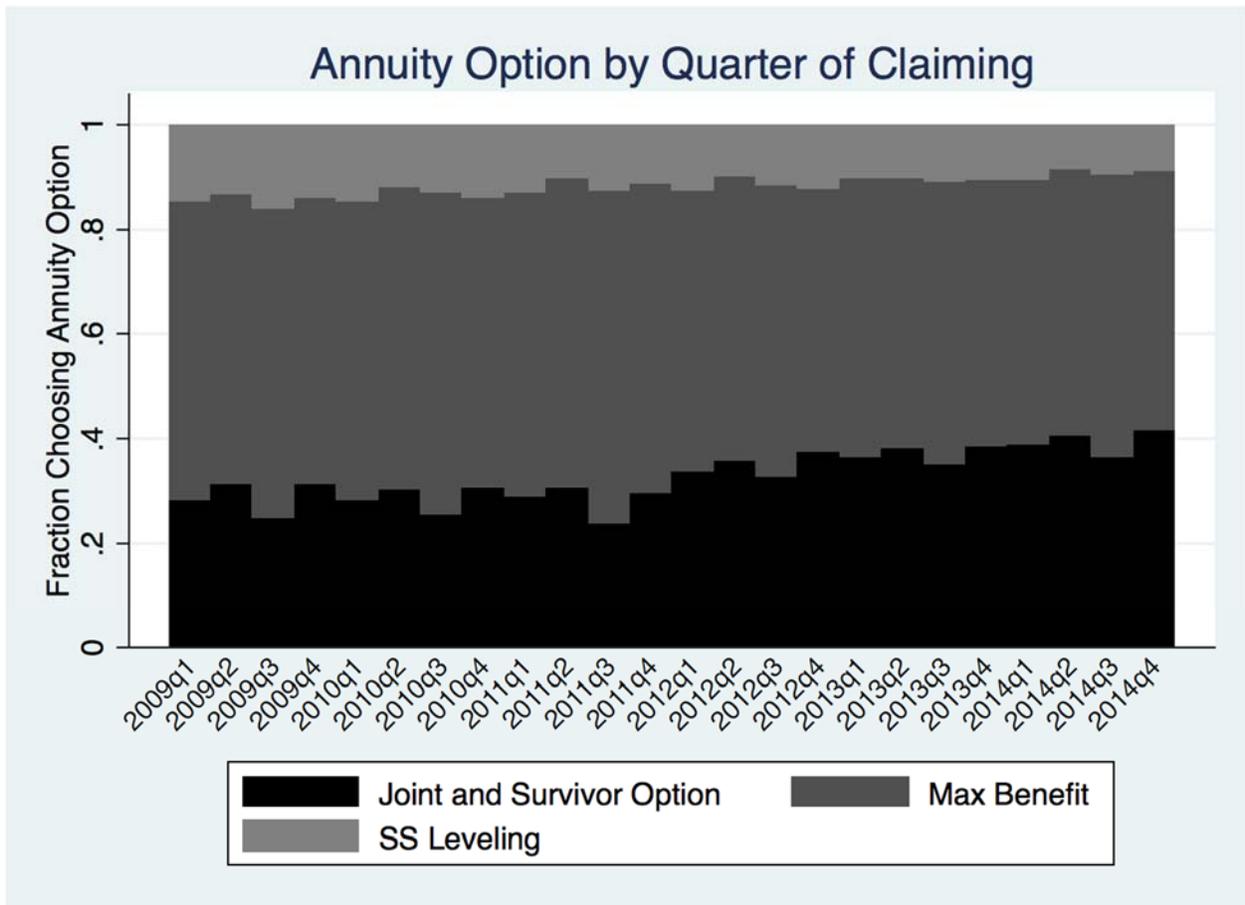
Notes: The sample is all benefit claimants from 2009 to 2014 as in Table 2, Column (1). Data are from the administrative records provided by the retirement system.

Table 1. Monthly Benefits of Retirees

Panel A: Benefit overview of an age 60 benefit claimant

Age of spouse	Max	SS Leveling (before 62)	SS Leveling (after 62)	J&S 100%	J&S 100% popup	J&S 50%	J&S 50% popup
61	$2,000	$2,996	$1,796	$1,813	$1,785	$1,902	$1,887

Panel B: J&S 100% option benefit

Age of spouse \ Age of benefit claimant	56	61	66
55	$1,849	$1,884	$1,915
60	$1,764	$1,813	$1,860
65	$1,646	$1,709	$1,774

Panel C: J&S 50% option benefit

Age of spouse \ Age of benefit claimant	56	61	66
55	$1,922	$1,940	$1,957
60	$1,875	$1,902	$1,927
65	$1,806	$1,843	$1,880

Note: The example is for a retiree with a maximum single life benefit of $2,000 per month, and a reduced Social Security benefit of $1,200 at age 62. The mean age at claiming is 60 and the mean spouse's age at claiming is 61 in the sample of retirees who responded to S2015.

Table 2. Means of Individuals Claiming Retirement Benefits between 2009 and 2014

	All Retirees	S2015 Respondents	S2015 Married
	(1)	(2)	(3)
Age at Claiming	60.7	59.9	59.7
Age at Termination	60.7	59.8	59.7
Early Retirement	36.1%	32.9%	33.2%
TSERS	79.1%	80.7%	80.6%
Community College	4.3%	5.4%	5.5%
Local Government	20.9%	19.3%	19.4%
Primary Government (and	19.8%	18.2%	18.4%
Public Schools	46.9%	47.0%	47.5%
University	8.1%	10.0%	9.2%
Male	34.2%	28.6%	33.2%
Years of Service	22.9	24.8	24.8
Years of Service 5-19	35.1%	27.6%	27.2%
Years of Service 20-24	15.7%	13.2%	13.1%
Years of Service 25-29	19.2%	19.4%	19.6%
Years of Service 30+	30.1%	39.8%	40.2%
Final Average Salary	$51,44737	$61,765.97	$62,754.32
Maximum Initial Benefit	$1,876.21	$2,386.90	$2,433.50
Annuity Type:			
Max	56.0%	54.1%	45.2%
SS Leveling	12.0%	13.0%	11.2%
J&S	32.0%	32.9%	43.6%
100%	10.5%	9.5%	12.8%
50%	3.7%	3.1%	3.8%
100% Popup	11.0%	11.9%	16.1%
50% Popup	6.9%	8.4%	10.8%
Has any other account	7.2%	2.0%	2.0%
Has both TSERS/LGERS	0.13%	0.02%	0.03%
N	72,350	5,515	3,952

Notes: Only primary TSERS and LGERS accounts are included in the sample, as described in Appendix A1. The bottom row indicates the percent of the sample that has both a TSERS and LGERS account in the data.

Table 3. Means of Married S2015 Respondents Claiming Retirement Benefits between 2009 and 2014

	All Retirees	Selecting Max	Selecting SS Leveling	Selecting J&S
	(1)	(2)	(4)	(3)
Age at Claiming	59.7	60.3	54.8	60.3
Age at Termination	59.7	60.3	54.7	60.3
Early Retirement	33.2%	38.7%	38.3%	26.1%
TSERS	80.6%	84.0%	82.2%	76.8%
Community College	5.5%	5.3%	4.5%	6.0%
Local Government	19.4%	16.0%	17.8%	23.2%
Primary Government	18.4%	14.3%	21.8%	21.8%
Public Schools	47.5%	56.0%	50.0%	38.2%
University	9.2%	8.4%	5.9%	10.8%
Male	33.2%	22.5%	24.1%	46.7%
Years of Service	24.8	23.1	28.0	25.8
Years of Service 5-19	27.2%	33.9%	7.9%	25.1%
Years of Service 20-24	13.1%	14.2%	12.8%	12.0%
Years of Service 25-29	19.6%	19.3%	23.9%	18.8%
Years of Service 30+	40.2%	32.6%	55.4%	44.2%
Final Average Salary	$62,754.32	$58,421.26	$57,886.60	$68,503.51
Maximum Initial Benefit	$2,433.50	$2,119.25	$2,409.20	$2,765.70
Has any other account	2.0%	1.1%	2.0%	2.9%
Has both TSERS/LGERS	0.03%	0.00%	0.00%	0.06%
N	3,952	1,786	444	1,722

Notes: Only primary TSERS and LGERS accounts are included in the sample, as described in Appendix A1. The bottom row indicates the percent of the sample that has both a TSERS and LGERS account in the data.

Table 4. Nested Logit Regression Results: Determinants of J&S Annuity Choice

	Baseline	Spouse Characteristics	Financial Characteristics
	(1)	**(2)**	**(3)**
Factor	-1.323	-1.360	-1.382
	(0.230)***	(0.246)***	(0.251)***
Male	0.845	0.872	0.853
	(0.077)***	(0.085)***	(0.086)***
Non-Hispanic Black	-0.575	-0.551	-0.493
	(0.126)***	(0.127)***	(0.130)***
Other Race/Ethnicity	0.150	0.093	0.134
	(0.208)	(0.211)	(0.215)
Age at Claiming	-0.008	-0.006	-0.007
	(0.004)**	(0.004)	(0.005)
BA Degree or More	-0.091	-0.039	-0.077
	(0.086)	(0.108)	(0.109)
Has Good Health	-0.227	-0.319	-0.360
	(0.131)*	(0.201)	(0.203)*
Life Exp 80+	-0.161	-0.310	-0.316
	(0.076)**	(0.149)**	(0.149)**
Has LI	0.062	-0.010	-0.001
	(0.087)	(0.139)	(0.140)
Has LTCI	-0.023	-0.380	-0.382
	(0.092)	(0.183)**	(0.184)**
Years of service 5-19	-0.402	-0.375	-0.399
	(0.157)**	(0.160)**	(0.161)**
Years of service 20-24	-0.303	-0.277	-0.288
	(0.141)**	(0.143)*	(0.144)**
Years of service 25-29	-0.200	-0.178	-0.172
	(0.106)*	(0.107)*	(0.108)
Maximum Benefit Amount	0.259	0.272	0.266
	(0.039)***	(0.040)***	(0.040)***
Own Age-Spouse Age (if positive)		-0.057	-0.057
		(0.014)***	(0.014)***
Own Age-Spouse Age (if negative)		-0.024	-0.023
		(0.012)*	(0.012)*
Spouse Has BA Degree or More		-0.171	-0.176
		(0.147)	(0.148)
Own BA Degree*Spouse BA Degree		-0.016	-0.028
		(0.171)	(0.172)
Spouse Has Good Health		-0.170	-0.177
		(0.250)	(0.252)
Own Health Good*Spouse's Health Good		0.262	0.283
		(0.273)	(0.275)
Spouse Life Exp 80+		0.447	0.417
		(0.169)***	(0.170)**
Own Life Exp 80+*Spouse's Life Exp 80+		-0.193	-0.174
		(0.218)	(0.219)

Spouse Has LI		0.078	0.042
		(0.182)	(0.183)
Has LI*Spouse Has LI		0.028	0.053
		(0.216)	(0.217)
Spouse Has LTCI		-0.380	-0.366
		(0.235)	(0.236)
Has LTCI*Spouse Has LTCI		0.813	0.793
		(0.310)***	(0.311)**
Spouse Has Pension		-0.115	-0.131
		(0.071)	(0.071)*
Financial Knowledge: Compounding Only			0.160
			(0.177)
Financial Knowledge: Inflation Only			0.031
			(0.159)
Financial Knowledge: Both			0.281
			(0.126)**
Impatient: Benefit Frame Only			-0.127
			(0.103)
Impatient: Lottery Frame Only			-0.140
			(0.092)
Impatient: Both Frames			-0.138
			(0.099)
Risk Averse: Pension Frame Only			-0.561
			(0.237)**
Risk Averse: Prize Frame Only			0.170
			(0.152)
Risk Averse: Both Frames			0.047
			(0.137)
N	3,952	3,952	3,952

Notes: Data are from administrative records on pension benefit claimants merged with survey responses. Coefficients are estimates from a nested logit model with standard errors in parentheses. All specifications include agency type and year of claiming fixed effects and a dummy variable for Hispanic ethnicity (mean 0.005). * p<0.1; ** p<0.05; *** p<0.01

Table 5. Nested Logit Regression Results: Determinants of Specific Annuity Choices

	SS Leveling	J&S 100% (both options)	J&S 50% (both options)
	(1)	(2)	(3)
Factor	-0.676	-0.676	-0.676
	(0.281)**	(0.281)**	(0.281)**
Male	0.369	0.964	0.796
	(0.203)*	(0.104)***	(0.130)***
Non-Hispanic Black	0.939	-0.334	-0.229
	(0.252)***	(0.150)**	(0.156)
Other Race/Ethnicity	0.505	0.197	0.137
	(0.483)	(0.234)	(0.240)
Age at Claiming	-0.023	-0.007	-0.006
	(0.014)*	(0.005)	(0.005)
BA Degree or More	-0.123	-0.122	-0.115
	(0.226)	(0.119)	(0.121)
Has Good Health	0.587	-0.276	-0.320
	(0.507)	(0.218)	(0.221)
Life Exp 80+	-0.484	-0.401	-0.422
	(0.294)*	(0.159)**	(0.162)***
Has LI	0.013	-0.024	-0.047
	(0.341)	(0.148)	(0.152)
Has LTCI	-0.753	-0.524	-0.454
	(0.394)*	(0.196)***	(0.198)**
Years of service 5-19	0.146	-0.298	-0.343
	(0.490)	(0.166)*	(0.170)**
Years of service 20-24	0.312	-0.126	-0.141
	(0.314)	(0.149)	(0.151)
Years of service 25-29	0.209	-0.076	-0.066
	(0.213)	(0.117)	(0.118)
Maximum Benefit Amount	-0.178	0.208	0.235
	(0.108)*	(0.043)***	(0.044)***
Own Age-Spouse Age (if positive)	0.079	-0.045	-0.039
	(0.032)**	(0.015)***	(0.016)**
Own Age-Spouse Age (if negative)	0.042	-0.023	-0.018
	(0.024)*	(0.013)*	(0.014)
Spouse Has BA Degree or More	-0.230	-0.228	-0.203
	(0.320)	(0.161)	(0.164)
Own BA Degree*Spouse BA Degree	-0.283	-0.041	-0.089
	(0.367)	(0.187)	(0.191)
Spouse Has Good Health	-0.863	-0.294	-0.439
	(0.674)	(0.266)	(0.282)
Own Health Good*Spouse's Health Good	1.129	0.440	0.582
	(0.725)	(0.290)	(0.305)*
Spouse Life Exp 80+	0.567	0.566	0.519
	(0.377)	(0.198)***	(0.202)**
Own Life Exp 80+*Spouse's Life Exp 80+	-0.460	-0.320	-0.205
	(0.468)	(0.247)	(0.255)

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Spouse Has LI	-0.268	-0.046	0.016
	(0.483)	(0.192)	(0.195)
Has LI*Spouse Has LI	0.758	0.204	0.164
	(0.558)	(0.229)	(0.231)
Spouse Has LTCI	-0.352	-0.414	-0.429
	(0.475)	(0.249)*	(0.253)*
Has LTCI*Spouse Has LTCI	0.793	0.948	0.893
	(0.653)	(0.329)***	(0.333)***
Spouse Has Pension	-0.160	-0.184	-0.122
	(0.156)	(0.079)**	(0.084)
Financial Knowledge: Compounding Only	0.060	0.150	0.124
	(0.334)	(0.193)	(0.195)
Financial Knowledge: Inflation Only	0.222	0.080	-0.000
	(0.306)	(0.173)	(0.177)
Financial Knowledge: Both	-0.106	0.266	0.196
	(0.247)	(0.138)*	(0.141)
Impatient: Benefit Frame Only	0.761	-0.018	0.044
	(0.260)***	(0.115)	(0.120)
Impatient: Lottery Frame Only	0.302	-0.123	-0.068
	(0.216)	(0.100)	(0.104)
Impatient: Both Frames	0.552	-0.065	-0.026
	(0.230)**	(0.109)	(0.112)
Risk Averse: Pension Frame Only	1.112	-0.383	-0.482
	(0.496)**	(0.253)	(0.262)*
Risk Averse: Prize Frame Only	0.370	0.228	0.149
	(0.358)	(0.163)	(0.167)
Risk Averse: Both Frames	0.798	0.174	0.115
	(0.338)**	(0.148)	(0.150)
N	3,952	3,952	3,952

Notes: Data are from administrative records on pension benefit claimants merged with survey responses. Coefficients are estimates from a nested logit model with standard errors in parentheses. All specifications include agency type and year of claiming fixed effects and a dummy variable for Hispanic ethnicity (mean 0.005). * p<0.1; ** p<0.05; *** p<0.01

Table 6. Retirement Income Well-being

	Best decisions	Enough info	Satisfied	Saved enough	Confident
Panel A: Means					
Full sample					
S2015 Agree	90.7%	90.9%	82.6%	62.3%	69.5%
S2017 Agree	82.1%	79.7%	74.0%	37.2%	37.2%
Max					
S2015 Agree	90.2%	89.8%	81.4%	61.1%	69.9%
S2017 Agree	81.5%	79.5%	76.4%	40.5%	38.5%
J&S					
S2015 Agree	91.8%	92.7%	84.5%	66.6%	71.1%
S2017 Agree	84.5%	80.9%	73.5%	38.0%	40.5%
SS Leveling					
S2015 Agree	88.3%	88.3%	79.9%	50.4%	61.7%
S2017 Agree	75.4%	76.1%	66.3%	20.8%	19.3%
Panel B: Comparisons					
J&S - Max (S2017 Agree)	2.9%*	1.4%	-2.9%	-2.5%	2.0%
SS Leveling - Max (S2017 Agree)	-6.2%**	-3.4%	-10.1%***	-19.7%***	-19.2%***
SS Leveling - J&S (S2017 Agree)	-9.1%***	-4.8%*	-7.2%**	-17.2%***	-21.2%***

Note: Data are from two surveys of individuals who initiated retirement benefits from 2009-2014 in 2015 and 2017. The sample is restricted to married individuals. "Agree" refers to selecting "Strongly Agree" or "Agree" to the specified statement in 2015 or 2017 surveys. Stars in Panel B indicate that the proportion of takers of an annuity option agreeing with the specified statement is statistically significantly different from the proportion of takers of another annuity option agreeing with the specified statement.

Table 7. Retirement Income Well-being in S2015 and S2017

	Best decisions	Enough info	Satisfied	Saved enough	Confident
Panel A: Changes between S2015 and S2017					
Full sample					
Increased in S2017	6.7%	6.1%	8.0%	4.8%	6.2%
Decreased in S2017	15.2%***	17.3%***	16.6%***	29.9%***	38.6%***
Max					
Increased in S2017	6.9%	7.2%	10.2%	6.5%	6.6%
Decreased in S2017	15.6%***	17.6%***	15.2%***	27.1%***	38.1%***
J&S					
Increased in S2017	6.1%	4.7%	6.0%	3.6%	6.5%
Decreased in S2017	13.4%***	16.4%***	16.9%***	32.2%***	37.0%***
SS Leveling					
Increased in S2017	8.0%	7.6%	7.2%	2.3%	3.8%
Decreased in S2017	20.8%***	19.7%***	20.8%***	31.8%***	46.2%***
Panel B: Comparisons					
J&S - Max (Decreased)	-2.2%	-1.2%	1.7%	5.0%**	-1.0%
SS Leveling - Max (Decreased)	5.2%**	2.1%	5.6%**	4.7%	8.1%**
SS Leveling – J&S (Decreased)	7.4%***	3.3%	3.9%	-0.3%	9.2%***

Note: Data are from two surveys of individuals who initiated retirement benefits from 2009-2014 in 2015 and 2017. The sample is restricted to married individuals. An "increase" refers to agreeing with the specified statement in 2017 survey but not 2015. A "decrease" refers to agreeing with the specified statement in 2015 survey but not 2017. Stars in Panel A indicate that the proportion of individuals whose well-being decreased between surveys is statistically significantly different from the proportion of individuals whose well-being increased between surveys, among those with a well-being change. Stars in Panel B indicate that the proportion of takers of an annuity option with a well-being decrease between surveys is statistically significantly different from the proportion of takers of another annuity option with a well-being decrease.

Table 8. Retirement Income Well-being Regression Results

	Best decisions	Enough info	Satisfied	Saved enough	Confident
J&S	0.013	-0.007	-0.067	-0.068	-0.035
	(0.018)	(0.019)	(0.020)***	(0.022)***	(0.022)
SS Leveling	-0.048	-0.021	-0.040	-0.126	-0.126
	(0.028)*	(0.030)	(0.032)	(0.035)***	(0.035)***
Male	-0.021	-0.003	0.032	0.028	0.138
	(0.018)	(0.019)	(0.021)	(0.023)	(0.023)***
Non-Hispanic Black	-0.054	-0.056	-0.097	-0.172	-0.145
	(0.029)*	(0.031)*	(0.033)***	(0.036)***	(0.036)***
Hispanic/Latino	-0.137	-0.109	-0.076	-0.244	-0.233
	(0.120)	(0.127)	(0.136)	(0.149)	(0.148)
Other Race/Ethnicity	0.020	0.070	0.066	-0.096	-0.047
	(0.057)	(0.060)	(0.064)	(0.071)	(0.070)
BA Degree or More	0.057	0.052	0.124	0.107	0.115
	(0.019)***	(0.020)**	(0.022)***	(0.024)***	(0.024)***
Age at Claiming	0.002	0.005	0.012	0.008	0.006
	(0.002)	(0.003)*	(0.003)***	(0.003)**	(0.003)*
Early Retirement	-0.002	0.007	-0.041	0.018	-0.002
	(0.027)	(0.028)	(0.030)	(0.033)	(0.033)
Years of Service 5-19	-0.074	-0.079	-0.057	0.058	0.101
	(0.043)*	(0.045)*	(0.048)	(0.053)	(0.052)*
Years of Service 20-24	-0.086	-0.060	0.012	0.034	0.115
	(0.040)**	(0.042)	(0.045)	(0.049)	(0.049)**
Years of Service 25-29	-0.055	-0.025	-0.027	0.018	0.027
	(0.026)**	(0.028)	(0.030)	(0.033)	(0.032)
Maximum Benefit Amount (1K)	-0.000	0.005	0.019	0.041	0.038
	(0.007)	(0.008)	(0.008)**	(0.009)***	(0.009)***
R-squared	0.03	0.02	0.07	0.08	0.09
N	2,303	2,304	2,310	2,300	2,301
Mean Dependent Variable	0.824	0.800	0.740	0.373	0.373

Notes: Data are from a survey of individuals who initiated retirement benefits from 2009-2014. Administrative records as of spring 2015 and survey responses are as of spring 2017. The sample is restricted to married individuals. Dependent variables are indicated in the column headings. Coefficients are estimates from a nested logit model with standard errors in parentheses. All specifications include agency type and year of claiming fixed effects. Details are provided in the appendix. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix A: Sample construction and restrictions

1. Administrative Records

The retirement system maintains records for several retirement plans including firefighters, judicial classes, and the legislature. We construct our data using administrative records on active retirement benefit accounts that were initiated between January 1, 2009 and December 31, 2014. We only consider retirement accounts from the TSERS or LGERS retirement systems. We exclude any accounts that are suspended. We do not include ancillary accounts from other systems but do retain an indicator if the individual has other benefit accounts, which might include the transfer benefit option or another retirement system such as the legislature or firefighters.[27] We also exclude any accounts that were closed for any reason, including disability, withdrawal, or transfer of benefits. We exclude firefighters and law enforcement officers that are within TSERS and LGERS, since the eligibility rules are different for those plans.

We confirm that the remaining 80,241 benefit records are unique accounts – individuals may only receive one benefit from TSERS and one benefit from LGERS. We make further exclusions as listed in Appendix Table B1 below. These include: recorded years of service is less than 5 years, termination of employment before 2008, days between termination and claiming greater than one year, and missing gender code. We end up with 72,350 unique benefit accounts representing 72,254 individuals with one account and 96 individuals with both a TSERS and LGERS account.

We sent a survey to 27,434 of the eligible benefit claimants. Our final sample for analysis includes 5,515 respondents for a response rate of 20%.

Appendix Table B2 presents a comparison between our sample and data from the American Community Survey (ACS). For the ACS data, we used the 2012-2016 5-year Public Use Microdata Samples (PUMS). We include individuals aged 50 or older. We consider those

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[27] While we focus solely on those accounts in TSERS and LGERS, individuals may also have accounts with these other systems. Where relevant, we include an indicator variable for the individual having an additional membership in another retirement plan. About 1 percent of our sample has both an active TSERS and LGERS retirement benefit. For those individuals we keep both records and treat them as separate observations but retain an indicator variable.

who were state or local government employees and worked full time (14+ weeks and 30+ hours per week worked). The sample is then restricted to those that did not work last week, that last worked within the past 12 months, and that are currently either unemployed or not in the labor force. This approximates recent retirees. Our ACS data will exclude individuals that claimed benefits from a public sector retirement system but immediately took another job.

2. Key Policy Details

Here we outline some key policies that were in place during the 2009-2014 time period.

Return to work:

Our data will include some individuals that have "retired" but are still working within the system according to the rules below.

- o Pension benefits can be received while working at any other job not covered by that pension. This includes a TSERS employee working under LGERS and vice versa.
- o Pension benefits can be received while working for a job at the prior employer as long as the position is not eligible for pension benefits (typically a part-time position).
- o Pension benefits will be suspended if an individual works in a job that is covered by the same pension. After 3 years of service, the earned benefits can be combined into one account. If 3 years of service are not reached, the new account is not eligible for pension benefits and must be withdrawn as a lump sum.

Multiple benefit accounts:

We retain individuals that have multiple benefit accounts and include TSERS and LGERS accounts separately in the data. The rules on maintaining multiple benefit accounts are below.

- o Each retirement benefit account can be paid separately and there are no restrictions on coordinating annuity type or timing. Individuals with multiple accounts have the option to consolidate them by transferring service from one account to another. The average final compensation (AFC) used is that from the receiving account, while the years of service is the sum of all accounts. We

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cannot track in the data whether the benefit account is the sum of multiple benefits earned under different retirement systems.

- An individual may have multiple membership accounts due to:
  - Long break in work
  - Return to work
  - Work with a different retirement system (first TSERS, then LGERS etc.)

Years of Service:

In our data, we only observe creditable service, which is a combination of tenure and optional purchased service.

- Creditable service: service calculation used for determining benefit level
  - Membership service
  - Purchased service: withdrawn service, military service, out-of-state, temporary, educational leave, workers' compensation, community service, parental leave, extended illness leave, etc. Also, unused sick leave and vacation time.
- Contributory service: service calculation used for determining eligibility

Using date of hire and date of termination, which are measured with some error, we estimate that most individuals have about 6-8 months of purchased service on top of membership service.

Appendix Table B1. Sample Construction

Restriction	Count of Observations	Sample Size
All eligible benefit accounts		80,241
Reported service credit < 5 years	368	79,873
Terminated prior to 2008	5,043	74,830
Days between termination and benefit claiming >= 366	2,454	72,376
Missing gender code	26	72,350
Full Administrative Records		**72,350**
Table 2, Column (1)		
Remove combinations of age and YOS that are not consistent with eligibility	299	72,051
Validated Email Address and Sent S2015		27,434
Survey Sample Responses		5,515
Completed Survey Response		**5,515**
Table 2, Column (2)		
Validated Email Address and Sent S2017		5,485
Survey Sample Responses		3,230
Completed Survey Response		**3,230**

Note: The 2015 survey response rate was 20% for the sample used in this paper. The 2017 survey response rate was 58.9% for the sample used in this paper.

Appendix Table B2. Data Representativeness

Variables	ACS United States	ACS North Carolina	Survey Respondents (Response Rate 20%)
	(1)	(2)	(3)
Number of Observations	11,733	444	3,952
Age at Survey			62.9
Age at Claiming			59.7
Age	61.5	61.0	
Male	39.8%	33.3%	33.2%
Non-Hispanic Black	7.1%	12.2%	9.2%
Hispanic/Latino	5.9%	1.6%	0.5%
Other Race/Ethnicity	4.3%	2.7%	2.8%
BA or above	49.2%	54.7%	69.1%

Notes: ACS data include married individuals ages 50 or above who were working full time (14+ weeks and 30+ hours per week worked) at a state or local government employer last year but are currently either unemployed or not in the labor force. Data from our survey include married individuals that claimed retirement benefits in North Carolina. Survey respondents are disproportionally higher educated than the population average.

Appendix Table B3. Annuity Choice by Gender

	Male	**Female**
	(1)	**(2)**
Annuity Type:		
Max	30.5%	52.5%
SS Leveling	8.1%	12.8%
J&S	61.3%	34.7%
100%	26.1%	6.2%
50%	5.6%	2.9%
100% Popup	20.0%	14.2%
50% Popup	9.6%	11.4%
N	1,313	2,639

Notes: Only primary TSERS and LGERS accounts are included in the sample, as described in Appendix A1.

Appendix Table B4. Multinomial Logit Regression Results: Determinants of J&S Annuity Choice

	Baseline	Spouse Characteristics	Financial Characteristics
	(1)	(2)	(3)
Male	0.845	0.831	0.818
	(0.077)***	(0.084)***	(0.085)***
Non-Hispanic Black	-0.618	-0.588	-0.541
	(0.125)***	(0.126)***	(0.129)***
Other Race/Ethnicity	0.061	-0.033	-0.036
	(0.207)	(0.211)	(0.214)
Age at Claiming	-0.005	-0.001	0.000
	(0.004)	(0.004)	(0.004)
BA Degree or More	-0.139	-0.101	-0.128
	(0.085)	(0.107)	(0.108)
Has Good Health	-0.409	-0.588	-0.597
	(0.128)***	(0.197)***	(0.200)***
Life Exp 80+	-0.146	-0.343	-0.341
	(0.076)*	(0.147)**	(0.148)**
Has LI	-0.045	-0.112	-0.089
	(0.084)	(0.138)	(0.139)
Has LTCI	0.007	-0.363	-0.362
	(0.091)	(0.182)**	(0.183)**
Years of service 5-19	0.073	0.082	0.057
	(0.143)	(0.146)	(0.147)
Years of service 20-24	0.014	0.035	0.027
	(0.133)	(0.135)	(0.136)
Years of service 25-29	-0.059	-0.036	-0.035
	(0.103)	(0.104)	(0.105)
Maximum Benefit Amount	0.242	0.253	0.248
	(0.038)***	(0.039)***	(0.039)***
Own Age-Spouse Age (if positive)		-0.050	-0.050
		(0.014)***	(0.014)***
Own Age-Spouse Age (if negative)		-0.037	-0.036
		(0.012)***	(0.012)***
Spouse Has BA Degree or More		-0.221	-0.217
		(0.147)	(0.148)
Own BA Degree*Spouse BA Degree		0.050	0.027
		(0.170)	(0.171)
Spouse Has Good Health		-0.455	-0.437
		(0.246)*	(0.248)*
Own Health Good*Spouse's Health Good		0.504	0.500
		(0.270)*	(0.272)*
Spouse Life Exp 80+		0.397	0.379
		(0.169)**	(0.170)**
Own Life Exp 80+*Spouse's Life Exp 80+		-0.095	-0.091
		(0.216)	(0.218)

Spouse Has LI		-0.032	-0.052
		(0.180)	(0.182)
Has LI*Spouse Has LI		0.118	0.128
		(0.214)	(0.216)
Spouse Has LTCI		-0.352	-0.339
		(0.231)	(0.232)
Has LTCI*Spouse Has LTCI		0.806	0.778
		(0.305)***	(0.307)**
Spouse Has Pension		-0.121	-0.134
		(0.070)*	(0.071)*
Financial Knowledge: Compounding Only			0.057
			(0.176)
Financial Knowledge: Inflation Only			-0.038
			(0.157)
Financial Knowledge: Both			0.201
			(0.124)
Impatient: Benefit Frame Only			-0.162
			(0.102)
Impatient: Lottery Frame Only			-0.172
			(0.091)*
Impatient: Both Frames			-0.209
			(0.098)**
Risk Averse: Pension Frame Only			-0.666
			(0.234)***
Risk Averse: Prize Frame Only			0.062
			(0.149)
Risk Averse: Both Frames			-0.041
			(0.134)
N	3,952	3,952	3,952

Notes: Data are from administrative records on pension benefit claimants merged with survey responses. Coefficients are estimates from a multinomial logit model with standard errors in parentheses. All specifications include agency type and year of claiming fixed effects and a dummy variable for Hispanic ethnicity (mean 0.005). * p<0.1; ** p<0.05; *** p<0.01

Appendix Table B5. Nested Logit Regression Results: Determinants of J&S Annuity Choice (Female Only)

	Baseline	Spouse Characteristics	Financial Characteristics
	(1)	**(2)**	**(3)**
Factor	-1.758	-1.709	-1.733
	(0.359)***	(0.372)***	(0.378)***
Non-Hispanic Black	-0.559	-0.516	-0.463
	(0.154)***	(0.156)***	(0.160)***
Other Race/Ethnicity	0.046	-0.009	0.017
	(0.253)	(0.258)	(0.263)
Age at Claiming	-0.011	-0.010	-0.010
	(0.005)**	(0.006)*	(0.006)*
BA Degree or More	-0.054	-0.056	-0.094
	(0.110)	(0.136)	(0.137)
Has Good Health	-0.259	-0.412	-0.472
	(0.173)	(0.257)	(0.262)*
Life Exp 80+	-0.247	-0.385	-0.391
	(0.094)***	(0.168)**	(0.169)**
Has LI	0.091	-0.184	-0.178
	(0.106)	(0.184)	(0.186)
Has LTCI	-0.077	-0.410	-0.416
	(0.114)	(0.219)*	(0.220)*
Years of service 5-19	-0.591	-0.547	-0.575
	(0.197)***	(0.200)***	(0.202)***
Years of service 20-24	-0.357	-0.323	-0.332
	(0.175)**	(0.177)*	(0.179)*
Years of service 25-29	-0.248	-0.213	-0.220
	(0.127)*	(0.129)*	(0.130)*
Maximum Benefit Amount	0.243	0.261	0.258
	(0.054)***	(0.055)***	(0.055)***
Own Age-Spouse Age (if positive)		-0.076	-0.075
		(0.026)***	(0.027)***
Own Age-Spouse Age (if negative)		-0.028	-0.027
		(0.014)**	(0.014)**
Spouse Has BA Degree or More		-0.022	-0.117
		(0.087)	(0.189)
Own BA Degree*Spouse BA Degree		-0.109	0.000
		(0.188)	(0.217)
Spouse Has Good Health		0.026	-0.249
		(0.215)	(0.340)
Own Health Good*Spouse's Health Good		-0.239	0.379
		(0.337)	(0.366)
Spouse Life Exp 80+		0.340	0.544
		(0.362)	(0.240)**
Own Life Exp 80+*Spouse's Life Exp 80+		0.562	-0.322
		(0.239)**	(0.287)

Spouse Has LI		-0.329	0.062
		(0.286)	(0.217)
Has LI*Spouse Has LI		0.085	0.266
		(0.216)	(0.269)
Spouse Has LTCI		0.251	-0.358
		(0.267)	(0.311)
Has LTCI*Spouse Has LTCI		-0.407	0.735
		(0.309)	(0.396)*
Spouse Has Pension		0.783	-0.039
		(0.393)**	(0.088)
Financial Knowledge: Compounding Only			0.204
			(0.204)
Financial Knowledge: Inflation Only			-0.091
			(0.190)
Financial Knowledge: Both			0.320
			(0.147)**
Impatient: Benefit Frame Only			-0.095
			(0.131)
Impatient: Lottery Frame Only			-0.097
			(0.112)
Impatient: Both Frames			-0.122
			(0.124)
Risk Averse: Pension Frame Only			-0.698
			(0.311)**
Risk Averse: Prize Frame Only			0.058
			(0.187)
Risk Averse: Both Frames			-0.030
			(0.168)
N	2,639	2,639	2,639

Notes: Data are from administrative records on pension benefit claimants merged with survey responses. Coefficients are estimates from a nested logit model with standard errors in parentheses. All specifications include agency type and year of claiming fixed effects and a dummy variable for Hispanic ethnicity (mean 0.005). * p<0.1; ** p<0.05; *** p<0.01

Appendix Table B6. Nested Logit Regression Results: Determinants of J&S Annuity Choice (Male Only)

	Baseline	Spouse Characteristics	Financial Characteristics
	(1)	(2)	(3)
Factor	-0.368	-0.378	-0.391
	(0.170)**	(0.180)**	(0.187)**
Non-Hispanic Black	-0.601	-0.596	-0.565
	(0.218)***	(0.222)***	(0.230)**
Other Race/Ethnicity	0.412	0.358	0.345
	(0.398)	(0.404)	(0.410)
Age at Claiming	0.009	0.011	0.009
	(0.006)	(0.007)	(0.008)
BA Degree or More	-0.164	-0.043	-0.083
	(0.144)	(0.193)	(0.195)
Has Good Health	-0.178	-0.100	-0.121
	(0.204)	(0.332)	(0.335)
Life Exp 80+	-0.004	-0.102	-0.097
	(0.131)	(0.337)	(0.339)
Has LI	0.018	0.225	0.207
	(0.156)	(0.233)	(0.235)
Has LTCI	0.088	-0.324	-0.338
	(0.163)	(0.350)	(0.356)
Years of service 5-19	-0.056	-0.072	-0.057
	(0.271)	(0.274)	(0.278)
Years of service 20-24	-0.146	-0.124	-0.123
	(0.244)	(0.247)	(0.250)
Years of service 25-29	-0.107	-0.109	-0.076
	(0.196)	(0.198)	(0.200)
Maximum Benefit Amount	0.292	0.297	0.295
	(0.060)***	(0.061)***	(0.062)***
Own Age-Spouse Age (if positive)		-0.047	-0.047
		(0.018)***	(0.018)***
Own Age-Spouse Age (if negative)		0.001	0.000
		(0.034)	(0.035)
Spouse Has BA Degree or More		-0.264	-0.274
		(0.125)**	(0.245)
Own BA Degree*Spouse BA Degree		-0.251	-0.057
		(0.242)	(0.293)
Spouse Has Good Health		-0.090	-0.071
		(0.290)	(0.379)
Own Health Good*Spouse's Health Good		-0.047	0.070
		(0.376)	(0.434)
Spouse Life Exp 80+		0.059	0.432
		(0.430)	(0.247)*
Own Life Exp 80+*Spouse's Life Exp 80+		0.451	-0.213
		(0.245)*	(0.406)

Spouse Has LI		-0.219	0.085
		(0.404)	(0.363)
Has LI*Spouse Has LI		0.154	-0.281
		(0.362)	(0.408)
Spouse Has LTCI		-0.359	-0.414
		(0.406)	(0.372)
Has LTCI*Spouse Has LTCI		-0.391	0.979
		(0.372)	(0.537)*
Spouse Has Pension		0.940	-0.268
		(0.532)*	(0.126)**
Financial Knowledge: Compounding Only			0.115
			(0.374)
Financial Knowledge: Inflation Only			0.253
			(0.313)
Financial Knowledge: Both			0.159
			(0.257)
Impatient: Benefit Frame Only			-0.197
			(0.172)
Impatient: Lottery Frame Only			-0.251
			(0.171)
Impatient: Both Frames			-0.175
			(0.172)
Risk Averse: Pension Frame Only			-0.372
			(0.383)
Risk Averse: Prize Frame Only			0.396
			(0.263)
Risk Averse: Both Frames			0.187
			(0.235)
N	1,313	1,313	1,313

Notes: Data are from administrative records on pension benefit claimants merged with survey responses. Coefficients are estimates from a nested logit model with standard errors in parentheses. All specifications include agency type and year of claiming fixed effects and a dummy variable for Hispanic ethnicity (mean 0.005). * p<0.1; ** p<0.05; *** p<0.01

Appendix Table B7. Nested Logit Regression Results: Determinants of Specific Annuity Choices (Female Only)

	SS Leveling	J&S 100% (both options)	J&S 50% (both options)
	(1)	(2)	(3)
Factor	-0.853	-0.853	-0.853
	(0.395)**	(0.395)**	(0.395)**
Non-Hispanic Black	1.284	-0.247	-0.140
	(0.351)***	(0.187)	(0.192)
Other Race/Ethnicity	0.348	0.047	-0.062
	(0.578)	(0.284)	(0.293)
Age at Claiming	-0.024	-0.008	-0.007
	(0.017)	(0.007)	(0.007)
BA Degree or More	-0.189	-0.116	-0.138
	(0.275)	(0.149)	(0.150)
Has Good Health	0.456	-0.408	-0.495
	(0.629)	(0.277)	(0.280)*
Life Exp 80+	-0.778	-0.529	-0.540
	(0.347)**	(0.182)***	(0.184)***
Has LI	-0.236	-0.260	-0.269
	(0.403)	(0.196)	(0.199)
Has LTCI	-1.163	-0.580	-0.538
	(0.506)**	(0.234)**	(0.234)**
Years of service 5-19	0.468	-0.428	-0.425
	(0.623)	(0.208)**	(0.210)**
Years of service 20-24	0.481	-0.174	-0.156
	(0.393)	(0.185)	(0.187)
Years of service 25-29	0.398	-0.113	-0.092
	(0.260)	(0.139)	(0.141)
Maximum Benefit Amount	0.006	0.211	0.252
	(0.133)	(0.061)***	(0.062)***
Own Age-Spouse Age (if positive)	0.075	-0.082	-0.041
	(0.050)	(0.033)**	(0.032)
Own Age-Spouse Age (if negative)	0.041	-0.031	-0.021
	(0.026)	(0.015)**	(0.016)
Spouse Has BA Degree or More	-0.143	-0.168	-0.112
	(0.413)	(0.204)	(0.206)
Own BA Degree*Spouse BA Degree	-0.297	-0.001	-0.088
	(0.458)	(0.235)	(0.240)
Spouse Has Good Health	-1.024	-0.323	-0.669
	(0.877)	(0.364)	(0.412)
Own Health Good*Spouse's Health Good	1.348	0.496	0.856
	(0.951)	(0.391)	(0.441)*
Spouse Life Exp 80+	0.728	0.713	0.564
	(0.518)	(0.274)***	(0.289)*
Own Life Exp 80+*Spouse's Life Exp 80+	-0.433	-0.456	-0.251
	(0.596)	(0.322)	(0.340)

Spouse Has LI	-0.522	-0.053	-0.035
	(0.574)	(0.227)	(0.230)
Has LI*Spouse Has LI	1.188	0.487	0.451
	(0.687)*	(0.285)*	(0.288)
Spouse Has LTCI	-0.578	-0.488	-0.423
	(0.573)	(0.335)	(0.336)
Has LTCI*Spouse Has LTCI	1.293	0.962	0.886
	(0.800)	(0.424)**	(0.425)**
Spouse Has Pension	-0.253	-0.118	-0.039
	(0.190)	(0.099)	(0.102)
Financial Knowledge: Compounding Only	-0.057	0.162	0.135
	(0.380)	(0.221)	(0.224)
Financial Knowledge: Inflation Only	0.162	-0.092	-0.098
	(0.350)	(0.205)	(0.207)
Financial Knowledge: Both	-0.268	0.263	0.228
	(0.280)	(0.159)*	(0.161)
Impatient: Benefit Frame Only	0.944	0.022	0.155
	(0.329)***	(0.152)	(0.165)
Impatient: Lottery Frame Only	0.259	-0.104	-0.026
	(0.253)	(0.121)	(0.127)
Impatient: Both Frames	0.393	-0.115	-0.001
	(0.267)	(0.138)	(0.146)
Risk Averse: Pension Frame Only	1.424	-0.468	-0.586
	(0.606)**	(0.336)	(0.343)*
Risk Averse: Prize Frame Only	0.246	0.133	-0.003
	(0.421)	(0.204)	(0.209)
Risk Averse: Both Frames	0.786	0.115	0.017
	(0.401)**	(0.185)	(0.187)
N	2,639	2,639	2,639

Notes: Data are from administrative records on pension benefit claimants merged with survey responses. Coefficients are estimates from a nested logit model with standard errors in parentheses. All specifications include agency type and year of claiming fixed effects and a dummy variable for Hispanic ethnicity (mean 0.005). * p<0.1; ** p<0.05; *** p<0.01

Appendix Table B8. Nested Logit Regression Results: Determinants of Specific Annuity Choices (Male Only)

	SS Leveling	J&S 100% (both options)	J&S 50% (both options)
	(1)	(2)	(3)
Factor	-0.213	-0.213	-0.213
	(0.203)	(0.203)	(0.203)
Non-Hispanic Black	-0.005	-0.586	-0.548
	(0.264)	(0.239)**	(0.243)**
Other Race/Ethnicity	0.569	0.494	0.500
	(0.554)	(0.453)	(0.454)
Age at Claiming	-0.003	0.008	0.008
	(0.014)	(0.008)	(0.008)
BA Degree or More	-0.453	-0.194	-0.178
	(0.284)	(0.209)	(0.209)
Has Good Health	-0.057	-0.124	-0.138
	(0.483)	(0.365)	(0.364)
Life Exp 80+	0.447	-0.003	-0.038
	(0.527)	(0.354)	(0.357)
Has LI	0.269	0.244	0.237
	(0.382)	(0.247)	(0.247)
Has LTCI	-0.145	-0.401	-0.360
	(0.383)	(0.366)	(0.368)
Years of service 5-19	-0.376	0.077	0.052
	(0.480)	(0.291)	(0.296)
Years of service 20-24	0.073	0.077	0.058
	(0.321)	(0.250)	(0.251)
Years of service 25-29	-0.061	0.009	0.005
	(0.239)	(0.207)	(0.207)
Maximum Benefit Amount	-0.318	0.253	0.259
	(0.193)	(0.065)***	(0.065)***
Own Age-Spouse Age (if positive)	0.054	-0.036	-0.038
	(0.035)	(0.018)**	(0.018)**
Own Age-Spouse Age (if negative)	0.045	0.008	0.008
	(0.046)	(0.037)	(0.037)
Spouse Has BA Degree or More	-0.417	-0.396	-0.396
	(0.322)	(0.259)	(0.260)
Own BA Degree*Spouse BA Degree	0.215	-0.006	-0.012
	(0.363)	(0.307)	(0.307)
Spouse Has Good Health	-0.842	-0.223	-0.236
	(0.708)	(0.389)	(0.390)
Own Health Good*Spouse's Health Good	1.154	0.236	0.243
	(0.810)	(0.445)	(0.445)
Spouse Life Exp 80+	0.251	0.485	0.483
	(0.353)	(0.268)*	(0.268)*
Own Life Exp 80+*Spouse's Life Exp 80+	-0.720	-0.365	-0.308
	(0.740)	(0.441)	(0.445)

Spouse Has LI	0.211	0.048	0.082
	(0.582)	(0.372)	(0.377)
Has LI*Spouse Has LI	-0.100	-0.268	-0.283
	(0.593)	(0.417)	(0.419)
Spouse Has LTCI	-0.091	-0.388	-0.417
	(0.468)	(0.377)	(0.380)
Has LTCI*Spouse Has LTCI	0.088	1.013	0.991
	(0.661)	(0.547)*	(0.548)*
Spouse Has Pension	0.093	-0.265	-0.250
	(0.174)	(0.131)**	(0.133)*
Financial Knowledge: Compounding Only	0.504	0.196	0.178
	(0.441)	(0.399)	(0.398)
Financial Knowledge: Inflation Only	0.628	0.388	0.322
	(0.430)	(0.333)	(0.338)
Financial Knowledge: Both	0.410	0.250	0.201
	(0.325)	(0.273)	(0.275)
Impatient: Benefit Frame Only	-0.201	-0.213	-0.206
	(0.255)	(0.176)	(0.176)
Impatient: Lottery Frame Only	0.150	-0.223	-0.206
	(0.260)	(0.181)	(0.183)
Impatient: Both Frames	0.298	-0.115	-0.123
	(0.305)	(0.195)	(0.195)
Risk Averse: Pension Frame Only	0.487	-0.359	-0.389
	(0.570)	(0.388)	(0.390)
Risk Averse: Prize Frame Only	0.613	0.423	0.404
	(0.459)	(0.274)	(0.274)
Risk Averse: Both Frames	0.705	0.232	0.215
	(0.513)	(0.246)	(0.246)
N	1,313	1,313	1,313

Notes: Data are from administrative records on pension benefit claimants merged with survey responses. Coefficients are estimates from a nested logit model with standard errors in parentheses. All specifications include agency type and year of claiming fixed effects and a dummy variable for Hispanic ethnicity (mean 0.005). * p<0.1; ** p<0.05; *** p<0.01

Appendix Table B9. Data Representativeness of S2017 Responses

	S2015 Married	S2015 Married (Not in S2017)	S2015 Married (in S2017)
	(1)	(2)	(3)
Age at Claiming	59.7	59.8	59.6
Age at Termination	59.7	59.7	59.6
Early Retirement	33.2%	32.7%	33.5%
TSERS	80.6%	80.9%	80.5%
Community College	5.5%	5.1%	5.8%
Local Government	19.4%	19.1%	19.5%
Primary Government (and	18.4%	17.4%	19.2%
Public Schools	47.5%	50.2%	45.7%
University	9.2%	8.2%	9.8%
Male	33.2%	31.9%	34.1%
Years of Service	24.8	24.7	25.0
Years of Service 5-19	27.2%	27.5%	26.9%
Years of Service 20-24	13.1%	13.0%	13.1%
Years of Service 25-29	19.6%	18.3%	20.5%
Years of Service 30+	40.2%	41.2%	39.5%
Final Average Salary	$62,754.32	$61,282.60	$63,799.36
Maximum Initial Benefit	$2,433.50	$2,364.28	$2,482.66
Annuity Type:			
Max	45.2%	46.4%	44.3%
SS Leveling	11.2%	11.0%	11.4%
J&S	43.6%	42.6%	44.3%
100%	12.8%	12.3%	13.2%
50%	3.8%	3.5%	4.0%
100% Popup	16.1%	16.6%	15.8%
50% Popup	10.8%	10.2%	11.3%
Has any other account	2.0%	1.9%	2.1%
Has both TSERS/LGERS	0.03%	0.00%	0.04%
N	3,952	1,641	2,311

Notes: Only primary TSERS and LGERS accounts are included in the sample, as described in Appendix A1. The bottom row indicates the percent of the sample that has both a TSERS and LGERS account in the data.

Appendix C: Definition of Key Survey Variables

Risk and Time Preferences

Impatient: Lottery Frame

Suppose that you won a prize that is worth $1000 if you take it today. Alternatively, you could wait one year to claim the prize and be guaranteed to receive $1200. Would you claim the $1000 dollars today, or would you wait one year for the $1200?

☐ **Claim $1000 today**

☐ Wait one year and claim $1200

☐ Not sure

Impatient: Benefit Frame

Imagine you are 65 years old, and you (and your spouse/partner) are receiving $1000 per month in Social Security benefits. Suppose you were given the choice to reduce that benefit by half, to $500 per month. This one-half benefit reduction would continue for as long as you (and your spouse/partner) live. In return, you would be given a one-time, lump-sum payment of $80,500. Would you take the $1000 monthly benefit for life, or the reduced monthly benefit combined with the lump sum payment?

☐ Take the $1000 monthly benefit

☐ **Take the reduced benefit and the lump sum**

☐ Not sure

Risk Adverse: Pension Frame

Suppose that you are about to retire and have two choices for your pension benefit. Pension A gives you an income equal to your pre-retirement income. Pension B has a 50% chance of providing a benefit worth double your pre-retirement income and a 50% chance of providing a benefit worth 20% less than your pre-retirement income. Which pension benefit would you choose?

☐ **Pension A**

☐ Pension B

☐ Not sure

Risk Adverse: Prize Frame

Suppose that you are offered a choice between two prizes. If you choose Prize A, you are guaranteed to receive $1000. Alternatively, if you choose prize B, you will have a 50-50 chance of receiving $2200 and a 50-50 chance of receiving $0. Which prize would you choose -- Prize A or Prize B?

- ☐ **Prize A**
- ☐ Prize B
- ☐ Not sure

Financial Knowledge

Financial Knowledge: Compounding

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 five years?

☐ **More than $102**   ☐ $102   ☐ Less than $102   ☐ Do not Know

Financial Knowledge: Inflation

If the current interest rate on your savings account 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?

- ☐ A larger amount than you can buy now
- ☐ Exactly the same amount as you can buy now
- ☐ **A smaller amount than you can buy now**
- ☐ Do not know

Self-Reported Financial Knowledge:

On a scale from 1 to 7 (where 1 means very low, and 7 means very high), how would you rate your financial knowledge?

<u>Well-Being Outcomes:</u>

The five retiree well-being outcomes in Table 6-8 of the text are derived from the following questions. The outcome is binary with a 1 for "agree" or "strongly agree" and 0 otherwise. Results are similar when the outcome is alternatively "strongly agree" only.

Please indicate whether you agree or disagree with the following statements regarding your retirement [Strong Disagree; Disagree; Neither Agree nor Disagree; Agree; Strongly Agree; Not Applicable/ Don't know]:

"Best decisions": I made the best possible decisions concerning the payment option for my TSERS/LGERS pension benefit.

"Enough info": I had enough information to make the best possible decisions regarding my retirement.

"Satisfied": I am satisfied with the standard of living I have had since I first started receiving a pension check.

"Saved enough": I saved enough for retirement while working.

"Confident": I am confident that I will not outlive my savings.