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ABSTRACT

Pension Plan Characteristics and Framing Effects in Employee Savings Behavior*

In this paper we document the importance of framing effects in the retirement savings decisions of college professors. Pensions in many post-secondary institutions are funded by a combination of an employer contribution and a mandatory employee contribution. Employees can also make tax-deferred contributions to a supplemental savings account. A standard lifecycle savings model predicts a "dollar-for-dollar" tradeoff between supplemental savings and the combined regular pension contributions made on behalf of an employee. Contrary to this prediction, we estimate that each additional dollar of employee contributions leads to a 70 cent reduction in supplemental savings, whereas each dollar of employer contributions generates only a 30 cent reduction. The asymmetry – which is consistent with different "mental accounts" for employer and employee contributions – provides further evidence of the sensitivity of individual savings decisions to the precise details of their pension plan.

JEL Classification: D91, G23, J26

Keywords: pensions, framing effects, retirement savings

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I. Introduction

Savings rates vary widely across people, even among those with similar age, income, and family structure (Bernheim, Skinner, and Weinberg, 2001). As with other outcomes of individual choice, the interpretation of this heterogeneity remains controversial. A strictly neoclassical view is that individuals solve a lifecycle planning problem and reach different decisions depending on their preferences. Although this perspective provides the basic framework for most economic analyses, a growing body of research suggests that savings decisions are also affected by a variety of "non-neoclassical" factors, including framing effects (Shefrin and Thaler, 1992) and the default provisions of pension plans (Madrian and Shea, 2001; Choi, Laibson and Madrian, 2004).[1]

In this paper we provide new evidence of framing effects in the retirement savings behavior of college and university faculty. Many post-secondary institutions in the United States offer a defined contribution pension plan funded by the combination of an employer contribution and a *mandatory* employee contribution.[2] Employees can also make a tax-deferred supplemental contribution to the same asset fund. A standard lifecycle savings model predicts a "dollar-for-dollar" tradeoff between the *combined* regular pension contribution made on behalf of an employee and his or her supplemental savings. In the presence of framing or mental accounting effects, however, employees may view their own required pension contribution as more salient,

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[1]A related literature on procrastination (Akerlof, 1991; O'Donoghue and Rabin, 1998) and time-inconsistent preferences (Laibson, 1997 Laibson, Repetto, Tobacman, 1998) asks why *on average* people appear to delay planning for retirement and end up saving "too little" (Lusardi, 2000).

[2]For example, the employer may contribute 10% of salary, and the employee is required to contribute 5%. A similar distinction between payers arises in the Social Security payroll tax. About one fifth of institutions offer plans with a matching formula. As discussed below, we exclude such plans from our analysis.

or more closely substitutable with supplemental savings. In this case, the employee component of regular pension contributions will exert a larger effect on supplemental savings than the employer component. We test for such differential responses using a unique data set combining 10 years of salary and pension information for tenured and tenure-track faculty at a sample of colleges and universities with TIAA-CREF pensions.

Our findings confirm that framing effects matter. Controlling for total compensation (i.e., the sum of wages and employer pension contributions), supplemental savings are significantly lower when a larger fraction of the regular pension contribution is "labeled" as an employee contribution. The discrepancy is large: we estimate that supplementary savings are reduced by about 70 cents per dollar of employee contributions to the regular pension, but only 30 cents per dollar of employer contributions. We interpret these findings as further evidence that behavioral departures from a strict neoclassical choice framework can help to explain the observed variability in savings behavior and wealth outcomes, even among highly educated workers with relatively secure careers.

II. Previous Literature

Our work builds on a number of strands of the existing literature on savings behavior.[3] One well-known set of papers studies the effect of tax deferred savings accounts on overall savings rates. Poterba, Venti, and Wise (1996, 1998) argue that tax deferred savings mechanisms like IRA's and 401(k) programs lead to a net increase in savings, while Gale and Scholz (1994),

[3]Savings behavior is intimately connected to intertemporal consumption. See Deaton (1992) for an evaluation of the literature up to the early 1990s, and Browning and Lusardi (1996) for a more recent survey.

Engen, Gale, and Scholz (1996), and Gale (1998) argue that the balances in these savings vehicles are offset by reductions in other forms of household wealth. The question we address is closely related, but we avoid some of the difficulties in this literature by focusing on the offset between savings flows that are treated equally by the tax system, and by using the same data sources to measure pension contributions and supplemental savings.

A second and related literature examines the quality of the information available to decision-makers. Surveys show that many workers lack basic information on their public and private retirement benefits (Bernheim, 1994; Gustman and Steinmeier, 2001). Since employee pension contributions appear as salary reductions on a worker's monthly pay stub, whereas employer contributions do not, information asymmetries may explain why employee contributions appear to "matter more". Given the fact that *total* pension contributions are reported quarterly to the employees in our sample, we suspect that information problems are less severe in our setting than in many others. Nevertheless, imperfect information can lead to behavior that is consistent with the framing effects we identify here.

A third body of research establishes that seemingly minor details about a defined contribution pension plan – such as the "default" arrangements for plan participation – have relatively large effects on pension savings behavior (see Choi, Laibson, and Madrian, 2004, for a recent survey). In an influential study, Madrian and Shea (2001) found that a change in the default option governing 401(k) enrollment (from "not enrolled" to "enrolled") led to an increase in plan participation. Confirmatory evidence is presented by Choi, Laibson, Madrian and Metrick (2005) and Choi, Laibson, and Madrian (2004). Other studies have examined the effect of allowing employees freedom of choice in the allocation of pension contributions (Papke, 2004; Huberman, Iyengar, and Jiang, 2003), and the effect of default options in asset allocation choices (Beshears et al., 2007).

Finally, our research is related to studies of mental accounting and savings behavior. Although the term "mental accounting" encompasses a wide range of behaviors (see the review by Thaler, 1999), a basic premise is that people divide different income sources into different "accounts", and treat the balances in different accounts as imperfect substitutes. For example, O'Curry (2000), Kooreman (2000), and Milkman et al. (2007) demonstrate a link between the source of an income gain and people's willingness to spend the gain on different things. Shefrin and Thaler (1988) use this approach to explain the excess sensitivity of consumption to temporary income shocks. Thaler (1990) posits that a mental accounting process can explain why people do not reduce their savings dollar-for-dollar by the amount of their pension wealth. Assuming that employees assign their own pension contribution to a different mental account than their employer's contribution, our empirical analysis provides a simple test of imperfect fungibility between mental accounts.

III. Some Features of Faculty Retirement Savings Programs

Before presenting a theoretical framework for modeling the effect of pension contributions on employee savings, it is useful to outline some of the main features of typical faculty retirement programs. As in other sectors, there are two basic types of faculty retirement programs: defined benefit (DB) plans, which provide a pension benefit based on an employee's age, years of service, and average salary; and defined contribution (DC) plans, which create a retirement fund owned by the employee (Mitchell and Schieber, 1998). Typically, DC pensions are funded by payments from the employer and the employee into an asset fund like TIAA-CREF or Vanguard. Employees usually have some choice in how funds are invested, but cannot freely access the money until they retire or reach a minimum age.

In a separate analysis, we matched pension characteristics to about 100 large US universities that participated in the 1995-96 Faculty Survey conducted by the Higher Education Research Institute at UCLA.[4] We found that about 25 percent of faculty were employed at institutions that only offered a DB plan, about 37 percent worked where only a DC plan was offered, and the remaining 38 percent worked for employers that offered both DB and DC plans. DB programs are particularly common at public institutions, where faculty are often included in a broader pension program for state workers (see e.g. Berger et al., 2001, Table 6.2). The most common DC pension fund is TIAA-CREF, which is available at about 72% of post-secondary institutions nationwide, and an even higher fraction of four-year institutions (U.S. Department of Education, 1997, Table 5.1).

Our empirical analysis is based on a sample of faculty who participated in a DC fund managed by TIAA-CREF in the mid-1990s. Table 1 provides a few examples of the DC pension plans offered at various U.S. universities, illustrating typical variation in the generosity of plans and in details of how benefits are calculated.[5] The plans in place at Indiana University and University of Michigan are typical of a large number of plans at universities and colleges throughout the country. At Indiana, the university makes an annual contribution of 12 percent of

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[4]Details of this analysis are available on request.

[5]The information in Table 1 comes from web sites of these institutions. We are unsure whether these institutions participated in the Princeton Retirement Survey that forms the basis for the following analysis, as we do not know the identities of survey participants.

the employee's salary. We refer to this type of plan as "noncontributory." At Michigan, on the other hand, the university contributes 10 percent of salary, and the employee is required to make a contribution of 5 percent. We label this type of plan "contributory."

A third type of pension arrangement is illustrated by the plans at American University and Stanford. In these plans, the employer offers a minimum contribution rate together with a "matching formula" that depends on the voluntary contribution rate of employees. While matching formulas are relatively common in 401(k) plans used outside of academia (see Choi, Laibson, and Madrian, 2005, for an interesting analysis of such plans) they are less common in the post-secondary education sector. For example, among the 96 FRS institutions for which we are able to obtain pension plan characteristics, only 19 had some sort of matching formula for at least a fraction of employees. In our empirical analysis, we therefore focus on the savings behavior of faculty at institutions with either no employee contribution to the regular pension (as at Indiana University) or a fixed employee contribution (as at the University of Michigan).

Because part of the compensation of professors in most pension plans is actually deferred compensation, comparisons of nominal contribution rates, such as those listed in Table 1, can be misleading. To address this issue, throughout this paper we express contribution rates as a fraction of *total compensation* (current salary plus the employer's contribution to the pension account). We call this the "effective" contribution rate. As an illustration, consider the pension plans of University of Michigan and Indiana University, listed in Table 1. At Indiana, the effective contribution rate is 12/1.12= 10.714 percent. (That is, an individual with a nominal salary of $100,000 has total compensation of $112,000, since the university also makes a $12,000 contribution to the his or her pension). By comparison, the effective contribution rate at the University of Michigan is (10+5)/(1.1) =13.64 percent, which consists of two parts, the employer's effective contribution rate of 9.09 percent (10/1.1) and the employee's effective contribution rate of 4.55 percent (5/1.1).

In addition to regular pension programs, most colleges and universities offer supplemental programs for tax-deferred savings known as 403(b) programs, or in the case of TIAA-CREF as supplemental retirement annuities (SRAs).[6] These so-called "elective deferral" plans permit an individual to set aside part of his or her current earnings and avoid Federal and (in most cases) State income taxes. Contributions to these plans are subject to a maximum annual contribution limit, which was roughly $9,000 in the early 1990s.

Elective deferral programs are intended to encourage saving for retirement, so there are penalties for "early" withdrawals (prior to age 59-1/2).[7] Most plans, however, waive the penalty if the withdrawal is used for educational expenses, or to purchase a house. Many plans also allow participants to borrow from their SRA balances. (It is not possible to borrow from, or to offer as collateral, balances in regular retirement accounts). Because of their favorable tax treatment and ready accessibility, SRAs provide an extremely convenient, and arguably the most convenient, instrument for supplemental retirement savings by college and university professors.

IV. A Basic Model of Retirement Saving

[6]SRA and 403(b) plans are available to employees of educational institutions and some other non-profit organizations. These plans are similar to programs like 401(k) plans and the Thrift Savings Plan for federal employees, but differ in certain details.

[7]Funds withdrawn before age 59-1/2 are subject to a 10 percent tax penalty. Once an employee reaches age 59-1/2, there is no penalty for withdrawing funds from the SRA, regardless of whether the employee has retired or not. Withdrawals must begin before age 70-1/2.

We begin by outlining a simplified neoclassical model of savings that ignores uncertainty over income, asset returns, or the timing of retirement. Assume that an individual's adult life is divided into T years of work and R years of retirement. The individual's objective function is

(1) $1/\beta \ \sum_{t=}^{T+R} \beta^t u(c_t)$,

where c_t represents consumption in period t, u( ) is a concave within-period utility function, and β is a discount factor. During any period t≤T the individual earns a salary w_t (in inflation-adjusted dollars). The individual has a defined contribution pension, to which the employer contributes p^1_t and the individual makes a required contribution of p^2_t. The individual can also save an additional amount s_t in a tax-sheltered supplemental (SRA) program. Pension and SRA contributions accumulate in a pooled fund with a fixed rate of return r. For simplicity, we will assume that individuals have the same discount rate as the market, implying β=1/(1+r). Letting A_t denote the value of combined assets at the beginning of any period t, assets in the next period are:

(2) $A_{t+1} = (1+r) (A_t + p^1_t + p^2_t + s_t)$.

The individual faces a constant marginal tax rate of τ. Consumption in any working period is related to supplemental savings by:

$$c_t = (1-\tau) (w_t - p^2_t - s_t) .$$

Solving for s_t and substituting into (2) we obtain

(3) $A_{t+1} = (1+r) (A_t + w_t + p^1_t - c_t /(1-\tau))$

for any working period t≤T. Assuming that withdrawals from the pension fund are taxed at the rate τ, the same equation holds during periods of retirement with $w_t = p^1_t = 0$.[8]

[8]Obviously, this model can be easily amended to include Social Security payments.

Setting A_{T+R+1}=0 and solving equation (3) backward yields the lifetime budget constraint

$$(4) \qquad A_0 + (1+r) \sum_{t=}^{T+R} (1+r)^{-t} k_t \quad = \quad (1+r) \sum_{t=}^{T+R} (1+r)^{-t} \; c_t /(1-\tau) \quad ,$$

where $k_t = w_t + p^1_t$ represents total compensation (salary plus the employer's pension contribution). Note that if savings are withdrawn from pre-tax earnings, and pension assets are allowed to accumulate tax-free, the intertemporal budget constraint is equivalent to one in which the current price of consumption is \$1/(1−τ), and the individual has earnings of k_t in each period.

Ignoring any upper or lower bounds on the amount of supplemental saving, the first order condition for maximizing (1) subject to (4) yields the standard first order condition:

$$(5) \qquad u'(c_t) = \lambda/(1-\tau) ,$$

where λ is the multiplier associated with the lifetime budget constraint. In the absence of borrowing constraints, the individual follows the permanent income hypothesis, setting $c_t = c^P$, where c^P is the annuity value of lifetime wealth. Supplemental savings are then given by

$$(6) \qquad s_t \quad = \quad k_t - c^P/(1-\tau) \; - p^1_t - p^2_t$$

$$= \quad S^*_t \; - p^1_t - p^2_t$$

where $S^*_t \equiv k_t - c^P/(1-\tau)$ represents total desired savings in period t. Holding constant lifetime wealth and current total compensation, supplemental savings are reduced dollar-for-dollar by the sum of total pension contributions made by the employer and the individual in period t.

If earnings early in life are relatively low equation (6) will require negative supplemental savings (i.e., borrowing). Provided that interest on debt is tax-deductible (as is the case for mortgage debt) this does not complicate the model, but it does introduce a distinction between supplemental *savings* (which can be negative) and supplemental *pension contributions* (which cannot). Specifically, if one assumes that an individual uses SRA contributions to save whenever supplemental savings are strictly positive then

(7) $\quad SRA_t = \max [\, 0,\ S^*_t - p^1_t - p^2_t \,]$.

A specification similar to equation (7) is also valid when individuals cannot borrow to finance consumption early in their life cycle. In this case consumption will track disposable income early in the career, with supplemental savings equal to 0, and follow an optimal path, with strictly positive supplemental savings, later in life. Formally, letting $\mu_t\,(1+r)^{-t}$ represent the multiplier associated with the constraint $s_t = w_t - p^2_t - c_t/(1-\tau) \geq 0$, equation (5) is replaced by

(8) $\quad u'(c_t) = (\lambda^0 + \mu_t)/(1-\tau)$, with $\mu_t \geq 0$, $w_t - p^2_t - c_t/(1-\tau) \geq 0$,

and $\mu_t\ (w_t - p^2_t - c_t/(1-\tau)) = 0$.

Note that an individual who is constrained to "over-save" early in life will have higher consumption (and lower supplemental savings) later in life. This will be reflected by a lower value for the multiplier λ^0 in equation (8) than for λ in the unconstrained case (equation (5)).

To illustrate the implications of (8), define c^0 by $u'(c^0) = \lambda^0/(1-\tau)$. Note that c^0 depends on lifetime wealth and on the "bite" of the sequence of borrowing constraints faced by the individual (with $c^0 = c^P$ when these constraints are not binding). Assuming that positive supplemental savings are deposited as SRA contributions, we again get a simple censoring model:

(9) $\quad SRA_t = \min [\, 0,\ S^0_t - p^1_t - p^2_t \,]$.

where

$$S^0_t = k_t - c^0/(1-\tau) .$$

This differs from equation (7) only in the substitution of c^0 for c^P in the definition of desired total savings.

Equation (7) (or the alternative (9)) specifies a very simple model for observed SRA contributions. For estimation purposes it is convenient to express the model in terms of SRA savings rates. Dividing by total compensation in period t, the SRA contribution rate is:

$$SRA_t/k_t = \max [\, 0,\ \ \sigma_t - \pi^1_t - \pi^2_t \,]$$

where

$$\sigma_t = [\, S^*_t - c^0/(1-\tau) \,] \,/\, k_t = 1 - c^0/(1-\tau)/k_t \ ,$$

$$\pi^1_t = p^1_t/k_t \ , \text{ and } \ \pi^2_t = p^2_t/k_t \,.$$

The advantage of this specification is that the SRA contribution rate is expressed in terms of the total desired savings rate σ_t and the pension contribution *rates* π^1_t and π^2_t which are specified in a given pension plan (see Table 1 for examples). In our empirical analysis below, we assume that the desired savings rate at age t can be proxied by a function of age and total compensation, plus an error term that reflects unobserved taste factors:

$$\sigma_t = X\gamma + \varepsilon_t \,.$$

Assuming that ε is normally distributed, this implies that the observed SRA contribution rate is generated by a Tobit model:

$$(10) \qquad SRA_t/k_t = \max [\, 0,\ \ X\gamma + \psi_1 \pi^1_t + \psi_2 \pi^2_t + \varepsilon_t \,]$$

where $\psi_1 = \psi_2 = -1$.

Framing Effects, Mental Accounting, and Imperfect Information

Although a conventional savings model suggests that people should treat employer and employee pension contributions as fully fungible (holding constant total compensation), a behavioral perspective suggests that people may treat them differently. In particular, suppose that people combine pre-tax savings deductions from their gross salary in one mental account, and employer pension contributions in another. Limited fungibility across mental accounts then implies that SRA contributions will be less affected by employer pension contributions than by employee contributions. In terms of equation (10), this suggests that $\psi_2 = -1$, and $\psi_1 > -1$. At the extreme, complete lack of fungibility between the two mental accounts would lead to the prediction that $\psi_1 \approx 0$.[9]

As we noted earlier, an alternative explanation for a differential effect of employer and employee contributions on SRA savings is differential information. An employee's pension contribution appears as a salary deduction, whereas the employer's contribution is not directly reported. If some fraction of people are unaware of their employer's contribution their behavior may mimic the behavior of savers with a different mental account for the employer's contribution. In our specific context, however, complete lack of information seems unlikely, because people with a pension account managed by TIAA-CREF receive quarterly statements that inform them of the combined amount contributed to their pension, and the fund balance. Indeed, to the extent that people use their quarterly pension statements as the source for information on their savings, they will automatically treat the employer and employee contributions as fungible. Thus, we suspect that differential information about the two sources of pension contribution is unlikely to explain the savings behavior of faculty, although we cannot rule out this explanation.

[9] To the best of our knowledge, previous studies of the offset between pensions and savings have not distinguished between the employer and employee pension contributions, and have instead assumed that $\psi_1 = \psi_2 = \psi$. Since the employer contribution tends to be as big or bigger than the employee contribution (at least in our sample) one would expect estimates of a pooled parameter ψ to be closer to the value of ψ_1.

V. Data

We analyze data from the Princeton Faculty Retirement Survey (FRS), a large sample of faculty at US universities and colleges. Ashenfelter and Card (2001) provide a detailed description of how the sample was designed and collected. The complete FRS sample contains records on salary and other administrative variables from 104 four-year colleges and universities for the period from 1986 to 1997, although not all schools provided data for all years.[10] These administrative data from schools were merged with information from pension accounts held in the TIAA-CREF system, including premiums paid during the year and balances in each account at the end of each year, for each professor in the sample.

In addition to this information, we have collected details of the pension plans for almost all of these schools. This information includes the contribution rate of the institution, the required contribution rate of the individual (for contributory plans), and whether the plan provides matching incentives.[11]

The FRS sample was collected in two waves. In the first wave, a total of 44 schools provided information for faculty over the age of 50. The 56 schools in the second wave provided data for faculty of all ages. When relevant, we have used information from both waves in our analysis here. Our sample of schools is somewhat reduced because some schools did not provide information for all of the variables that we have used in our analysis, or because we were unable

[10]From these 104 schools we have excluded four "pilot" schools because they did not provide all of the necessary detail in data from TIAA/CREF.

[11]The identity of the schools (and individuals, of course) is unknown to us. Details of pension plans were collected by the same group that administered the original FRS, and provided to us with an identification number only. This allowed us to match plan characteristics to institutions.

to obtain details of the pension plan at the school. In the end, we have professors from 78 colleges and universities.

Most faculty at the schools in our sample participate in TIAA-CREF as their primary retirement program. That is, they hold active accounts at TIAA-CREF, and their employer deposits premiums into those accounts during the years we analyze. (Schools that do not offer TIAA-CREF as a pension carrier were excluded from the FRS sample.) However, some institutions also offer alternative retirement programs. For example, many state colleges and universities offer new faculty a choice of participating in a TIAA-CREF defined contribution pension plan or in the state employee pension program, which is often a defined-benefit plan. Employees at some schools also have the option to allocate their regular pension contributions to other pension providers (such as Fidelity or Vanguard) that compete with TIAA-CREF. Since the only pension information we have comes from TIAA-CREF, however, we limit our sample to professors whose primary retirement plan is administered by TIAA-CREF.[12]

If a faculty member has his or her primary retirement fund at TIAA-CREF but uses an alternative carrier for supplemental retirement savings we have no way of knowing the contributions made to that plan. However, we believe it is plausible that employees whose primary pension is managed by TIAA-CREF will use an SRA at TIAA-CREF for their tax deferred supplemental savings. TIAA-CREF offers the same broad investment options for SRA plans as it competitors, and the choice of a single provider simplifies record-keeping. Nevertheless, the possibility that some supplemental savings are unobserved should be taken into

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[12]As shown in Ashenfelter and Card (2001, Table A2), roughly 80% of faculty members in the FRS sample have primary pension accounts at TIAA-CREF.

account in interpreting our empirical results.

Our model describes the determination of annual supplementary savings contributions to an SRA. Unfortunately, the administrative data from TIAA/CREF also includes "rollover" transfers of certain types of pension-like funds into (or out of) SRA accounts. Thus, for a small fraction of our sample we observe some very large "contributions" (exceeding legal limits and in some cases exceeding total salary). We also observe some negative contributions. We drop from our sample the few individuals who withdraw funds during a year, or who add more than 25 percent of total salary to their SRA during the year.[13]

Our primary interest is in how the pension contribution rate of the employing institution influences an individual's decision to contribute to an SRA. As discussed earlier, pension plans vary considerably across employers. Following our theoretical framework, we summarize an institution's pension generosity by the fraction of "total income" contributed to the pension plan, measured with two variables: (1) the effective contribution rate by the employer, and (2) the effective contribution rate required of the individual (which is 0 for non-contributory plans). As noted earlier, we drop from the sample the roughly 20% of observations from institutions with a matching formula in the pension plan.

Potentially, we have data for each individual for each year between 1986 and 1996. However, some individuals enter the sample during the period and others leave. Tables 2a and 2b summarize the data that we use in the analysis. Table 2a presents our broadest sample, including individuals from 78 institutions. Since some institutions did not provide information about other

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[13]The total number of these individuals constitute less than ½ of 1 percent of the sample. Our results are not sensitive to their exclusion.

demographic characteristics, such as sex, race, and seniority, we have also analyzed a narrower sample that includes individuals from 72 institutions. Table 2b presents summary statistics for the narrow sample.

The two samples appear to be quite similar in terms of the variables that we are most interested in. Participation in SRAs is generally quite low – we see contributions to SRAs in only about 20 percent of the person-years in our sample. Among those who did contribute to an SRA, the average fraction of income contributed is about 7.5 percent.

The average faculty member works for an employer who contributes a little more than 12 percent of salary each year to the employee's pension plan. The average faculty member is about 49 years old, with about 14 years of seniority. Just over 21 percent of the sample is female, and 85 percent have a doctoral level degree.

VI. Results

In order to focus on the substitution between regular pensions and SRAs, we estimate a Tobit specification that is a slight modification of equation (10):

$$(11) \quad SRA_t/k_t = \max [\, 0,\ X\gamma + \psi\,(\pi^1_t + \pi^2_t) + \psi^* \pi^2_t + \varepsilon_t \,].$$

In this specification, the parameter ψ is the offset to supplemental retirement savings that results from an additional \$1 contribution to the regular pension, regardless of whether the employer or the employee "makes" the contribution. The standard lifecycle model predicts $\psi=-1$. The parameter ψ^* represents the "excess offset" associated with an employee's own contribution: the conventional model predicts $\psi^*=0$.

Table 3 reports estimates of selected coefficients across different specifications and samples.[14] The first row reports our estimates of ψ. In columns (a), ©) and (e), the coefficient on the "Total Pension Contribution Rate" shows that the desired SRA contribution rate declines by 0.5 to 0.6 percent points when the pension contribution rate increase by 1 percentage point, when ψ^* is restricted to be 0. This is substantially smaller (in absolute value) than the value of -1 predicted by a standard lifecylce model. One possible explanation for this finding is that some SRA contributions are made to carriers other than TIAA-CREF, and are therefore unobserved in our sample. As discussed by Hausman (2001), such mis-measurement will tend to lead to an "attenuation bias" in a Tobit model, implying that the measured value for ψ will be biased toward a value of 0.

The specifications in columns (b), (d), and (f) allow differential offsetting effects from pension contributions made by the employer and employee. This distinction is important: the estimates of ψ^* are highly significant, with t-ratios of roughly 2.5. The estimates imply that a 1 percent increase in the employer's contribution rate reduces desired SRA contribution rate by only about .25 to .30 (the value of ψ), while a contribution out of own salary decreases desired SRA rate by 0.6 to 0.7 (the value of $\psi+\psi^*$). Evidently, individuals treat their own pension contribution as more important in deciding whether and how much to contribute to an SRA, even though the difference between employer and employee contributions is essentially one of labeling. An implication of this behavior is that faculty employed at schools with "contributory" pension plans will tend to have lower retirement savings balances at each age, even holding constant total

[14]Note that in Tables 3 and 4 we report "clustered" standard errors, calculated by clustering across all the person-year observations at each institution.

compensation and the total contribution rate to their regular pension.[15]

Table 4 shows the complete regression results for the model in column (f) of Table 3, reporting the effect of personal characteristics on saving rates. Desired SRA contribution rates are higher for those with higher incomes, at older ages, and with more seniority. Rates are also higher for women and for non-white professors, as well as for those with a doctoral degree. Relative to the others, professors in business and life sciences have higher desired contribution rates, with the rates of business professors particularly high. (This could reflect higher extramural incomes for these groups.)

There is also an interesting time pattern of contribution rates–rates decline from 1986 to 1990, then increase again before falling to 1996 (the reference year for this set of dummy variables). These year-to-year differences seem quite large compared to the overall savings rate for SRAs in our sample.

In both Tables 3 and 4, we have estimated the standard errors by clustering on the institution, yielding rather large standard errors relative to the number of observations in our samples. This choice reflects the fact that almost all of the variation from contribution rates comes from differences across institutions, with little variation across individuals at the same institution, or within person over time. A possible concern is that unobserved institution-specific factors (such as the financial education programs described in Clark and d'Ambrosio, 2002) could confound the relationship between pension features and average supplemental retirement

[15]Even if some supplemental savings are unobserved (leading to a downward bias in the estimate of ψ), the estimate of ψ^* will be unbiased, provided there is no correlation between the relative share of regular pension contributions made by employees and the likelihood of observing supplementary savings in our sample.

contribution rates. Although this should be kept in mind, we have no reason to suspect that such factors are related to the relative size of the employer and employee contribution rates at a given institution.

VII. Conclusions

We have examined the retirement savings behavior of a large sample of professors at universities and colleges in the United States. A key feature of our data is that we observe the total contributions to an individual's primary pension plan, *and* the amounts contributed to a tax-sheltered supplemental plan. A standard lifecycle model predicts that individuals with a more generous pension plan (i.e., a plan with a higher contribution rate relative to total compensation) will have lower supplemental savings. Qualitatively, we find strong support for this prediction. Quantitatively, however, the evidence is less supportive of the standard model. In particular, a 1 percentage point increase in the contribution rate of the regular pension leads to only a 0.5-0.6 percentage point reduction in voluntary supplemental contributions – much less than the 1-for-1 offset of a rational lifecycle saver. This implies that people with more generous pension plans reach retirement age with greater wealth, even controlling for lifetime earnings.

We explore a potential explanation based on differential reactions to the regular pension contributions made by employers and employees. To the extent that people assign their own pension contributions and supplemental savings to one "mental account", and their employer's to another, we would expect to see a higher degree of substitutability between the first two, and a lower degree of substitutability between supplemental savings and employer pension contributions. This insight is confirmed in the data: each percentage point increase in an employee’s own contribution to the regular pension plan leads to a 0.7 point reduction in supplemental savings, whereas a similar increase in the employer’s contribution generates only a 0.3 point reduction.

Our findings lend further support to an emerging body of work which shows the sensitivity of individual savings decisions to seemingly irrelevant features of their pension plan, such as the default enrollment options, or the default asset allocation options (Choi, Laibson, and Madrian, 2004; Beshears et al., 2007). The evidence here is perhaps especially surprising because the sample consists of tenured and tenure-track college professors - a highly educated group who work at large and highly stable employers. Even in this sample, however, the “labeling” of pension contributions matters, and presumably leads to very different levels of retirement wealth.

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Table 1
Examples of Characteristics of Defined Contribution Plans at US Universities

Institution & State	Employer Contribution (Percent of Salary)	Required Employee Contribution (Percent of Salary)	Matching Provisions
Indiana University, IN	12.0	0	None
University of Michigan, MI	10.0	5.0	None
University of Miami, FL	11.0	0	None
Georgetown University, DC	10.0	3.0	None
Princeton University, NJ	9.3 up to SSMax* 15.0 over SSMax*	0 0	None
University of Pennsylvania, PA	Under age 30: 6.0 Ages 30-40: 8.0 Over age 40: 9.0	4.0 8.0 8.0	None
California Institute of Technology, CA	8.3 to age 55 12.3 after age 55	5.7 5.7	None
Harvard University, MA	Age<=40: 5.0 up to SSMax* 10.0 over SSMax* Age>=41: 10.0 up to SSMax* 15.0 over SSMax*	0 0 0 0	None
American University, DC	2.0 to 10.0	1.0 to 5.0	Employee chooses contribution of 1 to 5 percent, university doubles that amount.
Stanford University, CA	5.0 plus matching	0 to 5.0	Employer contributes 5 percent and will additionally match employee contribution of up to 5.0 percent.

*SSMax refers to the earnings limit on Social Security contributions, which has varied over time. For 2006, the limit is 94,200. In 1990, the limit was 51,300.

Table 2a
Summary Statistics
(Broad Sample)

Variable	Mean	Standard Deviation.	Minimum	Maximum
Contribute to SRA?	0.196	0.397	0	1
SRA Contribution Rate (Percent of Total Salary)	1.342	3.475	0	1.462
SRA Contribution Rate (among contributors)	7.469	4.628	0.004	24.981
Effective Total Pension Contribution Rate (%)	12.182	1.928	0	18.182
Effective "Individual" Contribution Rate (%)	2.734	2.328	0	9.091
Effective "Institution" Contribution Rate (%)	9.448	1.841	0	16.667
Total Salary/10,000	5.909	2.253	0.004	38.803
Age	49.067	9.881	20.178	83.951
Female	0.216	0.412	0	1
Number of Observations		240,567		
Number of Individuals		34,819		
Number of Schools		78		

Table 2b
Summary Statistics
(Narrow Sample)

Variable	Mean	Standard Deviation	Minimum	Maximum
Contribute to SRA?	0.195	0.396	0	1
SRA Contribution Rate (Percent of Total Salary)	1.448	3.577	0	24.981
SRA Contribution Rate (Among contributors only)	7.426	4.609	0.004	24.981
Effective Total Pension Contribution Rate (%)	12.355	1.846	0.000	18.182
Effective "Individual" Contribution Rate (%)	2.889	2.304	0.000	9.091
Effective "Institution" Contribution Rate (%)				
Total Salary/10,000	5.911	2.268	0.004	38.803
Age	49.019	9.890	20.178	83.951
Has PhD	0.851	0.357	0	1
Seniority (Years)	14.660	10.008	0	51
Female	0.214	0.410	0	1
Non White Race	0.101	0.302	0	1
Field				
Life Sciences	0.069	0.253	0.000	1.000
Physical Sciences	0.133	0.340	0.000	1.000
Business	0.067	0.250	0.000	1.000
Engineering	0.107	0.309	0.000	1.000
Professional School	0.239	0.427	0.000	1.000
Arts & Sciences	0.535	0.499	0.000	1.000
Humanities	0.160	0.367	0.000	1.000
Social Sciences	0.173	0.378	0.000	1.000

Number of Observations (person years)	224,975
Number of Individuals	32,457
Number of Schools	72

Table 3
Tobit Regression Results

Dependent Variable is Percent of Total Income Contributed to SRA[§]

	"Broad" Sample		"Narrow" Sample			
Total Pension Contribution Rate (%)	-0.53** (0.16)	-0.23 (0.15)	-0.60** (0.15)	-0.29* (0.15)	-0.60** (0.14)	-0.29* (0.14)
Individual Contribution Rate (%)		-0.39* (0.16)		-0.40* (0.16)		-0.41** (0.16)
Total Income/10,000	0.58** (0.10)	0.50** (0 .08)	0.54** (0.10)	0.46** (0.08)	0.49** (0.10)	0.38** (0.08)
Other Variables						
Quartic in Age	Yes	Yes	Yes	Yes	Yes	Yes
Gender & Seniority	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Field, Degree, Race	No	No	No	No	Yes	Yes
Log Likelihood	-252948.18	-252,746.58	-235678.95	-235476.57	-235460.63	-235243.61
Sample Size (person years)	240,567		224,975			

Notes: Standard errors (in parentheses) are clustered by institution.
[§]"Total income" is the sum of salary and the institution's pension contribution–i.e., current plus deferred compensation.
*Indicates the coefficient is statistically different from 0 at the 5 percent significance level, ** at the 1 percent level.

Table 4§
Detailed Tobit Regression Estimates
"Narrow" Sample

Dependent Variable is Percent of Total Income Contributed to SRA

	Estimated Coefficient	Standard Error
Total Income/10,000	0.38**	0.08
Effective Total Pension Contribution Rate (%)	-0.29*	0.14
Effective "Individual" Contribution Rate (%)	-0.41**	0.16
Age	10.17**	2.64
$Age^2/1\times10^2$	-30.80**	8.23
$Age^3/1\times10^4$	41.96**	11.18
$Age^4/1\times10^6$	-21.29**	5.60
Years Seniority	0.07**	0.02
Female	0.47	0.33
Doctoral Degree	1.12**	0.40
Nonwhite Race	1.10**	0.31
Life Sciences	0.94*	0.47
Physical Sciences	0.21	0.29
Business	1.80*	0.74
Engineering	0.69	0.66
Professional School	0.34	0.58
Arts & Sciences	-0.30	0.49
Humanities	-0.21	0.40
Year 1986	1.65**	0.49
Year 1987	1.39*	0.54
Year 1988	1.12*	0.40
Year 1989	0.52	0.30
Year 1990	-0.77	0.56
Year 1991	0.69**	0.24
Year 1992	0.81**	0.21
Year 1993	0.99**	0.21
Year 1994	1.24**	0.20
Year 1995	0.94**	0.22
Constant	-140.96**	31.41
Standard error of latent normal variate	11.98	0.08
Log Likelihood	-235243.61	

Notes: Standard errors (in parentheses) are clustered by institution.
§Entries represent complete estimation results for specification reported in last column of Table 3. * indicates statistical significance at the 5% leve, ** at the 1 percent level.