Defined Contribution Savings Plans in the Public Sector:

Lessons from Behavioral Economics

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Abstract: In the private sector, defined contribution savings plans have largely displaced traditional defined benefit pensions. In the public sector, in contrast, traditional defined benefit pensions are still the norm, although some jurisdictions have followed the private sector and shifted either in whole, or in part, to a primarily defined contribution system. Going forward, fiscal pressures are likely to generate more movement in this direction, and even in states with a primary defined benefit plan, supplemental defined contribution plans are almost always offered to employees. In this paper, we apply the lessons we have learned about individual savings behavior in private sector defined contribution savings plans and from behavioral economics to the unique institutions of the public sector.

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Over the past 30 years, employer provided defined contribution (DC) savings plan have largely displaced traditional defined benefit (DB) pensions in the private sector. In 1975 in the private sector, there were 2.4 active defined benefit plan participants for each active participant in a defined contribution savings plan. By 2007, these proportions had almost reversed, with 3.4 active defined contribution savings plan participants for each active defined benefit plan participant (Figure 1). Several factors have been implicated in this shift, including increased regulatory costs for defined benefit pension providers following the passage of the Employee Retirement Income Security Act (ERISA) in 1974, the legislated creation of an attractive (to employers) alternative to the defined benefit pension through section 401(k) of the Internal Revenue Code in 1978, and an interest by workers in portable pension benefits as the labor force has become more mobile.

The picture in the public sector is very different. In most jurisdictions, a traditional defined benefit pension is still the primary retirement benefit offered to employees. But some jurisdictions have followed the private sector and shifted either in whole, or in part, to a primarily defined contribution system. Going forward, fiscal pressures are likely to generate more movement in this direction. Even in states with a primary defined benefit plan, supplemental defined contribution plans are offered to employees, and for some public sector employees, could be an important (potential) source of retirement savings.

The distinction between defined benefit and defined contribution plans is an important one. In a defined benefit plan, participants have little impact on the income that they will receive in retirement other than through their choice of when to retire (or end their employment). Plan sponsors dictate the pension formula that determines the level of retirement income received by participants; they determine how much money to set aside today to meet those needs in the future; and they are responsible for managing the assets that have been put aside to fund future pension benefits. All of these tasks are done with the help of highly trained financial professionals.

In a defined contribution plan, participants are often left to navigate the retirement savings landscape on their own with little in the way of guidance from their employer or plan sponsor. Although there are many details of defined contribution plans that vary across plan sponsors, individuals are usually tasked with determining whether or not to participate, selecting

a contribution rate, and choosing an asset allocation. These decisions can be overwhelming for ordinary employees, many of whom have little financial expertise. The consequences of charging individuals with limited financial capabilities to make complicated financial decisions for themselves has been well document in the literature: individuals procrastinate, their savings outcomes are heavily influenced by plan design features such as employer-selected defaults, they place too much weight on information that is not relevant (e.g., past returns) and too little weight on information that is (e.g., fees).

In this paper, we apply the lessons we have learned about individual savings behavior in private sector defined contribution savings plans to the unique institutions of the public sector. We start by first surveying the public pension landscape, evaluating the generosity of public sector defined contribution and defined benefit pension plans and describing the types of defined contribution plans that are available. One distinguishing feature of defined contribution plans relative to defined benefit plans is the level of choice required of participants, so we next turn to choices faced by employees in public sector defined contribution plans and how these choices compare to those of employees in the private sector. We conclude by discussing how previous research might inform better design of defined contribution plans in the public sector.

I. The Public Sector Pension Landscape

Defined Benefit and Defined Contribution Plans in the Public Sector

There are over 2500 different public employee retirement systems providing benefits to the over 20 million individuals employed in the public sector.[1] For most of these employees, the primary retirement benefit is a traditional defined benefit pension plan: according to Snell (2010a), "91 percent of full-time state and local government employees are covered by a traditional, defined benefit retirement plan." Although defined contribution plans are making some inroads in the public sector, quantifying their importance is difficult because the data collected on public sector retirement plans has been largely focused on defined benefit plans.

[1] The number of retirement systems comes from the U.S. Census Bureau: http://www.census.gov/govs/retire/2008ret05a.html (accessed August 4, 2010). The total number of retirement systems is comprised of 218 state systems, 160 county systems, 2054 municipal/township systems, and 118 school and special district systems. The number of public sector employees comes from the U.S. Bureau of Labor Statistics: http://www.bls.gov/cps/cpsaat15.pdf (accessed August 5, 2010).

Pensions & Investments has compiled some data on the 1000 largest retirement plan sponsors (public and private) in the U.S., as measured by assets under management. Of the 1000 largest plans in 2009, 222 are classified as public plans.[2] In this subset of public plans, the DB plan is still king of the hill: only 6% of the total assets under management are in defined contribution savings plans. But 94 of the 222 largest public pension plan sponsors have a DC plan component, and 38 of these plans have over $1 billion in DC plan assets.[3]

To get a more complete picture of the role of DC plans in the public sector, we compiled information on the retirement plans offered to new hires going forward (that is, we assess the plans in place for newly hired employees, not the plans that may exist for more tenured employees but that are not available to newly hired employees). We gathered this information for all 50 states and the District of Columbia, the 20 largest cities, and the 20 largest counties in the U.S. (as measured by population). Public plans vary in the types of employees that are covered. Some jurisdictions have a single plan for most or all public sector employees, whereas others have separate plans for different categories of public employees, e.g. teachers, public safety workers, or elected officials. In Tables 1A (states) and 1B (counties and cities), we list the plans available to a general public sector employee in each of the jurisdictions listed. Note that some plans appear in Table 1 multiple times—for example, a plan that covers public sector workers employed at all levels of government within the state could show up as a plan covering state, county and city employees. In Table 2, we list what types of public sector employees are covered by the plans listed in Table 1.

Table 1 confirms our earlier assertions: at all levels of government, the principal retirement plan for most jurisdictions is a defined benefit pension. But some jurisdictions have jettisoned a primary DB plan in favor of either a primary DC plan, a hybrid DB/DC plan, or are giving participants a choice between a DB, a DC, or a hybrid DB/DC plan. The hybrid DB/DC plans have a DB component with an additional mandatory DC component layered on top. The DC component of these hybrid plans is distinct from the optional and supplemental DC plans that are available in all states. Thirteen states have some sort of DC component in their primary

[2] Pensions & Investments classifies plans as being corporate, public, union, or miscellaneous. A handful of plans classified as "miscellaneous" appear to be public plans (e.g., the Federal Retirement Thrift plan, or the Illinois State Universities plan). In the numbers reported here, we follow the Pensions & Investments categorization.
[3] By way of comparison, private sector companies like Apple and 7-Elevan have roughly $1 billion in DC assets under management and no DB assets.

retirement plan. Three states—Georgia, Indiana, and Oregon—have a hybrid DB/DC plan. Two states—Alaska and Michigan—have switched to an entirely DC system for new employees. The District of Columbia also has a DC only plan for new employees.[4] Seven states give new employees a choice of primary plan. In Colorado, Florida, Montana, North Dakota (for exempt employees), and South Carolina, new employees have the choice between a DB and a DC plan; in Washington, new employees have the choice between a DB only plan and hybrid DB/DC plan; and in Ohio, new employees have the choice between a DB only plan, a hybrid DB/DC plan, and a DC only plan. Utah will join the ranks of states with a choice of primary plan in 2011 following a recently legislated pension reform that gives public sector employees a choice between a hybrid DB/DC plan and a DC only plan. Figure 2 shows a timeline of the state plan changes over the past 25 years that involve adding a DC only or a hybrid DB/DC option to the retirement system, replacing a DB plan with a DC plan, or in the case of Nebraska, replacing a DC plan with another type of plan. Since 1997, 11 states (not including Utah) have incorporated some type of DC element into their primary retirement plan—about 1 state per year on average.

Relatively fewer of the largest cities and counties in the U.S. have a primary plan that is not DB only: only 7 of the 40 jurisdictions listed in Table 1B. At the city level, both Indianapolis, IN and Columbus, OH belong to state-wide public employee retirement systems that, as discussed above, have a defined contribution element. San Diego, CA has a hybrid DB/DC plan, and Jacksonville, FL gives new employees the choice between a DB and a DC plan. At the county level, Wayne County, MI has a hybrid DB/DC plan, while King County, WA and Orange County, CA give new employees the choice between a DB only plan and a hybrid DB/DC plan.

Regardless of the nature of their primary retirement plan, all of the jurisdictions in Table 1 have a supplemental and optional defined contribution savings plan available to employees, and a non-trivial fraction have multiple different supplemental options. The role of primary defined contribution plans in the states without a primary defined benefit plan is obvious. The need for, and role of, supplemental defined contribution plans depends in large part on how well the primary defined benefit and defined contribution plans are meeting the retirement income needs of public sector employees.

[4] Nebraska had a DC only plan for new state employees from 1967 to 2002, but replaced this with a cash balance plan for new employees starting in 2003.

The Adequacy of State Defined Benefit Pensions

To evaluate the role of defined contribution plans in the public sector, it is important to understand something about the defined benefit pensions that the defined contribution plans have either replaced, or complement. Public sector defined benefit pensions are often perceived by the public as being quite generous. To evaluate this claim, we calculate the retirement income replacement rate for a stylized public sector employee—Joe the Bachelor. Our goal is to assess the extent to which Joe's employment generates an annuity-like stream of income in retirement under each state's primary retirement plan. We include in Joe's retirement income the annual stream of benefits to which Joe is entitled under each state's DB plan or the DB component of a hybrid plan (if relevant). Because in some states Joe's employment may entitle him to a stream of retirement income under social security, we also include Joe's social security income in our calculation. And because the taxation of wage (pre-retirement), social security, and public sector pension income varies across states, we evaluate Joe's replacement rate on an after-tax basis. Finally, we subtract from Joe's pre-retirement salary any mandatory contributions he must make to the retirement plan to which he belongs. We do not make any assumptions about Joe's potential wealth accumulation in defined contribution plans and the type of replacement rate they would generate. And we assume that he has no income other than his salary before retirement, and no income other than his defined benefit pension or social security (if relevant) when he is retired. Our goal is to assess the extent to which Social Security and Joe's public sector defined benefit pension (if any) replace his pre-retirement income. Appendix A includes more details on the assumptions and methodology we use in calculating Joe's retirement income replacement rate.

In Figures 3 and 4, we plot Joe's retirement income replacement rate across the different plan options available in all of the states and the District of Columbia. The plans are grouped by type and ordered alphabetically by state postal code abbreviation within group: cash balance plans are orange, defined benefit plans are blue, DC only plans are red, and hybrid DB/DC plans are green. States that offer employees a choice of different retirement plans show up each the

figure multiple times, once in each group for which they have a relevant plan option. States whose newly hired general employees do not participate in Social Security are outlined in black.[5]

In Figure 3, we assume that Joe retires with a final annual salary of $50,000, whereas in Figure 4 we assume that Joe retires with a final salary of $100,000. In both Figures 3 and 4, we show Joe's replacement rate under six different scenarios:

A) Joe retires at age 65 having worked for 40 years, all of it in the public sector

B) Joe retires at age 65 having worked for 35 years, all of it in the public sector

C) Joe retires at age 65 having worked for 35 years, the first 5 in the private sector and the last 30 in the public sector

D) Joe retires at age 65 having worked for 35 years, the first 30 in the private sector and the last 5 in the public sector

E) Joe retires at age 65 having worked for 35 years, the first 15 in the private sector and the last 20 in the public sector

F) Joe retires at age 65 having worked for 35 years, the first 20 in the public sector and the last 15 in the private sector

Note that in all these scenarios, we are calculating Joe's replacement rate using his post-retirement income in his first year of retirement relative to his pre-retirement income in his last year of work. The replacement rate he would get later in retirement could be different than our calculations here due to cost-of-living adjustments (COLAs). To the extent that states have differential cost-of-living adjustments, the patterns of variation across states that we document in Figure 3 and 4 could also change.

There are several things to note about the patterns in these figures. First, because the Social Security system is progressive, Joe's replacement rate is almost always lower when his final average salary is $100K than when it is $50K.[6] When Joe has a 35-year career entirely spent in the public sector (the second histogram in Figures 3 and 4), his replacement rate in DB only plans is 10 percentage points lower on average with a $100K final income than with a $50K final income.

[5] The states whose newly hired general public employees do not participate in social security are: Alaska, Colorado, Louisiana, Maine, Massachusetts, and Ohio. Some states in which newly hired general employees are part of the Social Security system have older cohorts of employees that are not a part of the Social Security system. And some states in which newly hired general employees do participate in Social Security have other types of public sector workers (e.g. teachers) that do not.

[6] The exceptions occur in the states with DC only plans that do not participate in Social Security, where the replacement rate is 0% regardless of Joe's income.

Second, in the DB only plans and the hybrid DB/DC plans, Joe's replacement rate is increasing in the time he has spent working in the public sector (40 vs. 35 vs. 30 vs. 20 years). This is due to the nature of the typical defined benefit pension formula in which benefits are increasing in years of service. In some states, however, the defined benefit replacement rate is capped, so that additional years of service do not translate into a higher pension benefit after some point. At $50K in final income in the DB only plans, the average changes in Joe's replacement rate that results from increasing the years of public sector work from 20 to 30, from 30 to 35, and from 35 to 40 are 17%, 8%, and 8% respectively (see Table 3).[7]

Third, holding fixed Joe's income at retirement, the total length of this career, and the division of his time between the public and the private sector, there is substantial heterogeneity in his replacement rate across states with DB only plans. For example, at $50K in income and with 35 years of work all spent in the public sector, the average replacement rate across all DB only plans is 120% (Table 3). But if Joe worked in Pennsylvania, his replacement rate would be much higher 148%. In contrast, if Joe had worked in Maine, also a state with a DB only pension, his replacement rate would be 79%, a difference of 69 percentage points relative to Pennsylvania. The average replacement rate in the states with hybrid DB/DC plans is lower on average than in the states with DB only plans, 90% vs. 120% (Table 3), although Joe would retire in these states with a stock of accumulated wealth in his DC component of these plans, so the comparison between these states and the DB only states is an apples-to-oranges comparison. Nonetheless, there is also substantial variation in the replacement rate in the small number of hybrid DB/DC plans, ranging from a low of 44% in Ohio to a high of 117% in Oregon (Table 3). In the DC only plans under the assumptions above about Joe, his replacement rate is either 0 (in the states that do not participate in Social Security), or around 50% (the replacement rate that he gets from Social Security alone after accounting for taxes).

Fourth, conditional on working partly in the public sector and partly in the private sector, Joe has a higher replacement rate if he ends his career in the public sector relative to if he starts his career in the public sector (Figures 3E vs. 3F, or 4E vs. 4F). For example, if Joe retires with a final average salary of $50K and works 20 years in the public sector and 15 years in the private sector, his replacement rate is 19 percentage points higher on average if he works first in the

[7] For the scenarios in which Joe spends time working in both the public and private sectors, we assume that he works first in the private sectors and then retires from the public sector.

private sector and then in the public sector than the other way around (95% vs. 76%). This is because the defined benefit pension formulas are a function of Joe's *nominal* final average salary in the public sector.[8]

Fifth, in the scenario where Joe works only 5 years in the public sector, there are many states with a DB system in which Joe is not entitled to *any* DB pension because he does not satisfy the plan vesting requirements. In these states, Joe's replacement rate is determined solely by his Social Security benefit and the tax code. In most of these states, Joe would receive a refund of his contributions to the state pension system if the system requires employee contributions and he leaves before vesting.[9] This would give Joe a stock of accumulated wealth that he could choose to save until retirement, much like a defined contribution plan, although as with defined contribution balances (or other sources of income), we do not attempt to convert these pension refunds into the replacement rates that are shown in Figures 3 and 4.

And finally, there are six states that do not participate in the Social Security system: Colorado, Louisiana, Maine, Massachusetts, Nevada and Ohio. This means that neither Joe nor his public sector employer make contributions to the social security system while Joe is employed in the public sector, and consequently, Joe's public sector earnings history is not counted in determining his potential social security benefits. In these states, outlined in black in Figures 3 and 4, Joe's income in retirement in the scenarios where Joe works entirely in the public sector (A and B) is comprised entirely of his defined benefit pension because he has no private sector work history. In the states with DC only plans, those that do not participate in Social Security have a 0 replacement rate. In scenarios C and D, even though Joe has some private sector work experience, it is not long enough to qualify Joe for Social Security, so in these cases as well Joe's income in retirement is comprised entirely of his defined benefit pension. In scenarios E and F, Joe works in the private sector long enough to qualify for Social Security in addition to his public sector pension, but he is subject to the Social Security windfall elimination provision (WEP) which will result in a lower Social Security benefit than what he

[8] In contrast, Social Security is a function of Joe's prior earnings after they have been indexed for wage growth in the economy. In a defined contribution plan, Joe's account balance would not be linked directly to his wage growth or to the level of wage growth in the economy. But if wage growth and investment returns in the economy are positively correlated, then Joe's account balance would be correlated with wage growth.

[9] In most states with DB plans, if Joe leaves public sector employment before he is vested, the refund he receives is of his contributions only. He does not receive any investment return on his contributions, nor does he receive any part of any employer contributions made on his behalf.

would get if his private sector work experience were the entirety of his career. As explained on the Social Security web site:

> "Social Security benefits are intended to replace only a percentage of a worker's pre-retirement earnings. The way Social Security benefit amounts are figured, lower-paid workers get a higher return than highly paid workers…Before 1983, people who worked mainly in a job not covered by Social Security had their Social Security benefits calculated as if they were long-term, low-wage workers. They had the advantage of receiving a Social Security benefit representing a higher percentage of their earnings, plus a pension from a job where they did not pay Social Security taxes. Congress passed the Windfall Elimination Provision to remove that advantage."
> (Source: http://www.ssa.gov/pubs/10045.html, accessed August 7, 2010.)

The replacement rates in Figures 3 and 4 account for the effect of the windfall elimination provision on Joe's social security benefits in the states that do not participate in Social Security.

Interestingly, the replacement rates of the states that do not participate in Social Security are, if anything, lower than the average replacement rates in states that do participate in Social Security. In fact, in many of the scenarios in Figures 3 and 4, the lowest replacement rates are in states that do not participate in Social Security. Evidently any additional generosity in the state pension benefit formula in these states does not compensate for the lack (or reduction) in Social Security income in retirement.

Figures 3 and 4 show the replacement rates for Joe the Bachelor if he starts working in the public sector today. In Figure 5, we take scenario B and plot the replacement rate that Joe would get if he retired today under the rules in place for individuals reaching retirement today (including the current tax code), against the replacement rate that Joe would get at retirement if he was newly hired today and if the pension and tax rules in effect for newly hired employees do not change between now and Joe's eventual retirement.[10] For most states, the benefits for currently retiring Joe and future retiring Joe are fairly close to the 45-degree line, indicating that pension plan generosity has not changed much over time, at least not for employees who spend their entire careers in the public sector. In the states where defined benefit pension generosity has changed, defined benefit plans have, for the most part, lowered their retirement income replacement rates. This is certainly the case in the states that have replaced a DB plan with a DC

[10] The values for the y-axis in Figure 5 come from Figure 3B. In contrast to Figures 3 and 4, states with multiple plan options are included only once in Figure 5. We show what has happened to the DB only plan in these states.

plan (Alaska, Michigan and Washington, DC). In the states where retirement plan generosity has changed, replacement rates have fallen by an average of 11%.

Several states have made recent pension plan changes that decrease the generosity of their defined benefit pension but that do not show up in the scenario plotted in Figure 5. For example, an increase in the years of service at which employees vest would reduce benefit generosity for employees who leave the public sector with years of service greater than the old but less than the new vesting requirement. Similarly, an increase in the combination of age and years of service required to claim a full pension benefit would also decrease generosity for some subset of employees. Many states have adopted so-called "anti-spiking provisions". Anecdotally, public sector employees and employers have been accused of "spiking" pay in the final year or two before retirement as a way to increase the stream of future pension benefits, since the pension formulas depend on some measure of final average pay. This spiking could take the form of extremely high levels of overtime, or short-term "promotions" into higher paying jobs. In our calculations, we assume that Joe has 1% real wage growth each year until 5 years before retirement, at which point we assume that his pay is flat until reaching retirement, so the replacement rates that we generate are not influenced by spiking. But in practice, stricter anti-spiking provisions would be one way in which the generosity of defined benefit pensions is being reduced that would not show up in Figure 5.[11] States are also reducing the generosity of the retiree health insurance that they provide to eligible retired workers, a benefit that we do not incorporate into our replacement rate calculation but one that can be very valuable to some retired employees.[12] The general point is that public sector retirement benefits are becoming less generous over time along several dimensions, many of which don't show up in the stylized calculations that we have done here. The current fiscal situation facing many jurisdictions will likely precipitate many more such changes.

From the data presented in Figures 3 and 4 it is hard to make a blanket conclusion about the retirement income adequacy of state defined benefit pensions. For some retiring public sector workers, their state defined benefit pension is probably more than adequate, especially when

[11] In practice, the anti-spiking provisions take the form of caps on the annual salary growth that will be used in calculated a worker's pension benefit.

[12] States have been making retiree health insurance less generous by charging higher premiums, increasing deductibles and copayments, and increasing the service requirements for eligibility (Clark and Morrill, 2010).

coupled with the retiree health insurance that is available to public sector retirees.[13] The tremendous heterogeneity in replacement rates across states for equivalent workers with defined benefit only plans, however, suggests that either some states have overly generous pensions, or that some states have pensions that alone are inadequate. If the latter, then there is certainly a role for supplemental savings plans to help fill the gap. Similarly, to the extent that pensions are becoming less generous in some of the less visible ways discussed above, this may also increase the need for supplemental savings plans. And for those workers whose public sector careers are so short that they receive little, if anything, in the way of public pension benefits, there is also a role for supplemental savings plans (e.g., scenarios D and F).

The Adequacy of State Defined Contribution Pensions

The adequacy of defined contribution savings plans is more difficult to assess than that of defined benefit plans because their adequacy depends significantly on participant behavior—are employees participating, how much are they contributing, and what type of asset allocation do they choose? In most private sector 401(k) plans, there are many ways employees can come up short (Munnell and Sunden, 2004): they can delay enrolling in the plan, they can choose a contribution rate that is too low to generate the necessary resources to maintain consumption in retirement, and they can choose an inappropriate asset allocation (e.g., investing heavily in employer stock, or choosing only very conservative asset allocation, or investing in high fee funds).

Table 4 lists some of the features of the defined contribution savings plans in states that have a primary plan that is entirely DC, or the choice of a primary plan that includes a DC only option (optional supplementary DC plans and the DC component of hybrid DB/DC plans are not included in Table 2). Just as there is heterogeneity in the generosity of the DB plans in states with a primary DB plan, there is also heterogeneity in the generosity of the DC plans in the states with primary DC plans. Some plans are better designed to set employees up for adequate retirement wealth accumulation than others.

In contrast to most private sector defined contribution savings plans in which savings plan participation is optional, public sector retirement plan participation is mandatory for most

[13] Clark and Morrill (2010) find that states with more generous retiree health insurance also have higher pension replacement rates.

employees.[14] In all three jurisdictions that have only a defined contribution plan, participation is automatic and employees cannot opt out. Similarly, in the states that give employees a defined contribution plan as an option, participation in one of the plan options is required. Participation in the defined contribution plan, however, requires active enrollment as in all states with plan choice the default plan is the defined benefit plan or, the case of Washington state, the hybrid DB/DC option.

In the private sector, most defined contribution plans are funded by elective employee contributions and an employer contribution that is contingent on, and related to, the employee's contribution (e.g., the employer will match 50% of employee contributions up to a maximum of 3% of pay). The structure of contributions in state defined contribution plans is very different. Only one state, Michigan, allows for variable employee contributions that are matched by the employer, as is the norm in the private sector. Instead, public sector defined contribution plans are characterized by a non-contingent employer contribution, ranging from 4% in Michigan to over 10% in Colorado. Most also have a mandatory (and fixed) employee contribution, ranging from 4% to 8%, although two jurisdictions (Washington, DC and Florida) do not allow employee contributions at all. The minimum combined employer/employee contribution ranges from a low of 4% in Michigan to a high of almost 19% in Ohio.

The one aspect of public and private sector defined contribution plans that is largely the same is the investment options. The number of investment options ranges from 10 to the low 20s with only one exception, South Carolina, which differs because it has four different investment fund managers and a total of 85 funds. All of the fund menus have a set of investment options that span the risk-return spectrum, and most have incorporated target date funds into their investment menu. The default fund is either an age-appropriate target date fund or a balanced fund with one exception, Michigan, where the default is a fixed income fund. This is in line with the private sector which has also moved toward target date and balanced fund defaults that satisfy the Qualified Default Investment Alternative (QDIA) guidelines following the passage of the Pension Protection Act in 2006.

Employees are always immediately vested in their own contributions in both the private sector and in the state DC plans listed in Table 4. The vesting of employer contributions varies

[14] States often exempt some groups of employees from retirement plan participation, although these employee groups tend to be a small (e.g., temporary or part-time workers).

across jurisdictions, from immediate vesting (in South Carolina) to cliff vesting after 5 years (Montana). Most states, however, have a vesting schedule in which employees become progressively more vested in their employer contributions over time, becoming fully vested after 4 or 5 years. As with the investment menus, the range of vesting schedules also mirrors what we observe in private sector plans.

Relative to private sector defined contribution saving plans, public sector plans are more conducive to generating retirement wealth accumulation. In the DC only states, participation is mandatory and automatic. Colorado and Ohio have combined employer/employee contribution rates exceeding 18%. Four other states have combined employer/employee contribution rates equal or exceeding 10%, which is about equal to the average combined employer/employee contribution rate among private sector savings plan participants. But some states have rather low combined employer/employee contribution rates: Michigan at 4% (although with optional employee contributions and the employer match it could be higher), Washington at 5%, North Dakota at 8%.

II. Behavioral Economics and Savings Outcomes

We now turn to a brief summary of the literature on behavioral economics and savings outcomes. We will then, in Section III, apply this research to the institutions of the public sector retirement plans that we have described above in Section I.

Several recent papers document a pervasive lack of general financial literacy in the U.S. population (e.g., Lusardi and Mitchell, 2006, 2007; Lusardi, Mitchell and Curto, 2010; Lusardi and Tufano, 2009; Applied Research and Consulting, 2009). This lack of financial literacy carries over to the specific domain of their employer sponsored retirement plans. Gustman, Steinmeier, and Tabatabai (2007) and Stevens and Chan (2008) show that many respondents to the Health and Retirement Survey do not understand important features of the retirement plan to which they belong, including whether the plan is a defined benefit or a defined contribution plan, the age at which they qualify for full benefits, and the relationship between continued work and future benefits. Choi et al. (2006) similarly show that many employees in a defined contribution savings plan are unable to correctly articulate the employer match that they face. Finally, Brown and Weisbenner (2009) document confusion about which of the available plan options best meets

the needs of the different types of individuals participating in the State Universities Retirement System of Illinois.

As noted in the introduction, complicated financial decisions can be overwhelming for many individuals, especially those who have little financial expertise and only limited financial experience. Saving for retirement can be especially daunting as it involves making long-term commitments that are both large and consequential. And the nature of the task is such that many individuals never develop significant expertise. Individual learning is slow to occur because many choices are made infrequently and their outcomes are realized only with substantial delay and significant noise, while social learning is limited first by the fact that many financial shocks are common, and second by the rapid pace of financial innovation that quickly renders acquired knowledge obsolete.

The consequences for savings plan outcomes in this context have been well documented. There are several broad patterns of behavior that emerge from the literature. First, individuals procrastinate when faced when complicated choices. In the context of retirement saving, this implies not saving at all. Carroll et al. (2009) document substantial procrastination in 401(k) savings plan enrollment in a large private sector savings plan, even though the costs of delay can be substantial (Choi, Laibson and Madrian, forthcoming). Conversely, Choi, Laibson and Madrian (2009a) and Beshears et al. (2010) show that simplifying the process of savings plan enrollment leads to sizeable increases in savings plan participation.

A second broad pattern of behavior is that decisions with respect to savings plan participation, contributions rates, and asset allocation are all heavily influenced by plan design features that, in standard economic models, should matter little. The best evidence on this front is the sensitivity of outcomes to the plan defaults. Madrian and Shea (2001), Choi et al. (2004 and 2006), and Beshears et al. (2008) document substantial increases in savings plan participation following employer adoption of automatic enrollment, which changes the default savings plan participation status from being out of the plan to being in the plan. They also document sizeable shifts in both contribution rates and asset allocation toward the automatic enrollment defaults on these margins. There are many other examples of default effects on savings plan outcomes: allowing employees to choose future automatic increases in their contribution rates leads to sizeable increases in savings (Thaler and Benartzi, 2004); portfolios have much more overall

exposure to employer stock when the employer match is defaulted into employer stock (Benartzi, 2001; Choi et al. 2005; Choi, Laibson and Madrian, 2009b); the fraction of pension beneficiaries choosing a joint and survivor annuity increased substantially when this option became the legal default for married individuals (Holden and Nicholson, 1998; Saku, 2001).

Defaults are not the only plan design feature that influence savings outcomes—there are several examples of other plan design features that also influence outcomes in significant ways. Employee contribution rates are heavily influenced by the employer choice of the match threshold in plans that provide employer matching contributions (Choi et al. 2006). And in plans without an employer match, employee contribution rates are influenced by whether mandatory contributions are labeled as employee or employer contributions (Card and Ransom, forthcoming). Several authors have found that asset allocation choices are sensitive to the structure of the investment menu (Benartzi and Thaler, 2001; Brown, Liang and Weisbenner, 2007; Karlsson, Massa, and Simonov, 2007).

A third broad pattern is that individuals pay too much attention to information that should not matter, and too little attention to information that should matter. For example, individuals chase past returns in both their asset allocation choices (Benartzi, 2001; Choi et al. 2004; Calvet, Campbell and Sodini, 2009) and contribution rate choices (Choi et al. 2009) while paying too little attention to the importance of mutual fund fees (Choi, Laibson and Madrian, 2010).

A fourth pattern is a reliance on heuristics and rules of thumb in decision making. For example, Benartzi and Thaler (2001) document what they call "naïve diversification": individuals diversify by investing in several different mutual funds, but they fail to account for the underlying correlations in returns across the funds when making their choices. Choi et al. (2006) show that in choosing contribution rates, employees place disproportionate weight on numbers that are divisible by 5.

Finally, individuals do a poor job of integrating various aspects of their financial lives; rather, they appear to be engaged in various types of mental accounting (Choi, Laibson and Madrian, 2009; Card and Ransom, forthcoming).

III. Implications for Public Sector Retirement Plans

What are the implications of these behavioral patterns for thinking about how well public sector retirement plans meet the retirement income needs of public sector employees?

Public sector retirement plans are both simpler, and more complicated, than savings plans in the private sector. To the extent that complexity helps drive some of the behavioral patterns

described above, there are reasons to think that things could be both better and worse in the public sector.

We start by considering the situation of employees who face a primary defined benefit plan. Relative to defined contribution savings plans, defined benefit plans have been characterized as being less complicated for their participants, at least in terms of the choices they require. This is almost certainly true—defined contribution plans demand, or at least allow, a substantial amount of individual autonomy, whereas defined benefit plans require almost no choice on the part of participants, at least up until the time or retirement. But there are many complicated features of defined benefit plans that may nonetheless have implications for employee savings outcomes in the supplemental savings plans that are offered. The formulas determining defined benefit pension payouts seem relatively straightforward on the surface—final average salary multiplied by years of service multiplied by a retirement factor. But these formulas often have complicated wrinkles—limits on the growth in final wages that will count in the formula, future cost-of-living adjustments that are hard to value, or rules about the combination of age and years of service that must be met to get a full benefit—that make them less transparent than they initially seem. As noted earlier, many individuals do indeed have misconceptions about the nature of the retirement benefits to which they are entitled. These misconceptions may impact the choices that individual make about whether or not to save, or how much to save, in supplemental savings plans.

By their nature, defined benefit plans reward tenure. Most payout formulas depend directly on years of service; they also depend directly on some measure of final average pay, which is itself often related to tenure, particularly for unionized public sector workers. Individuals who, for whatever reason, leave the public sector before vesting or who are vested with relatively low levels of tenure, will be entitled to very little.[15] While the common perception is that public sector workers are generally long-term employees, a recent task force report for the state of Maine claims that over half of public sector workers in Maine leave the public sector before reaching the 5 years of service necessary to vest (Maine URP Task Force, 2010). If this is true in other states as well, then more attention probably needs to be paid to the role of supplemental DC plans in the public sector, particularly for lower-tenured workers.

[15] In most states, employees in DB plans who leave public sector employment before they are vested are entitled to a refund of their own contributions only, although some states credit a rate of interest to employee contributions.

Finally, in states that do not participate in Social Security, the windfall elimination provision of Social Security greatly complicates making an accurate assessment about the level of social security income that employees will receive in retirement. As explained earlier, the windfall elimination provision may result in a reduction in social security payments to employees in states not participating in social security who have long enough private sector careers that they qualify for social security benefits in addition to their public sector pension. The annual statements that social security sends to participants projecting their future benefits do not account for the effects of the windfall elimination provision, so public sector employees who are impacted may mistakenly believe that they are entitled to higher social security benefits than they will in fact receive. This misperception may impact both the savings and retirement decisions of impacted employees.

In some states, employees have a choice of plans in which to participate. To the extent that either DB or DC plans are complicated, having to choose between them adds yet another layer of complexity. In this case, employees do not typically have the option of procrastination—there is a timeframe in which a decision must be made.[16] But in fact, the decision does not need to be made, because the employer must specify a default plan for those individuals who do not choose. Table 5 lists the states that have a choice of primary plan, which plan is their default option, and the fraction of new employees choosing each option for the states from which were able to get that information. In all of the choice states that have a DC only plan as one of the options, the default plan is the defined benefit plan. Washington is the one choice state in which the defined benefit plan is *not* the default; rather, the default is a hybrid DB/DC plan. Consistent with the previous research on defaults, the default option in all the states for which we were able to obtain plan election data is by far the most prevalent option: 79% to 87% of new employees are in the default plan.

Beshears et al. (2008) discuss several reasons why defaults may be persistent. Two are particularly relevant here: the complexity of the decision-making task may induce procrastination in making a choice, and the potential perception of the default as an endorsement. The choice between multiple retirement plans is likely to be complicated for most workers, and lacking strong preferences, the default may be particularly likely to be perceived as the correct

[16] For the states with a plan choice in Table 2, employees have from 30 days to twelve months to opt-out of the default plan.

course of action. Yang (2005), Brown and Weisbenner (2009), and Goda and Manchester (2010) all document strong default effects among employees who have a choice between a DB and a DC plan (the employees studied by Brown and Weisbenner had a choice between three different plans). In the organization studied by Goda and Manchester, the default was differentiated depending on age: employees above age 45 who did not make an active choice were defaulted into the DB plan, while employees under age 45 were defaulted into the DC plan. Goda and Manchester find that employees who are just above the age 45-cutoff are 60 percentage points more likely to be in the DB plan than employees who are just below the age 45-cutoff. Their analysis suggests, however, that even though the defaults in this context were incredibly persistent, the age-based default rule used was close to optimal ex ante. The organizations studied by Yang and by Brown and Weisbenner, in contrast, designated the DB plan as the default for all employees. Like Goda and Manchester, Yang finds that the default is very persistent, particularly so for young employees (<30), a group whom she calculates is least likely to benefit from being in the DB plan.[17] Similarly, Brown and Weisbenner also find that the default is very persistent; they also find evidence that employees who persist in the default are making mistakes, and that employees who opt-out of the default predominantly choose a dominated non-default plan.

No one has yet examined the extent to which employees end up in the plan that is optimal for them ex post when they have a choice of plans. In the Goda and Manchester analysis of plan choice, the dramatic difference in the fraction of employees in the DB plan before vs. after the age 45 change in the default suggests that even if an age-based default rule is optimal on average, there could be many employees who nonetheless end up in a plan that is not individually optimal. Given the very large impact that the default has on realized outcomes in the context of plan choice, more research is needed on the impact of the plan choice default on long-term outcomes. More research is also needed on how to optimally structure defaults in this context taking into account how employee behavior responds to the default choice. An alternative approach to designating a default option would be to require employees to make an active choice

[17] This result is consistent with the findings of Beshears et al. (2010) who find that the employees who persist at what appears to be a sub-optimal default contribution rate tend to be of lower socio-economic status.

of their primary plan, an approach that would be greatly facilitated with mechanisms to help employees quickly and easily learn the relative merits of each option.[18]

An interesting wrinkle to the plan choice decision is whether or not the choice is reversible. In some states in which employees have a choice of plans, their choice, once made, is fixed. In other states, employees have at least one, sometimes multiple, opportunities to switch between plans. This may complicate the decision-making task even further. But it may also change the psychology of the original decision-making task. To the extent that employees make a mistake, or to the extent that their circumstances change, they do have an opportunity (or opportunities) to undo their original decision, and this flexibility could be valuable. But to the extent that employees know that their decision is reversible in the future, they may take less care in making a thoughtful choice initially.

In states with a DC only plan, all states remove at least one layer of complexity by automatically enrolling employees in the DC plan with a non-contingent employer contribution. Most go a step further by also requiring a fixed contribution on the part of employees, some at relatively high rates that facilitate wealth accumulation. The default investment fund in these plans is typically a target date fund. Although target dates are not perfect, they are diversified across multiple asset classes. From the participant perspective, they also offer age-based portfolio rebalancing without future action on the part of the employee.

The defined contribution complexity in public plans comes when we consider the optional supplemental savings plans that are available. As noted above in our discussion of DB plans, not all DB plans generate high retirement income replacement rates for all public sector workers. And regardless of plan generosity, it is not always straightforward for employees to ascertain how much income their DB pension and Social Security will provide in retirement, a situation that may lead to mistakes in how employees use any supplemental savings vehicles that are offered. Similarly, in some states with a DC only plan or a DC option, the DC plan does not automatically result in savings at a rate conducive to significant long-term asset accumulation. And even though the amount that is being saved is more transparent in the primary DC plans than in their DB counterparts (even if the translation into retirement income is not), many jurisdictions have supplemental DC plans than seem unnecessarily complicated. For example, a

[18] See Carroll et al. (2009) for evidence on the impact of requiring employees to make an active decision on savings plan participation.

state may have one provider administering its primary DC plan with one set of investment options, another provider with a completely different set of investment options managing its first supplementary plan, and yet a another provider with a third set of investment options for a second supplementary plan. If there are multiple supplementary plans, employees who desire to supplement their primary benefits would have to choose which supplementary plan to use first. Like the choice between a DB and a DC plan discussed above, this is not necessarily a straightforward decision.

Another source of complexity in both DB and DC plans is the process of transforming accumulated benefits into retirement income. Most private sector DC plans do not have an annuitization option within the plan, and accumulated balanced are not automatically converted into a payment stream in retirement. Rather, retirees must take some action to convert their plan balances into an annuitized stream of retirement income, or they must self-manage spending down their wealth in retirement. In the private sector DC plans that have an annuity option available, the take-up rates of these options are quite low. This low rate of annutization, both within DC plans and with other sources of wealth, is often referred to as the annuity puzzle because it goes against strong theoretical predictions that individuals should demand some level of annuitization of their wealth to insure against longevity risk (Brown, 2007). The within-plan annuitization options are only marginally better in the public than in the private sector. Of the 13 states in Table 1 that have a DC only plan, a DC option, or a DC component as part of a hybrid plan, fewer than half have an option within the plan for employees to annuitize their wealth upon retirement.[19]

In contrast, in both private and public sector DB plans, accrued benefits have traditionally been paid out as either a single or joint-and-survivor life annuity. But many such plans have started to offer a lump sum pay-out option in lieu of an annuity. Mitchell (1999) reports that in 1991, when aggregate data on lump-sump payout options were first collected, only 14% of private sector DB pension plan participants had the option of a lump sum payout. By 2005, more than half (52%) of private sector DB pension plan participants had a lump sum option available (U.S. Department of Labor, 2007). Anecdotal discussions with those in the pension and

[19] Alaska, Florida, Georgia, Indiana, and Washington all have a mechanism for converting DC balances into an annuity. Michigan facilitates annuitization of DC balances through a platform that gives participants competing quotes from several different annuity providers.

retirement savings industry suggest that when a lump-sum option is available, the majority of participants elect the lump-sum. So the trend in private sector DB plan is towards decreased levels of annuitization, at both the plan and the participant level. For public sector DB plans, the situation is quite different. Only a handful of states allow employees the option of taking a lump sum rather than an annuity, and in most the lump-sum payout is limited to the equivalent of a few years of annuitized benefits.[20] Thus, public sector DB plans do a better facilitate annuitization of income in retirement than either private sector DB plans or than DC plans in either sector.

IV. Conclusions

In this paper we have provided an overview of the public sector pension landscape in the U.S. Although defined benefit plans remain the primary plan of choice, some jurisdictions, particularly at the state level, have opted for DC only plans or, more frequently, given employees a choice between a tradition DB plan or a parallel DC or hybrid DB/DC plan. All jurisdictions have one or more supplementary DC plan available to employees.

Among the primary DB and DC plans, we document substantial heterogeneity in plan generosity across states. There are plans of both varieties that are very generous, giving long-term public sector employees a high retirement income replacement rate in the case of DB plans, or setting employees up to accumulate a substantial stock of wealth at retirement in the case of DC plans. But there are also primary plans of both varieties that are much less generous and for which some supplemental savings may be necessary to maintain workers' standard of living in retirement, particularly for low-tenured workers who may not vest in a DB plan, or who may only partially vest in a DC plan.

We conclude by discussing how the recent research on behavioral economics and savings outcomes applies to the institutions and choices that employees face in public sector retirement systems. There are some aspects of public sector defined contribution retirement plans that are better designed from a behavioral perspective than their private sector counterparts, for example, automatic enrollment with mandatory employee contributions and non-contingent employer

[20] Retirees may take their entire benefit as a lump sum in Deleware, Kentucky, Pennsylvania and South Dakota; in Oregon and Wisconsin, retirees may only take their entire benefit as a lump sum if the monthly benefit to which they are entitled is below a (low) threshold. The following states allow for a partial lump sum payout: Arizona, Georgia, Kansas, Louisiana, Mississippi, Missouri, North Dakota, Ohio, Texas, Utah and Virginia.

contributions. But there are other aspects of public sector savings plan design that are more complicated and confusing than typically found in the private sector, and, at least in private sector savings plans, complexity often leads employees to make mistakes. Complexity in public sector plans comes from offering employees the choice between different types of primary plans, offering employees multiple supplementary plans, and offering employees the choice of multiples providers either within or across plans. More research is needed to determine how well public sector employees do when faced with these types of choices.

Appendix A: Calculation of Retirement Income Replacement Rates

Our calculation of the retirement income replacement rates in Figures 3,4 and 5 incorporates both the defined benefit pension income available to state retirees and their social security income. We do not transform accumulated DC retirement wealth into an income stream in retirement. This is by design—our goal is to assess the extent to which public sector employment generates an annuity-like income stream in retirement.

Assumptions

Our calculations of retirement income replacement rates are based on a stylized public sector employee, Joe the Bachelor. For the scenarios illustrated in Figures 3 and 4, we make the following assumptions:

- Joe was born on January 1, 1945 and entered the labor force in either 1970 (if he has a 40-year career) or 1975 (if he has a 35-year career).
- Joe retires on January 1, 2010 when he reaches age 65
- Joe is single when he retires and has never been married
- Joe's earnings trajectory is independent of the sector in which he is employed.
- Joe retires with a final average salary of either $50,000 (Figure 3) or $100,000 (Figure 4).
- Joe's earnings grow at a real annual rate of 1 percent up until age 60, at which point his earnings are flat at either $50,000 (Figure 3) or $100,000 (Figure 4) until he retires at age 65. This makes Joe's final average salary, which is used in the defined benefit pension formulas, the same as his final salary in the majority of states.
- We calculate Joe's nominal wage profile up until age 60 from his real wage profile using the Social Security Administration wage index factors. Note that Social Security only indexes wages up through age 60.
- In calculating Joe's defined benefit pension income, we assume that Joe is covered by the plan rules in effect for new employees going forward (scenarios in Figures 3 and 4)
- In Figure 5, we also calculate Joe's defined pension benefit pension income assuming that Joe is covered by the plan rules in effect for newly eligible employees on January 1, 1975.

Calculating Defined Benefit Pension Income for State Employees

We calculate the public pension benefits for all states, including the District of Columbia, which have either a defined benefit or a hybrid DB/DC plan for their general employees. If a public retirement plan has a hybrid DB/DC structure, we only calculate the defined benefit portion of the available retirement benefit. Joe's public pension benefit is zero for those states with defined contribution or cash balance plans; it is also zero for the defined contribution portion of states' hybrid DB/DC plans.
If Joe does not satisfy his plan's vesting rules for a particular scenario, then he is ineligible to receive a pension benefit. If Joe satisfies the vesting rules for a particular scenario, we calculate his normal, unreduced yearly retirement benefit using the plan rules in place for newly eligible employees in 2010. Even though Joe is not a newly eligible employee himself in 2010, this gives us a measure of pension plan generosity in place for new employees like Joe going forward. For Figure 5, we also calculate the pension benefit Joe would receive under the plan rules in place for newly eligible rules on January 1, 1975. If the state subsequently increases its pension plan generosity, we assume that Joe switches to the newer plan that provides a greater future retirement benefit if he is offered the option of changing plans.

In calculating Joe's retirement benefits, we follow each plan's documented rules. For every scenario, we calculate his pension income assuming a pre-retirement final salary of $50,000, and also $100,000. We calculate Joe's final average salary, which is used in each state's defined benefit pension benefit formula, from Joe's nominal earnings profile. His years of credited service consist solely of his public-sector tenure which varies by scenario. Once we have calculated the yearly pension benefit provided by each plan, we compare these amounts with the plan's minimum and maximum allowances, if they exist, and we modify his pension benefits, if necessary, to satisfy these constraints.

Calculating Social Security Benefits for State Employees

We assume that Joe claims his Social Security benefit when he retires in 2010 at age 65. In order to calculate the benefit amount, we use Joe's nominal earnings profile and take the lower of his nominal earnings and the maximum Social Security-taxable earnings for each year of his career. Next, we index the resulting values, multiplying them by the index factors discussed above. To obtain his average indexed monthly earnings (AIME), we sum the 35 years of highest indexed earnings, divide by 420 (=35 years x 12 months), and round to the nearest lower dollar. Then, using the 2007 bend points of $680 and $4100, we multiply the first $680 of the AIME by 0.9, the amount over $680 and less than or equal to $4100 by 0.32, and the amount over $4100 by 0.15. We add the three values generated from the previous step and round to the nearest lower 10 cents to get the primary insurance amount (PIA). To account for cost-of-living adjustments (COLAs), the PIA is increased beginning in 2007, the year that Joe reaches age 62. We multiply his PIA by the 2007 COLA factor, with the resulting amount rounded to the next lower

10 cents; we then repeat this process using the 2008 COLA factor. In effect, we obtain the full monthly Social Security benefit. However, since Joe chooses to receive his benefit prior to reaching the normal Social Security retirement age of 66 for individuals in his birth cohort, his benefit is reduced. In Joe's case, his benefit is reduced by 5/9 of 1 percent for each of the 12 months that he receives a benefit before age 66. After making this reduction, we multiply the revised monthly benefit by 12 to obtain his annual Social Security benefit.

For states whose general employees are covered by Social Security, Joe is entitled to the above benefit. For states that do not participate in Social Security, Joe only receives a Social Security benefit if he has at least 10 years of substantial earnings through private sector employment. If Joe has fewer than 30 years of creditable earnings, Joe's benefit is reduced in accordance with the Windfall Elimination Provision (WEP). For those states without Social Security coverage, the WEP is relevant in scenarios E and F (in which Joe has 15 years of private sector employment and 20 years of public sector employment). In these scenarios and for those states without Social Security coverage, we change the 0.9 multiplicative factor for the first 2007 bend point to 0.4 and compute the resulting Social Security benefit.

Calculating State and Federal Income Taxes

Before retirement, we assume that Joe's only source of income is his public sector job. Once Joe retires at age 65, we assume that his public pension and Social Security benefits are his only potential sources of income. Using the NBER's TAXSIM, we calculate Joe's federal income tax liability using the 2009 tax rules (the most recent effective tax rules). Because TAXSIM does not distinguish public vs. private sector pensions in calculating state income tax liabilities, and because many states have preferential tax treatment for public sector pension income (Table A1), we calculate state liabilities on our own, also using the 2009 tax rules. If Joe is employed, we subtract his public sector pension contributions, if made on a pre-tax basis, from his income; we are subtract the applicable state-level personal exemption and standard deduction from his salary to calculate his state-level taxable income before retirement. If Joe is retired, we first subtract state individual income exemptions for public pensions and Social Security, if applicable, from Joe's respective public pension income and Social Security income. Next, we add together the remaining taxable pension and Social Security income. We then subtract applicable state-level personal exemptions and standard deductions, giving us Joe's post-retirement taxable income at the state level. For both employed and retired Joe, if Joe's state taxable income is zero or negative, we assume that he has zero state individual income tax liability. Otherwise, we apply the state individual income tax brackets to his taxable income and calculate his initial state tax liability. From this tax liability we subtract any tax credits for which Joe is eligible. The remaining amount, so long as it is non-negative,

represents his state individual income tax liability; otherwise, we assume that Joe has zero state tax liability.

Calculating Retirement Income Replacement Rates

The numerator of Joe's retirement income replacement rate is his annual gross retirement income. We calculate Joe's gross retirement income as the sum of his public pension and his Social Security benefit minus his federal and state income taxes. The denominator of his replacement rate is his gross prê-retirement income. We calculate Joe's gross pre-retirement income as his public sector salary minus any mandatory state pension plan contributions and minus his federal and state income taxes and his portion of the FICA tax (for states that participate in Social Security). We divide the numerator, Joe's gross retirement income, by the denominator, Joe's gross-pre-retirement income. The resulting numbers are the replacements rates that are plotted in Figures 3, 4 and 5 and discussed in the text.

TABLE A1. State Participation in Social Security for Newly Hired General Public Employees and the State Taxation of Public Pension Benefits

State	Participates in Social Security	Has an Income Tax	Taxation of State Pension Benefits
Alabama	Yes	Yes	Public pension fully excluded from taxable income
Alaska	No	No	No personal income tax
Arizona	Yes	Yes	$2,500 public pension exclusion
Arkansas	Yes	Yes	$6,000 public pension exclusion
California	Yes	Yes	Public pension fully taxed
Colorado	No	Yes	$24,000 exclusion for social security and public and other qualified pension income for those 65+
Connecticut	Yes	Yes	Public pension fully taxed
Delaware	Yes	Yes	$12,500 public pension exclusion for those 60+
District of Columbia	Yes	Yes	Up to $3,000 on pension income for those 62+
Florida	Yes	No	No personal income tax
Georgia	Yes	Yes	$35,000 retirement income exclusion
Hawaii	Yes	Yes	Public pension fully excluded from taxable income
Idaho	Yes	Yes	Public pension fully taxed
Illinois	Yes	Yes	Public pension fully excluded from taxable income
Indiana	Yes	Yes	Public pension fully taxed
Iowa	Yes	Yes	$24,000 public pension exclusion
Kansas	Yes	Yes	Public pension fully excluded from taxable income
Kentucky	Yes	Yes	$41,110 public pension exclusion
Louisiana	No	Yes	Public pension fully excluded from taxable income
Maine	No	Yes	Exclusion of $6,000 minus SS benefits
Maryland	Yes	Yes	$24,500 pension exclusion for those 65+
Massachusetts	No	Yes	Public pension fully excluded from taxable income
Michigan	Yes	Yes	Public pension fully excluded from taxable income
Minnesota	Yes	Yes	Public pension fully taxed
Mississippi	Yes	Yes	Public pension fully excluded from taxable income
Missouri	Yes	Yes	May deduct the greater of $6,000 or 50% of public penion for those 62+; pension exemption limited to the amount of SS income

Montana	Yes	Yes	Pension exclusion of up to $3,600 if AGI<$30,000
Nebraska	Yes	Yes	Public pension fully taxed
Nevada	No	No	No personal income tax
New Hampshire	Yes	No	No personal income tax
New Jersey	Yes	Yes	$15,000 pension exclusion for those age 62+ if AGI<=$100,000
New Mexico	Yes	Yes	Retirement income exclusion of up to $2500 for those with AGI<=$39,667
New York	Yes	Yes	Public pension fully excluded from taxable income
North Carolina	Yes	Yes	$4,000 public pension exclusion
North Dakota	Yes	Yes	Public pension fully taxed
Ohio	No	Yes	Retirement income tax credit of up to $200 if retirement income >= $500
Oklahoma	Yes	Yes	Retirement income exclusion of up to $10,000
Oregon	Yes	Yes	Tax credit of up to 9% of pension income if household income <$22,500
Pennsylvania	Yes	Yes	Public pension fully excluded from taxable income
Rhode Island	Yes	Yes	Public pension fully taxed
South Carolina	Yes	Yes	Public pension exclusion of up to $15,000 for those 65+
South Dakota	Yes	No	No personal income tax
Tennessee	Yes	No	No personal income tax
Texas	Yes	No	No personal income tax
Utah	Yes	Yes	Tax credit of up to $450
Vermont	Yes	Yes	Public pension fully taxed
Virginia	Yes	Yes	Pension exclusion of up to $12,000 for those 65+
Washington	Yes	No	No personal income tax
West Virginia	Yes	Yes	$2,000 public pension exclusion; additional retirement income exclusion for those age 65+
Wisconsin	Yes	Yes	$5,000 pension exclusion for those 65+ if AGI<$15,000
Wyoming	Yes	No	No personal income tax

Note: State participation in Social Security is categorized for newly hired public sector employees. Some states in which newly hired employees are part of the Social Security system have older cohorts of employees that are not a part of Social Security.

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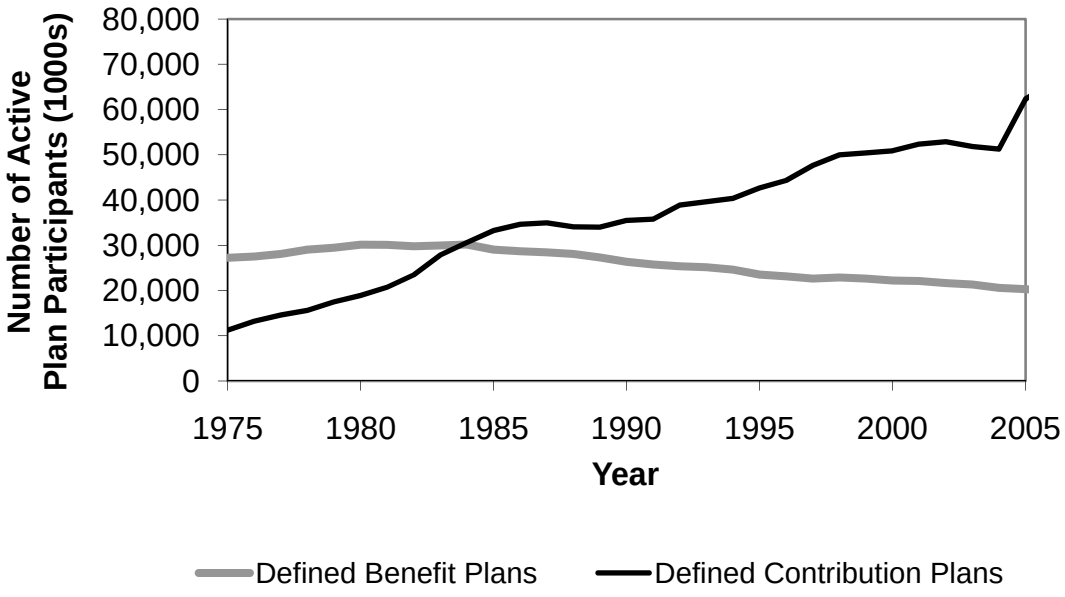
FIGURE 1.
The Changing Composition of Employer Sponsored Retirement Plans in the Private Sector



Source: Department of Labor, Employee Benefit Security Administration (2007 and 2010).

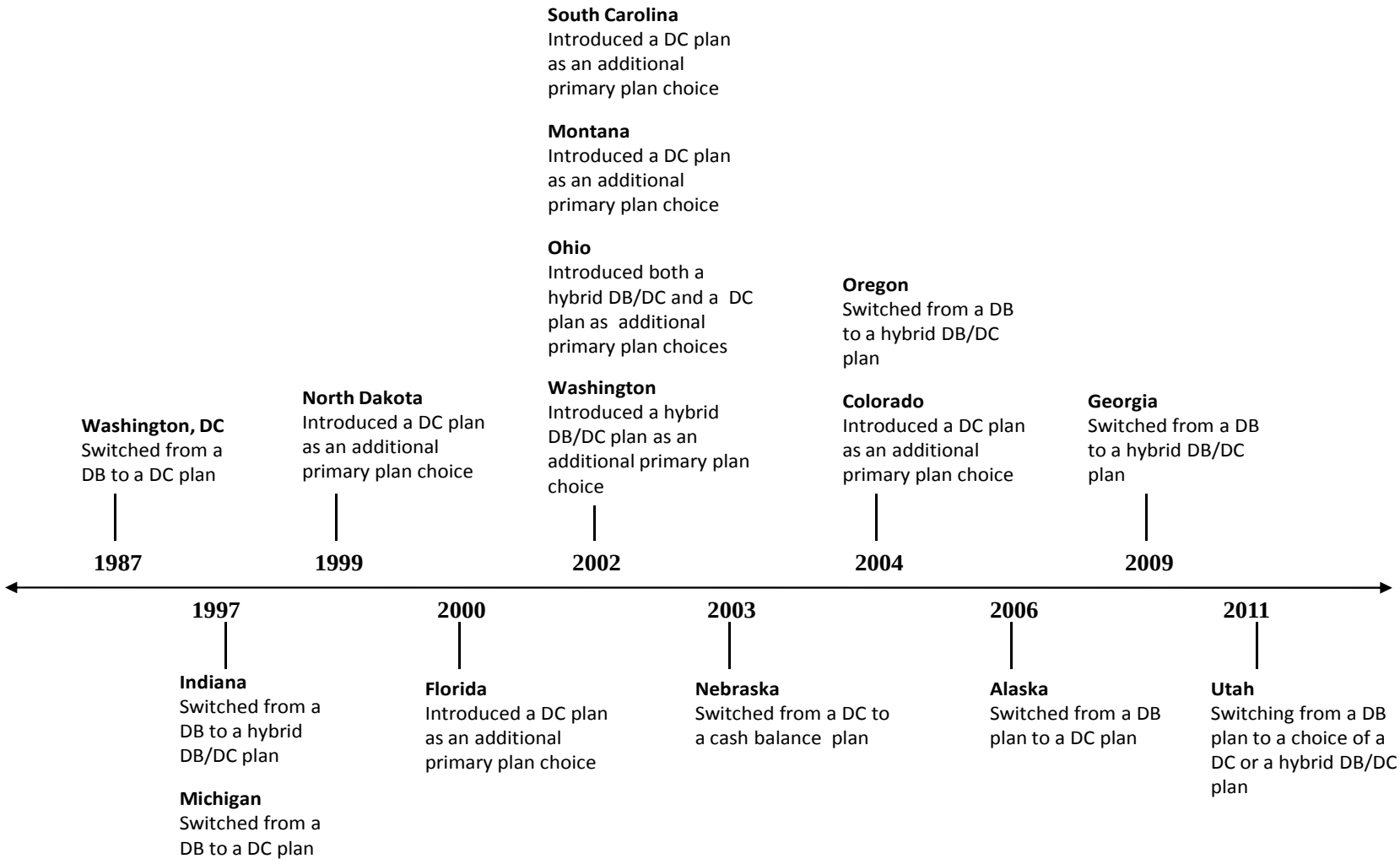
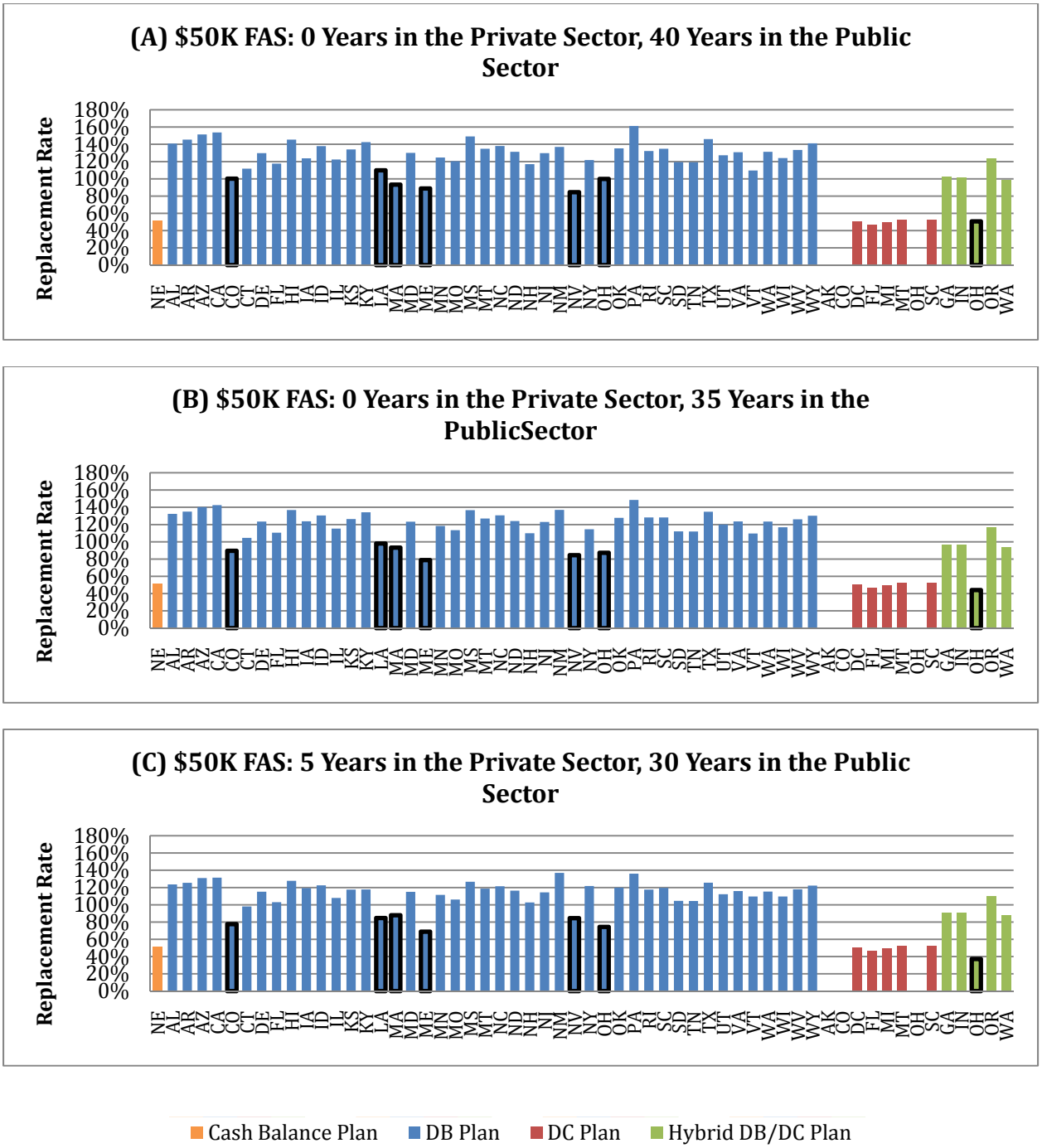


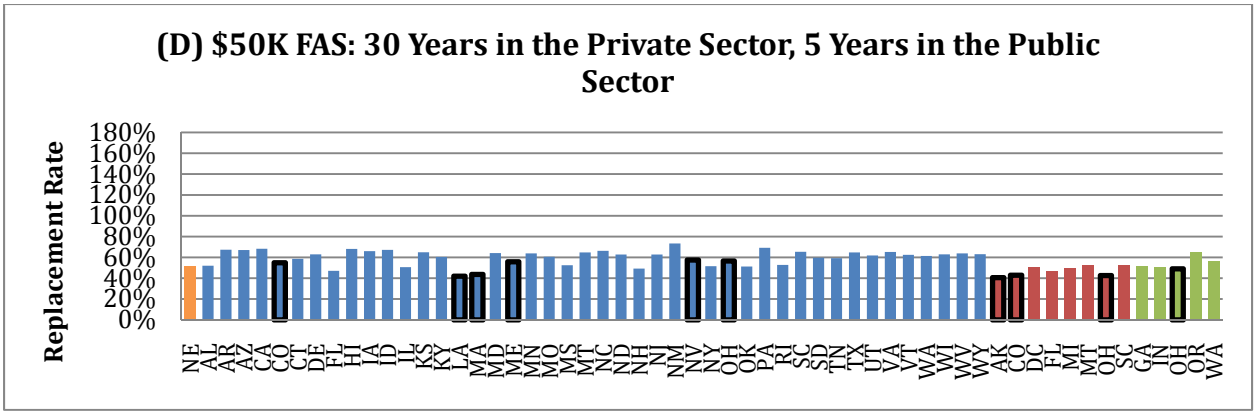
FIGURE 2. Timeline of State Defined Contribution Primary Retirement Plan Changes for Newly Hired Employees

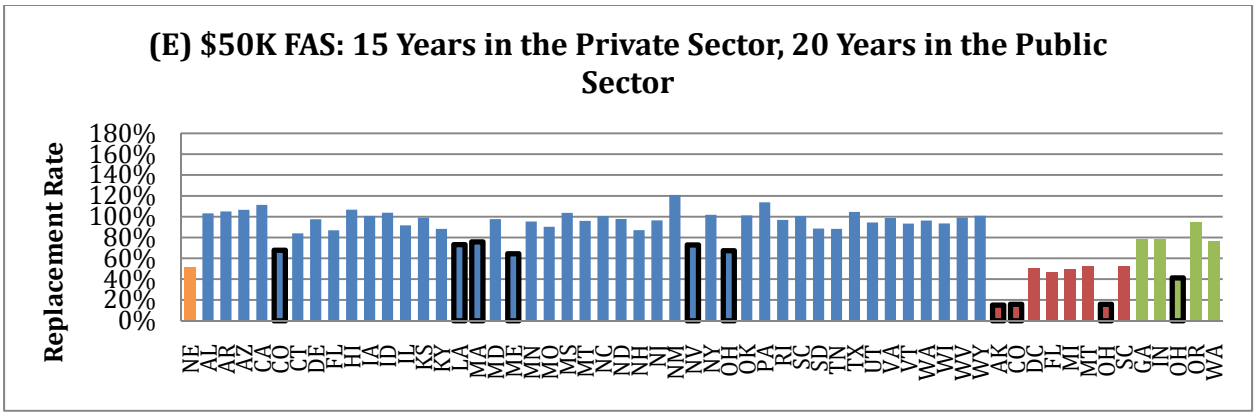
FIGURE 3. Joe the Bachelor's Retirement Income Replacement Rates under Various Scenarios (Final Average Salary of $50,000 Annually)

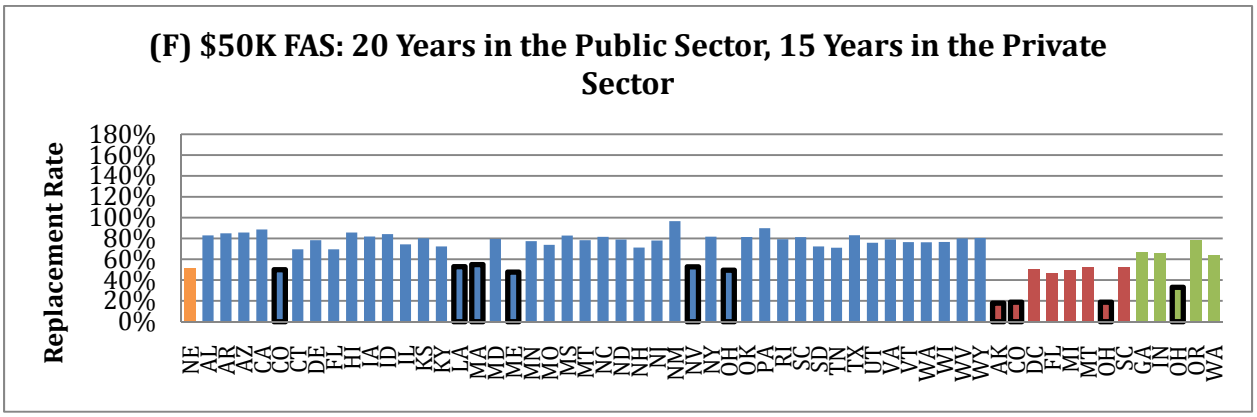


Note: States whose general public employees do not participate in Social Security have a black border. See Appendix 1 for details on how the replacement rates are calculated.

FIGURE 3 (cont'd). Joe the Bachelor's Retirement Income Replacement Rates under Various Scenarios (Final Average Salary of $50,000 Annually)

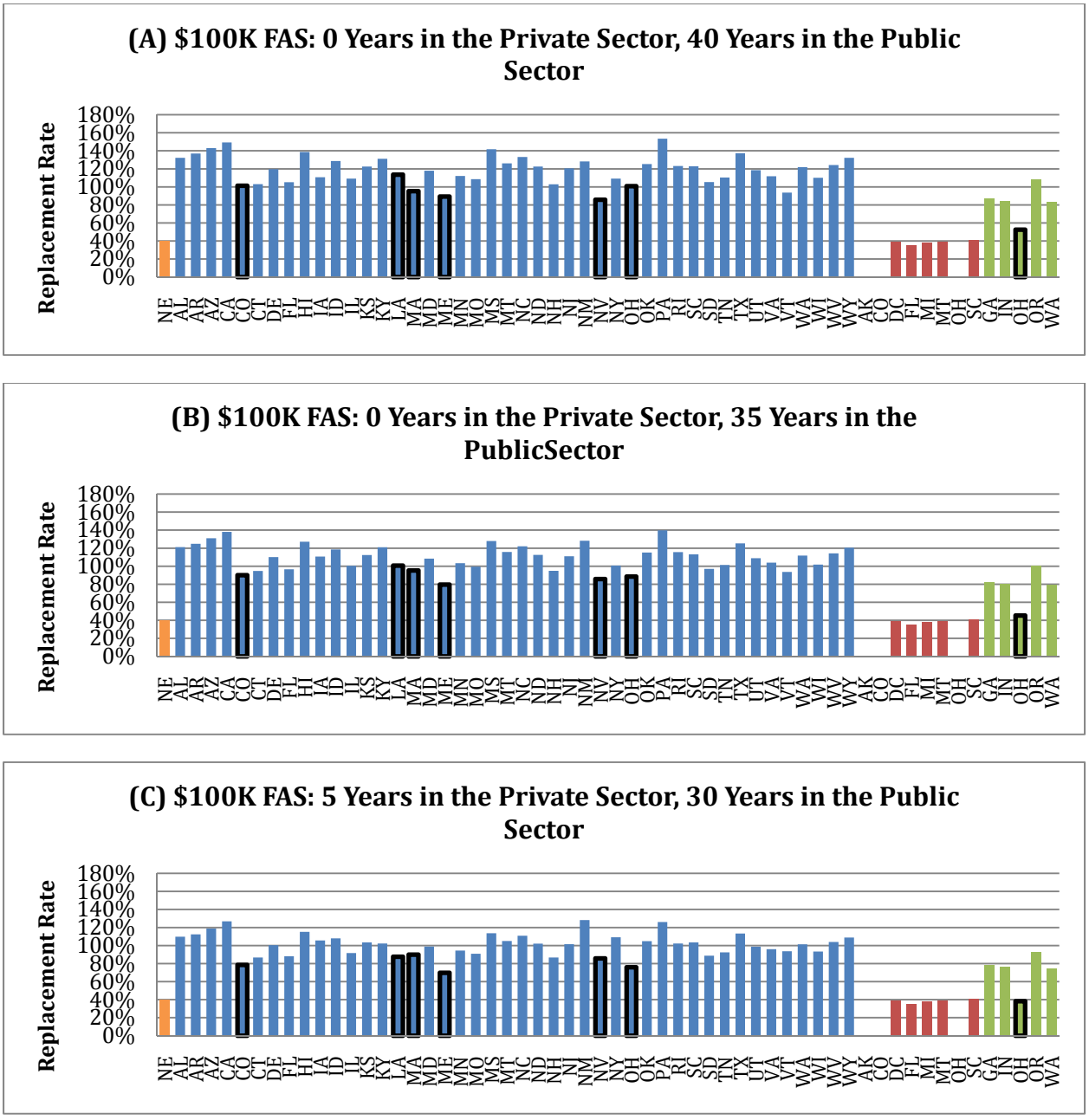






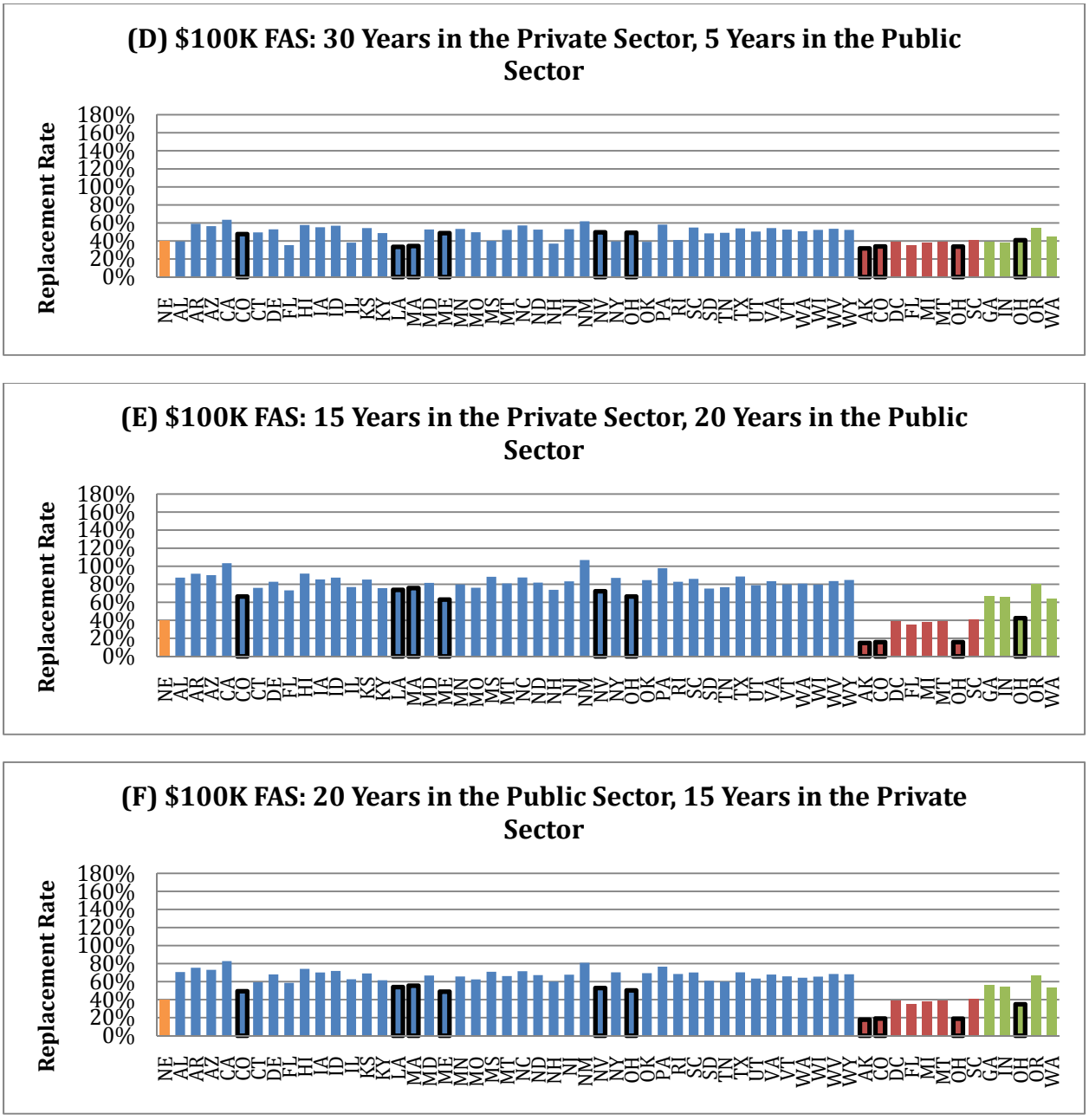
Note: States whose general public employees do not participate in Social Security have a black border. See Appendix 1 for details on how the replacement rates are calculated.

FIGURE 4. Joe the Bachelor's Retirement Income Replacement Rates under Various Scenarios (Final Average Salary of $100,000 Annually)



Note: States whose general public employees do not participate in Social Security have a black border. See Appendix 1 for details on how the replacement rates are calculated.

FIGURE 4 (cont'd). Joe the Bachelor's Retirement Income Replacement Rates under Various Scenarios (Final Average Salary of $100,000 Annually)



Note: States whose general public employees do not participate in Social Security have a black border. See Appendix 1 for details on how the replacement rates are calculated.

FIGURE 5. The Changing Generosity of State Retirement Plans Over Time

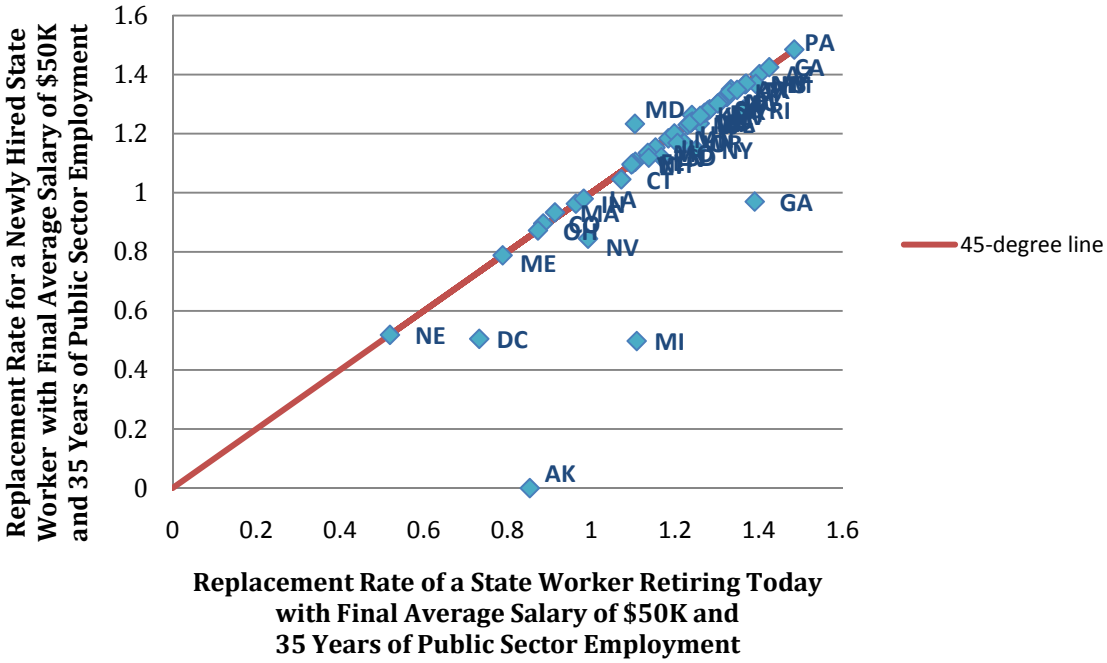


Table 1A. Primary Retirement and Savings Plans Available to Newly Hired General State Employees

State	Primary plan	State	Primary plan
Alabama	DB	Montana	Choice of DB or DC
Alaska	DC	Nebraska	Cash Balance
Arizona	DB	Nevada	DB
Arkansas	DB	New Hampshire	DB
California	DB	New Jersey	DB
Colorado	Choice of DB or DC	New Mexico	DB
Connecticut	DB	New York	DB
Delaware	DB	North Carolina	DB
District of Columbia	DC	North Dakota[a]	DB
Florida	Choice of DB or DC	Ohio	Choice of DB, DC, or Hybrid DB/DC
Georgia	Hybrid DB/DC	Oklahoma	DB
Hawaii	DB	Oregon	Hybrid DB/DC
Idaho	DB	Pennsylvania	DB
Illinois	DB	Rhode Island	DB
Indiana	Hybrid DB/DC	South Carolina	Choice of DB or DC
Iowa	DB	South Dakota	DB
Kansas	DB	Tennessee	DB
Kentucky	DB	Texas	DB
Louisiana	DB	Utah[b]	DB
Maine	DB	Vermont	DB
Maryland	DB	Virginia	DB
Massachusetts	DB	Washington	Choice DB or hybrid DB/DC
Michigan	DC	West Virginia	DB
Minnesota	DB	Wisconsin	DB
Mississippi	DB	Wyoming	DB
Missouri	DB		

[a]North Dakota gives a small group of state employees (<10%) a choice between a DB and a DC plan.

[b]Starting in 2011 Utah state employees will have a choice between DB and a DC plan.

Table 1B. Primary Retirement and Savings Plans Available to Newly Hired General County and City Employees

County	Primary plan	City	Primary plan
Los Angeles County, CA	DB	New York City, NY	DB
Cook County, IL	DB	Los Angeles, CA	DB
Harris County, TX	Cash balance	Chicago, IL	DB
Maricopa County, AZ	DB	Houston, TX	DB
Orange County, CA	Choice of DB or hybrid DB/DC	Phoenix	DB
San Diego County, CA	DB	Philadelphia, PA	DB
Kings County, NY	DB	San Antonio, TX	Cash balance
Miami-Dade County, FL	DB	Dallas, TX	DB
Dallas County, TX	Cash balance	San Diego, CA	Hybrid DB/DC
Queens County, NY	DB	San Jose, CA	DB
Wayne County, MI	Hybrid DB/DC	Detroit, MI	DB
San Bernardino County, CA	DB	San Francisco, CA	DB
Riverside County, CA	DB	Jacksonville, FL	Choice of DB or DC
King County, WA	Choice of DB or hybrid DB/DC	Indianapolis, IN	Hybrid DB/DC
Broward County, FL	DB	Austin, TX	DB
Clark County, NV	DB	Columbus, OH	Choice of DB, DC, or Hybrid DB/DC
Santa Clara County, CA	DB	Fort Worth, TX	DB
Tarrant County, TX	Cash balance	Charlotte, NC	DB
New York County, NY	DB	Memphis, TN	DB
Bexar County, TX	Cash balance	Boston, MA	DB

Table 2. Employees Covered by State Public Sector Retirement and Savings Plans

State	Employees included	State	Employees included
Alabama	General employees	Montana	General employees
Alaska	General employees	Nebraska	General employees
Arizona	General employees, teachers	Nevada	General employees, teachers
Arkansas	General employees	New Hampshire	General employees, teachers
California	General employees	New Jersey	General employees
Colorado	General employees	New Mexico	General employees
Connecticut	General employees, police and fire	New York	General employees
Delaware	General employees, teachers	North Carolina	General employees, teachers
District of Columbia	General employees	North Dakota[a]	General employees
Florida	General employees, teachers	Ohio	General employees
Georgia	General employees, police and fire	Oklahoma	General employees
Hawaii	General employees, teachers	Oregon	General employees
Idaho	General employees, teachers	Pennsylvania	General employees, some police and fire
Illinois	General employees	Rhode Island	General employees
Indiana	General employees	South Carolina	General employees, teachers
Iowa	General employees, teachers	South Dakota	General employees, teachers
Kansas	General employees, teachers	Tennessee	General employees
Kentucky	General employees	Texas	General employees
Louisiana	General employees	Utah[b]	General employees, teachers
Maine	General employees	Vermont	General employees
Maryland	General employees	Virginia	General employees, teachers
Massachusetts	General employees	Washington	General employees
Michigan	General employees	West Virginia	General employees
Minnesota	General employees	Wisconsin	General employees, teachers, police and fire
Mississippi	General employees, teachers	Wyoming	General employees, teachers
Missouri	General employees		

TABLE 3. Joe the Bachelor's Retirement Income Replacement Rates: Summary Statistics

	Replacement Rate					
	Years working in Public and Private Sector for each Scenario (Final Average Salary of $50,000)					
	A 0 private 40 public	B 0 private 35public	C 5 private 30 public	D 30 private 5 public	E 15 private 20 public	F 20 public 15private
DB only plans						
Mean replacement rate	128%	120%	112%	60%	95%	76%
Minimum replacement rate	84%	79%	69%	42%	64%	48%
Maximum replacement rate	161%	148%	137%	73%	121%	97%
DB component of hybrid DB/DC plans						
Mean replacement rate	95%	90%	83%	55%	74%	62%
Minimum replacement rate	51%	44%	37%	49%	41%	33%
Maximum replacement rate	124%	117%	110%	65%	94%	78%
	Years working in Public and Private Sector for each Scenario (Final Average Salary of $100,000)					
	A 0/40	B 0/35	C 5/30	D 30/5	E 15/20	F 20/15
DB only plans						
Mean replacement rate	119%	110%	101%	50%	82%	66%
Minimum replacement rate	86%	80%	70%	34%	63%	49%
Maximum replacement rate	153%	140%	128%	64%	107%	83%
DB component of hybrid DB/DC plans						
Mean replacement rate	83%	77%	72%	43%	64%	53%
Minimum replacement rate	53%	45%	38%	38%	42%	35%
Maximum replacement rate	109%	101%	93%	54%	80%	67%

TABLE 4. Characteristics of State Primary Defined Contribution Retirement Savings Plans

	States with primary DC plan only				
	Participation	**Employee contributions**	**Employer contributions**	**Investment options**	**Vesting**
Alaska	Automatic and immediate	Mandatory 8%	5% non-contingent contribution	10 funds, target date fund default	100% after 5 years 0-0-25-50-75-100
Michigan	Automatic and immediate	Optional up to 100%	4% non-contingent contribution; 100% match on employee contributions up to 3% of pay	22 funds, fixed income default	100% after 4 years 0-0-50-75-100
Washington DC	Automatic after 1 yr. service	None	5% non-contingent contribution	17 funds, target date fund default	100% after 5 years 0-0-20-40-60-100
	States with choice of primary plan that includes DC only option				
	Participation	**Employee contributions**	**Employer Contributions**	**Investment options**	**Vesting**
Colorado	Opt-in	Mandatory 8% if DC plan chosen	10.15% non-contingent contribution	21 funds, balanced fund default	5 years 50-60-70-80-90-100
Florida	Opt-in	None	9% non-contingent contribution	20 funds, balanced fund default	1 year 0-100
Montana	Opt-in	Mandatory 6.9% if DC plan chosen	4.19% non-contingent contribution	15 funds, balanced fund default	5 years 0-0-0-0-0-100
North Dakota[a]	Opt-in	Mandatory 4% if DC plan chosen	4.12% non-contingent contribution	20 funds	4 years 0-0-50-75-100
South Carolina	Opt-in	Mandatory 6.5% if DC plan chosen	5% non-contingent contribution	83 funds, target date default fund	Immediate
Ohio	Opt-in	Mandatory 10% if DC plan chosen	8.73% non-contingent contribution	16 funds, target date default fund	5 years 0-20-40-60-80-100
Utah (starts 2011)	NA	Allowed	10% non-contingent contribution	NA	4 years

[a]North Dakota gives a small group of state employees (<10%) a choice between a DB and a DC plan.

TABLE 5. Plan Defaults in States that Offer a Choice of Primary Plan

State	Retirement plan options	Fraction of new employees electing each option
Colorado	Defined Benefit (default)	--
	Defined Contribution	--
Florida	Defined Benefit (default)	79%[a]
	Defined Contribution	21%[a]
Montana	Defined Benefit (default)	--
	Defined Contribution	--
North Dakota	Defined Benefit (default)	--
	Defined Contribution	--
Ohio	Defined Benefit (default)	87%[b]
	Hybrid DB/DC	5.6%[b]
	Defined Contribution	7.4%[b]
South Carolina	Defined Benefit (default)	~85%[c]
	Defined Contribution	~15%[c]
Washington	Hybrid DB/DC (default)	81%[d]
	Defined Benefit	19%[d]

We calculate the fraction of new employees electing each option from the annual reports of the states that report active members by year for each plan.

[a] Florida: the fraction of new employees hired between 2000 to 2009

[b] Ohio: the fraction of new employees 2003 and 2008

[c] South Carolina: ballpark estimate from a state employee in the South Carolina pension office (personal communication)

[d] Washington: the fraction of new employees hired between 2002 and 2008