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Teacher Pension Choice: Surveying the Landscape in Washington State

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Contents

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Abstract

In this descriptive paper we detail the structure of two Washington State teacher retirement plans: a traditional defined benefit plan and a hybrid defined benefit-defined contribution plan. We provide preliminary evidence on how retirement plan structures may relate to the choices that teachers make. Our analysis of the financial incentives offered to Washington State teachers under the two different plans reveals several patterns that may influence teacher behavior. Teachers experience large gains in their pension wealth by crossing key age and experience thresholds. The relative magnitude of expected pension wealth differs sharply between the plans depending on when a teacher anticipates exiting the position, and the magnitude of anticipated returns to investment. We observe teacher choices between the traditional defined benefit plan and the hybrid plan during two time periods: 1996–1997 and 2008–2010. In 1996–1997 teachers were offered a financial inducement to switch into the newly created hybrid plan and defaulted into staying in the traditional plan if no action was taken. Teachers hired during 2008–2010 defaulted into the hybrid plan if no action was taken. Most of the teachers who were given a choice opted for the hybrid plan. This preference for the hybrid plan is more pronounced among the 1996–1997 cohort, who received a financial incentive in the form of a transfer payment for switching. The notable exception is among teachers who were over 55, and or teachers with relatively high experience levels, who were more likely to choose the traditional defined benefit plan.

Introduction

Numerous studies show that student academic success depends in large part on access to high quality teachers.[1] Efforts to improve student performance should, given this fact, consider policies designed to promote the staffing of effective teachers. Compensation practices offer one potentially important avenue for helping districts and schools to attract, motivate, and retain a highly talented workforce. A number of studies have examined how salary and working conditions might influence teachers' career paths (e.g., Boyd et al., Forthcoming; Clotfelter et al., 2008; Goldhaber et al., 2010; Scafidi et al., 2007), but researchers have only recently begun to consider how the structure of teacher retirement incentives influences labor market behavior. A significant proportion of teacher compensation is in pensions,[2] and researchers and policy makers need a better understanding of whether and how pensions influence the composition of the workforce.

Questions related to the design and impact of teacher retirement systems are particularly salient today. There is, for instance, growing concern that states have failed to adequately fund and manage their employee pension systems, a problem exacerbated by the recent financial downturn. Current estimates of state pension funding show a shortfall that totals $1 trillion to $2 trillion nationally (Barro and Buck, 2010; Bullock, 2010; Novy-Marx and Rauh, 2011; Pew Center on the States, 2010). Recent work by Fitzpatrick (2011) suggests that teachers would prefer less of their total compensation be deferred in the form of future pension payments, pointing towards opportunities to improve compensation structures for both education systems and teachers. As states look to modify and possibly redesign their teacher pension systems, it is important to understand how pensions might influence teacher labor market behavior, and thus, the quality of the teacher workforce.

[1] See, for example, Hanushek, 1992; Sanders and Rivers, 1996; Wright et al., 1997; Sanders and Horn, 1998; Rockoff, 2004; Rivkin et al., 2005; Aaronson et al., 2007.

[2] According to an analysis by Costrell and Podgursky (2009), employer contributions to teacher retirement benefits make up to 14.6 percent of teacher earnings.

Economic theory suggests several ways pensions can influence workforce composition through the incentives they create for mobility and retirement timing. Substantial evidence from both private and public sector labor market research suggests that individuals do, in fact, respond to these incentives, which affect where people decide to work, how mobile they are, and when they decide to retire (e.g., Asch et al., 2005; Dorsey, 1995; Even and Macpherson, 1996; Friedberg and Webb, 2005; Gustman, 1994; Ippolito, 2001). For instance, pensions may include separation incentives that encourage retirement within a particular age range (Chan and Stevens, 2004; Costrell and Podgursky, 2007; Furgeson et al., 2006). They can also encourage geographic commitments if a worker must forfeit retirement contributions or benefits when moving to a new location (Koedel et al., 2011).

Pension incentives may also induce certain types of individuals to self-select into a workforce (Salop and Salop, 1976; Ippolito, 2001, 2002). The incentives described above will be more or less attractive to a potential worker depending on whether she plans to change location, change careers, or retire at a certain age or experience level. Self-selection into an occupation may also depend on personal characteristics such as tolerance for risk, confidence about managing one's own assets, and desire for personal control over financial assets (Croson and Gneezy, 2009; Dohmen and Falk, 2011).

Washington State's Teacher Retirement System (TRS) provides a useful case study of teacher preferences for different pension structures. Unlike most other states, Washington has, over certain periods, allowed teachers to choose between two different types of retirement plans: a traditional defined benefit plan and a hybrid defined benefit-defined contribution plan.[3] These periods of choice allow us to study how teachers respond to pension plan change, how they value different

[3]Other states with hybrid plans with DC options include Indiana, Oregon, Florida, Ohio, South Carolina, Alaska, and West Virginia (Hansen, 2010).

pension characteristics, and how pension structures influence their behavior. TRS is also an example of a pension system that is on much better financial footing than in most other states.[4]

In this paper we examine the retirement options available to Washington State teachers between the 1996 and 2010 school years. Similar to other teacher pension research,[5] we analyze the structure of pension wealth accruals for each plan over time. Then, drawing on data linking teacher pension and personnel records, and district and school level student demographic and achievement data, we provide a descriptive account of how the features of each pension plan relate to teacher retirement and mobility behavior. In cases where teachers were able to choose between plans, we show how teacher, school, and district characteristics are distributed across the two retirement plans. The goal of this paper is primarily descriptive and exploratory—to detail the structure of Washington's TRS plans and provide preliminary evidence on how retirement plan structures may relate to the choices that teachers make. The paper concludes by outlining several future research directions indicated by these preliminary results.

Our analysis of the financial incentives offered to Washington State teachers under two different retirement plans reveals several patterns that may influence teacher behavior. Teachers experience large gains in their pension wealth by crossing key age and experience thresholds. The relative magnitude of expected pension wealth differs sharply between the plans depending on when a teacher anticipates exiting the position and on anticipated returns to investment. We observe teacher choices between the traditional defined benefit plan and the hybrid plan during two time periods: 1996–1997 and 2008–2010. In 1996–1997 teachers were offered a financial inducement in the form of a transfer

[4] Of Washington's three pension plans for teachers, the original plan (TRS1) is the only underfunded plan, at 84 percent (shortfall of $1.4 billion). The other two plans open to current teachers, TRS2 and TRS3, are amply funded (at 116 percent as of state fiscal year 2010). New evidence, however, suggests that the plan is less financially sound after accounting for post-retirement benefits such as health care (Pew Center on the States Report, 2010). Furthermore, some economists (e.g. Barro and Buck, 2010 and Novy-Marx and Rauh, 2011) argue that the long term average investment returns assumed by state actuaries (usually around 8 percent) are overly optimistic. Legislation adopted in 2012 in Washington State will lower its assumed discount rate from 8 percent to 7.7 percent (Senate Bill 6378, Laws of 2012).

[5] For example, Podgursky and Costrell (2007) and Friedberg and Turner (2011).

payment to switch into the newly created hybrid plan and defaulted into staying in the traditional plan if no action was taken. Teachers hired during 2008–2010 defaulted into the hybrid plan if no action was taken. Most of the teachers in these two time periods opted for the hybrid plan, but this preference for the hybrid plan is more pronounced among the 1996–1997 cohort. This result is consistent among most sub-groups, including most categories defined by gender, race, age, experience, and school characteristics. The notable exception is teachers who were over 55 and teachers with relatively high experience levels, who were more likely to choose the traditional defined benefit plan.

Background on Pension Structures

Pensions are a type of deferred compensation designed to help employees replace employment income after retirement. This section describes how pensions work, with a focus on how features that may influence workforce composition differ between defined benefit and defined contribution pension plans. Section III describes the Washington State TRS plans in particular.

Two Types of Pensions: Defined Benefit and Defined Contribution

Pension plans can be classified into two general categories: defined benefit (DB) plans and defined contribution (DC) plans. DC plans predominated in both the public and private sector into the 1980s. During the 1980s and 1990s there was a significant shift in the private sector toward DC-type plans; by 2003 less than 10 percent of wage and salary workers with pension coverage were covered by pure DB plans, compared to over 55 percent in 1981 (Buessing and Soto, 2006). This is also true for most federal employees, who have been enrolled into a DC pension plan since Congress passed the Federal Employee's Retirement System Act of 1986, which created the Thrift Savings Plan. Public school

teachers, by contrast, remain primarily enrolled in DB plans: currently, 83 percent of the pension plans covering public educators are pure DB plans. Less than 4 percent of plans are pure DC plans.[6]

The distinguishing features of a DB plan are its predictability and its method for allocating post-retirement wealth over time. It provides a guaranteed stream of annual income (much like an annuity) from the time of an employee's retirement until the end of life. Typically, the level of retirement income is based on a formula accounting for years of service and peak salary levels. Most public sector pensions provide cost-of-living adjustments (COLAs) to the annual retirement benefit as well as health benefits (Hansen, 2010). Each system's rules dictate how long an employee must work to become eligible for retirement benefits and when an employee is eligible to begin drawing annual payments. A DB pension is funded by contributions from the employer and in most public sector systems, the employee as well (Hansen, 2010). However, retirement benefits are not generally tied to the size of these contributions.

Under a DC plan, the employer establishes an individual retirement account for an employee who is required to contribute some minimum percentage of income to the account (for example, 5 percent). In many cases, the employer will also contribute to the account on the employee's behalf (often based on the employee's contribution rate). Taxes on these accounts are deferred until the employee withdraws funds and federal tax rules determine when an employee is eligible to begin withdrawing funds.[7] Common DC plans in the United States include the Individual Retirement Account (IRA) and 401(k) plans. Two distinguishing features of a DC plan are: 1) the level of retirement savings available to an employee is directly tied to the level of contributions into the account and the

[6] See the 2010 National Education Association report "Characteristics of Large Public Education Pension Plans" for more information about pension plan characteristics in each state.

[7] An employee may withdraw funds from retirement accounts at any time, but face penalties for withdrawing before eligibility for retirement at age 59 ½.

investment returns; 2) in contrast to a DB plan's annual payments, the employee decides the rate at which DC funds will be utilized upon retirement.[8]

Under most pension systems, an employee must work a minimum of 5 to 10 years before becoming eligible to benefit from any employer contributions to retirement, at which point the employee becomes vested. Under a DB plan, an employee is not eligible to receive any pension before becoming vested, but may withdraw personal contributions plus interest.[9] Under a DC plan, an employee does not own any contributions made by the employer until vested, but controls all assets associated with the personal contributions. In short, employer contributions to employee retirement benefits under both types of plans are not portable until an employee becomes vested.[10]

Tradeoffs of DB and DC plans for employees

For employees, there are a number of tradeoffs between DB and DC pension structures.[11] Whether individuals prefer either pension structure is likely to depend on individual preferences for risk and flexibility (e.g. pension portability). Two primary differences between DB and DC plans are: 1) who is primarily responsible for investment decisions and 2) who bears the risk associated with uncertain rates of return on investments. Under a DB plan, an employee does not make investment decisions that affect the size of the retirement benefit. Indeed, the size of the pension is not determined by any person's investment decisions; it is formulaic. Hence, the important pension-related decisions for a DB employee are when to separate (i.e. leave job) and when to retire (i.e. begin drawing benefits). Under a DC plan, by contrast, employees decide how much to contribute to retirement accounts, where to invest the

[8] Should a retiree with a DC pension plan wish to obtain a guaranteed annual income for the duration of retirement, DC account assets could be used to purchase annuities. The size of the annuity would depend on life expectancy at the time of purchase.
[9] Employee contributions to a DB plan typically earn a fixed annual return set by the employer.
[10] After an employee becomes vested, both DB and DC plans are portable. The employee may move to a different job and maintain the retirement benefits that have been earned. The primary difference is that under a DC plan, the benefits are no longer tied to the former employer.
[11] For a more in-depth discussion of the general tradeoffs between DB and DC pension plans see Bodie et al. (1988).

funds, when to retire, and how to distribute the consumption of funds during retirement (though these decisions are constrained by federal tax rules).[12]

The *overall* risk associated with the rate of return on investments and employee life expectancy is the same under both types of systems. But, under a DB plan, an employee bears no financial risk associated with the size of the benefit, which is known and guaranteed.[13] If the contribution rate to the DB plan is variable, the employee will face risk associated with fluctuations in the rate (Koedel et al., 2012).[14] A DC employee chooses a contribution rate and decides to make either low- or high-risk investments, bearing the full financial risk of investment decisions. Furthermore, a DC employee must accommodate the uncertainty associated with longevity, whereas a DB employee can count on pension payments for the duration of life. An employee's preferences for DB and DC plans are likely to depend in part on how risk averse the employee is and whether or not the employee expects to live for a long time after retiring.

A new employee's preference for a DB or DC plan may depend on the expected tenure with the employer and desired retirement timing. For both types of plans, vesting rules penalize employees who leave after a short duration by withholding employer contributions. An employee who expects to stay long enough to become vested, but not for the very long term, may prefer a DC plan because DB plans tend to be backloaded.[15] A DC plan may also be more attractive to an employee who desires professional mobility because after vesting, retirement assets are no longer tied to the employer, making them readily portable. Retirement timing under a DB plan is largely dictated by what age and/or experience level an employee becomes eligible to begin drawing benefits because there is a large

[12] Federal tax laws penalize the withdrawal of funds from individual retirement accounts before the age of 59½ with an additional tax of 10 percent.
[13] Recent concerns about the underfunding of DB pension plans, the political unpopularity of raising taxes to bolster them, and the financial fragility of many states raises questions about the certainty of DB retirement benefits.
[14] In Washington, the employee contribution rate is capped at six percent.
[15] The uneven accrual of benefits, with the awarding of larger accruals as tenure increases, is known as backloading. DB plans tend to be backloaded in order to encourage employee retention, but backloading is not inherent to the DB structure.

opportunity cost to delaying retirement: an employee forgoes the pension income that could be earned by not working. Under a DC plan, an employee saves unspent retirement funds and the opportunity cost of delaying retirement is limited to foregone leisure time. Finally, employee preferences about making investment decisions will also influence which type of retirement system is seen as more desirable. Employees who garner some satisfaction from making investment choices would, all else equal, tend to favor DC over DB systems.

The structure of pension incentives has large financial consequences for individuals. Though pensions often do not garner the same level of attention as other forms of compensation such as salary and health benefits, the multiple dimensions of pension incentives including wealth, risk, and choice can each influence not only the behavior of current employees, but potential employees as well. An important question facing state policy makers is how teacher preferences towards the tradeoffs described above may affect the composition of the workforce. What types of individuals might consider teaching if they believed their wealth was more portable or more stable? Once on the job, are DB and DC pension structures equally effective at retaining employees? These questions are examined in the context of the revealed choices of Washington State teachers in Section VIII.

Washington State Teacher Retirement System

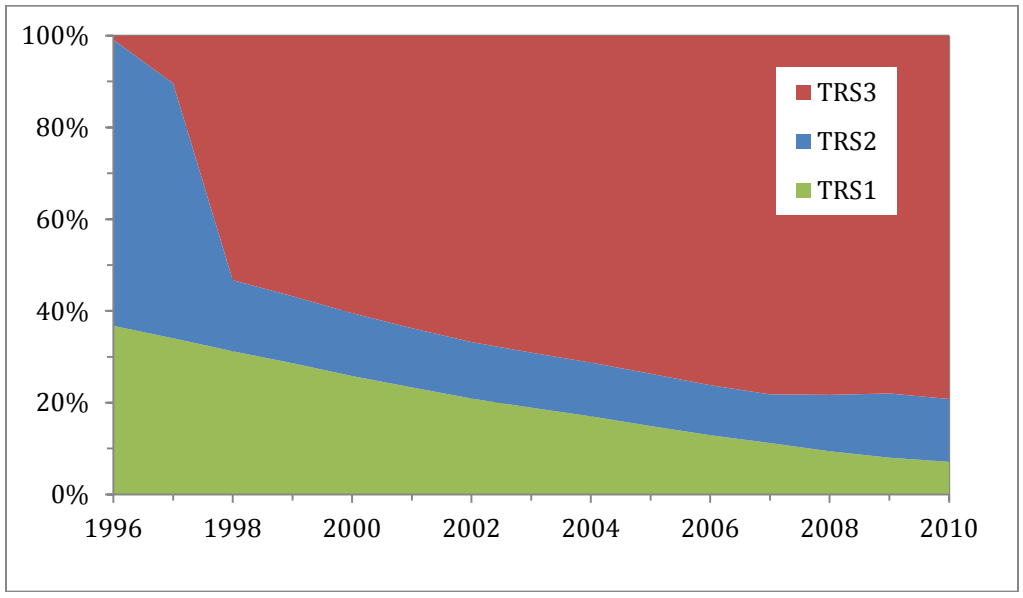
Three Pension Plans

Municipalities in the United States began offering teachers pensions in the late 1800s. The motivation was multifaceted: to make up for low salaries, particularly in rural areas, and to re-shape the composition of the workforce, in part by encouraging older teachers—many of whom were perceived to be of declining ability and using out-of-date methods—to leave upon being eligible for retirement benefits (Graebner, 1978).[16]

[16] For a thorough discussion of teacher pension systems in the United States, see Hansen (2010).

Washington established its Teacher Retirement System (TRS) in 1938.[17] All active teachers are enrolled in one of three plans (TRS1, TRS2, or TRS3). TRS1 and TRS2 are both traditional DB plans and TRS3 is a hybrid plan, with both a DB and a DC component. A teacher's eligibility for enrollment into any of these plans depends on when the teacher was hired. During two time periods (July 1996 – December 1997 and 2008 – present), teachers were able to choose between TRS2 and TRS3. These choice periods allow us to analyze teacher preferences for pension structures and will be discussed in detail in Section V below.[18] Figure 1 shows the distribution of teachers in each pension plan by year. As of 2010, 79 percent of teachers were enrolled in TRS3 and 14 percent in TRS2.

Figure 1. Distribution of TRS Plan Membership, WA Teachers 1996-2010



Here, we describe the key features of the three pension systems. Information about the features and rules associated with each pension plan were obtained from the Washington State

[17] The system is operated by the Washington Department of Retirement Services (DRS).
[18] When TRS3 was created in 1996, teachers enrolled in TRS2 were given an opportunity to switch to TRS3. They were offered transfer payments if they switched between July 1, 1996 and December 31, 1997. As described in **Section VI**, size of the transfer payment increased twice. Since 2008, newly hired teachers can choose between TRS2 and TRS3.

Teachers' Retirement System Handbooks, published for each plan by the state Department of Retirement Services. Each of these handbooks had been updated as of 2011, and are available at www.drs.wa.gov.

TRS 1

TRS1 covers teachers who were hired before October 1, 1977. It is a traditional DB plan that guarantees teachers a pension payment for life (and optionally for a survivor) based on years of service—called "service credit years," or SCY—and the average of the salary of the two highest consecutive paid fiscal years—called "Average Final Compensation," or AFC. The TRS1 monthly benefit formula is: *Annual Benefit = 0.02*SCY*AFC*.[19]

TRS1 teachers become "vested" (entitled to benefits) after five years. They are eligible to *collect* retirement benefits after either 30 years of service, at age 55 with 25 years of service, or at age 60 with at least five years of service. Historically, TRS1 benefits were adjusted after retirement, and no sooner than age 66, by a non-contractual cost of living adjustment (COLA) provided at the State's discretion.[20] As with most DB plans, if a teacher leaves employment before retiring, contributions can be withdrawn with interest. However, by withdrawing, any right to a future benefit is forfeited.

TRS 2

Like TRS1, TRS2 is a traditional DB plan that guarantees teachers a pension payment for life. It follows the same basic formula (*Annual Benefit = 0.02*SCY*AFC*) and its vesting requirements are also the same (five years). Unlike TRS1, TRS2 bases a teacher's AFC on the 60 highest-paid consecutive service credit months (versus the two years used in TRS1). A teacher enrolled in TRS2 makes contributions to the pension fund equal to at least 50% of the cost of funding the plan. The teacher

[19] For example, if a TRS1 teacher separates and retires at 55 with 30 years of experience, having earned an average of $55,000 during the two highest paid years service, the annual pension benefit would be $33,000.
[20] Since 2011, there has been no COLA given to TRS1 pensioners.

bears no investment risk in regard to the size of the retirement benefit as it is tied only to the AFC, separation timing, and retirement timing. However, the size of the contributions made by the teacher to help fund the plan are uncertain. Historically, TRS2 contribution rates have averaged about 4.6%.[21] To accommodate increases in the cost of living during retirement,TRS2 contractually guarantees a COLA to retirement benefits starting after the first year of retirement, up to a maximum of 3 percent per year.

TRS2 benefit eligibility is less generous than under TRS1. A teacher is vested after five years of service and is eligible to receive retirement benefits at age 65 years or older. An employee with at least 20 years of service and 55 years of age is eligible for early retirement, but with reduced benefits determined by an early retirement factor (ERF). For a teacher with 20–30 SCY, the ERF varies between 35.8 percent (at age 55) and 89.6 percent (at age 64). For a teacher with more than 30 SCY, the ERF varies between 80 percent (at age 55) and 98 percent (at age 61).[22] A teacher is eligible for health care coverage under TRS2, but only if retirement is begun immediately after separating.

To provide an example of how TRS2 works, consider a teacher who separates and retires at age 62 with 37 SCY and an AFC of $55,000. If the teacher retires the same year, the pension will provide *0.02*37*$55,000*100% = $40,700* for the duration of the teacher's life. Purchasing an annuity providing the same benefit would cost approximately $550,000 if purchased through the Washington State Investment Board's Total Allocation Portfolio Annuity.

TRS 3

According to the legislation enabling its implementation, the stated purpose of TRS3 was to create,

[21] Historical TRS2 contribution rates: www.drs.wa.gov/employer/EmployerHandbook/pdf/trs2elected.pdf
[22] Prior to 2008, the ERF tables were less generous, not reaching 100 percent until age 65. See Table 1 in Appendix C for details.

> *"…a new public retirement system that balances flexibility with stability, provides both increased employee control of investments and responsible protection of the public's investment in employee benefits, and encourages the pursuit of public sector careers without preventing employees from transitioning into other public or private sector employment."* (House Bill 1206, Laws of 1995)

TRS3 is a hybrid pension plan with both DB and DC components. Participation in both components is mandatory for any teacher enrolled in TRS3, but in all other respects the two components operate independently. Teachers contribute exclusively to the DC component and the employer contributes exclusively to the DB component.

The DB component of TRS3 is very similar to the TRS2 plan, but there are several important differences. The DB retirement benefit is halved (*Annual Benefit = 0.01*SCY*AFC*) and only the employer contributes to the plan. The vesting period is longer (ten versus five years), but early retirement requires fewer SCY (ten versus twenty years). A teacher who has at least twenty SCY and separates early receives an increase to the defined benefit of approximately 3 percent per year, for each year retirement is delayed, until age 65.

The plan's DC component is entirely employee-financed. Each teacher controls how contributions are invested and bears the risk of those decisions. The value of a teacher's DC assets upon retirement, which is determined by contribution levels and investment performance, is uncertain. A teacher enrolled in TRS3 is offered the choice of six different contribution rates that range between 5 percent and 15 percent of salary.[23] Upon retirement, accumulated DC assets are allocated at the teacher's discretion. Assets may not be withdrawn prior to separation, and federal tax laws penalize withdrawals made before age 59 ½.

To provide an example of how TRS3 works, consider a teacher who separates at age 55 with 30 SCY and an AFC of $55,000. If the teacher retires the same year, the DB component of the pension will

[23] The minimum contribution level, which is also the default plan, is 5 percent. See Appendix C for details.

provide *0.01*30*$55,000*80% = $13,200.* If the teacher delays receiving benefits, benefits will be increased by approximately 3 percent for each year of delay, in addition to eligibility for a higher ERF. If retirement is delayed until age 62, the defined benefit would be equal to *0.01*30*$67,643*100% = $20,293*. The value of the DC pension is uncertain, but let's assume a contribution rate of 5 percent and a standard pay schedule for a teacher with a master's degree. If low nominal returns of 4 percent per year were earned on investments, the nominal value of the account at age 60 (when it can be withdrawn without penalty) would be $266,062. If high annual returns of 10 percent were earned on investments, the nominal value of the account at age 60 would be $700,242. Currently, these funds could be used to purchase a single life annuity through the Washington State Investment Board's Total Allocation Portfolio Annuity that would provide annual benefits of between $18,648 (assuming low returns) and $49,092 (assuming high returns).[24]

[24] See the WSIB TAP annuity calculator at https://mp1.newkirkone.com/summitup/Control.aspx.

Table 1. Key Features of TRS Retirement Plans

	TRS1	TRS2	TRS3	
Membership Definition	Hired pre-1977	Hired 1977 – 1996 (*default*) Hired 2008 – pres. (*opt in*)	Hired 1977 – 1996 (*opt in*) Hired 1996 – pres. (*default*)	
Type	Traditional Defined Benefit	Traditional Defined Benefit	**DB Component**	**DC Component**
Employee contribution rate	6% of salary	Variable: equal to at least 50% of cost of funding plan[25]	0%	5 – 15% (teacher's choice)[26]
Vesting period	5 years	5 years	10 years[27]	N/A
Retirement eligibility	30 SCY, or 60 yrs of age, or 55 yrs of age & 25 SCY	65 yrs of age, or 62 yrs of age & 30 SCY (full benefit), or 55 yrs of age & 20 SCY (reduced benefit)	65 yrs of age, or 62 yrs of age & 30 SYC (full benefit), or 55 yrs of age & 10 SYC (reduced benefit)	Withdrawal ages and penalties for early withdrawal dependent on Federal tax rules.
Average Final Compensation	Average salary during two highest-paid consecutive fiscal service years	Average salary during 60 highest-paid consecutive service credit months	Average salary during 60 highest-paid consecutive service credit months	N/A
Annual benefit formula	*Annual Benefit = 0.02*ACF*SCY*	*Annual Benefit = 0.02*ACF*SCY*	*Annual Benefit = 0.01*ACF*SCY*	N/A
Cost of living adjustments	After retirement and no sooner than age 66, benefits are adjusted by a COLA.[28]	Once a year, after the first full year of retirement, the benefit is adjusted by up to 3% per year	Once a year, after the first full year of retirement, the benefit is adjusted by up to 3% per year	N/A
Early Separation Inflation Protection	N/A	N/A	With 20 or more SCY, benefit increases by approx. 3% per year, each year teacher delays retirement (up to age 65)	N/A
Withdrawal from system	May withdraw employee contributions with interest.	May withdraw employee contributions with interest.	N/A – teacher does not contribute to DB component.	N/A - Funds are not tied to employer.

[25] Between 1979-2011, the TRS2 contribution rate averaged 4.63%, and ranged between 0.15% (in 2002) and 7.00% (in 1989).
[26] A teacher is offered six different contribution options. See Appendix C for details.
[27] A teacher can vest with 5 years of experience if at least one of those years is accrued at an age greater than or equal to age 44.
[28] The TRS1 COLA is determined at the State's discretion. Since 2011, there has been no COLA given to TRS1 pensioners.

Pension Wealth

Several recent analyses of the separation and retirement incentives created by complex pension rules focus on the accrual of pension wealth over time (e.g., Costrell and Podgursky, 2009; Friedberg and Turner, 2011; Friedberg and Webb, 2005). We use the concept of net pension wealth to inform the discussions that follow of the trade-offs between TRS2 and TRS3, and of teacher preferences for pensions. Here we describe how we estimate pension wealth for the DB and DC components of the TRS plans. Our specific approach, which approximately follows Costrell and Podgursky (2009), is detailed in Appendix A.[29]

The concept of pension wealth puts the value of DB and DC pensions in a common metric. A DB pension, which pays a retiree monthly benefits for the duration of life, functions in essentially the same way as an annuity. The pension wealth value of a DB pension can then be thought of as the size of the 401(k) that would be needed to purchase an annuity providing the same level of monthly benefits. The value of a DC pension is simply the size of the account at the time of separation. In both cases we net out employee contributions (which gives us *net* pension wealth) and discount the pension wealth to its present value at the time an employee was hired, which is when new Washington State teachers make their choice between TRS 2 and TRS 3. We assume a discount rate of 4 percent, which includes an inflation rate of 2 percent.

To illustrate the estimation of net pension wealth, consider Figure 2, which represents the net pension wealth estimates of a new female teacher with a master's degree and a career beginning at age 25. Her life span is modeled probabilistically using survival probabilities derived from the TRS mortality tables reported in the Washington State 2010 Actuarial Valuation Report (2011).[30] The DB components of TRS2 and TRS3 assume a wage growth rate of 2 percent and an annual COLA of 2 percent in

[29] An important difference in our approach is that we estimate the present value of pension wealth at the time a teacher is hired, rather than when a teacher separates. We are interested in the point in time when a teacher is choosing a pension plan.

[30] DB pension wealth estimates for males are smaller because they have lower life expectancies.

retirement. We assume that the teacher chooses when to begin collecting retirement benefits such that net DB pension wealth is maximized. The DC component of TRS3 assumes real returns (above inflation) to investment of between 2 percent and 8 percent,[31] and an employee contribution rate of 5 percent. Under TRS2, we also assume a contribution rate of 5 percent. For both TRS2 and the DC component of TRS3, employee contributions to the plans are netted out. For simplicity, we do not net out contributions made by the employer.[32] Note that the horizontal axis represents separation age, which is not generally the same as retirement age.

The plots in Figure 2 each start at zero pension wealth, and grow slowly until vesting at age 30 for TRS2, and age 35 for TRS3. The TRS3 plot jumps again at age 45 when with 20 SCY, the teacher becomes eligible for the early retirement adjustment, which increases benefits by approximately 3 percent each year retirement is delayed (up to age 65). Both plots jump at age 55 due to the accrual of 30 years of experience, which enables the teacher to begin drawing benefits early under relatively generous ERFs starting at age 55, and full benefits at age 62. When the teacher in Figure 2 reaches eligibility to begin collecting full retirement benefits, delaying separation corresponds with falling net pension wealth. Here, the cost of forgoing pension payments outweighs the benefits adding experience and potentially increasing average final compensation.

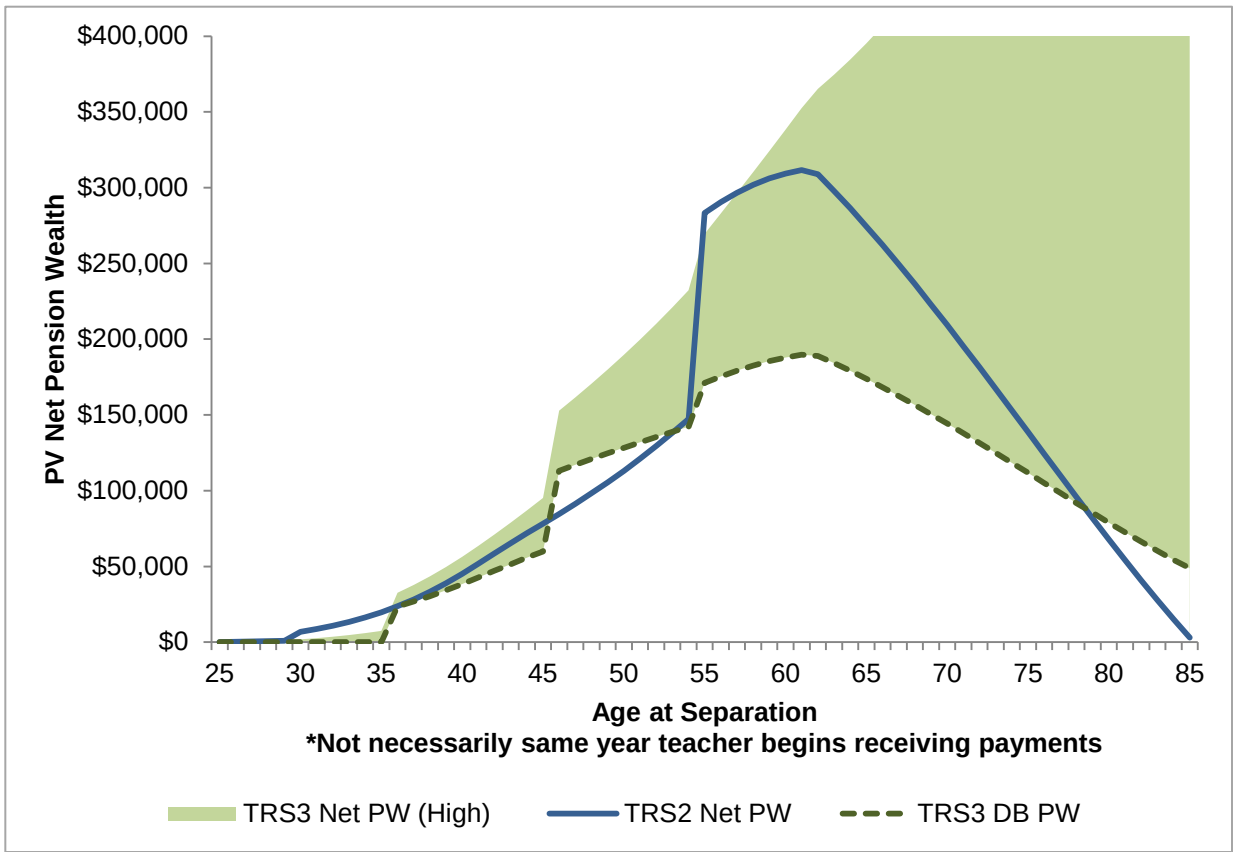
The defined benefit component of TRS3 (represented by the dotted line) appears to be the lower bound of net TRS3 pension wealth. Here we have assumed that the lower bound of nominal returns to investment and the discount rate are both equal to 4, which results in zero net returns to the DC component. The retirement benefit formula for the DB component of TRS3 is half as large as the

[31] A teacher's expectations about returns to DC assets will have a large effect on how large she expects her retirement benefit to be under TRS3. Washington State currently assumes average annual returns of 8 percent. However, many economists expect far lower returns looking forward. Shiller (2006) uses U.S. and international historical data to simulate returns to assets in a moderately aggressive life-cycle investment plan and estimates a median return of 3.1 percent, and 25th and 75th percentile returns of 2.2 percent and 4.0 percent respectively.

[32] Netting out employer contributions would not change the shape of the TRS2 plot relative to the TRS3 plot because the employer contribution rates are the same for both plans. Inclusion of employer contributions in the model would also require assumptions about what portion of deferred compensation would be translated into current compensation if pension payments were reduced or eliminated.

TRS2 benefit formula. These proportions are not represented in Figure 2 because it plots *net* benefits, and the teacher contributes to TRS2, but does not contribute to the DB component of TRS3.

Figure 2. Present Value of Net Pension Wealth, TRS2 and TRS3 (Teacher with a Master's Degree)[33]



Comparing TRS2 and TRS3

In this section, we compare the TRS2 and TRS3 plans in terms of contribution decisions and risk, portability, and retirement timing. An enrollee is likely to decide which plan best fits her preferences based in part on these criteria. In Section VII, we examine the actual decisions teachers make when choosing between TRS2 and TRS3.

[33] The example we use assumes the teacher is female, as females have different life expectancies and thus different payment projections.

Choice and Risk

A major difference between TRS2 and TRS3 is how much control an employee has over retirement assets. Under TRS2 the contribution rate is determined by the state according to the cost of funding the plan. An employee does not make any decisions as to how contributions are managed, nor is the retirement benefit tied to contribution rates and investment performance. In contrast, under TRS3 an employee chooses the contribution rate and can decide how the funds in the DC component of the retirement plan are managed. As such, employees who value choice for its own sake, or who have high expectations about investment returns, may tend to favor TRS3. Similarly, employees who desire a hands-off approach to financial management, or lack confidence in making investment decisions, may tend to favor TRS2.

Personal control over one's account contributions under TRS3 is accompanied by exposure to investment risk. While both plans provide a guaranteed retirement benefit for life, the guaranteed benefit under TRS3 is half as large, and an enrollee cannot be certain about the future size of the DC component. The stylized pension wealth estimation in Figure 2 represents a smooth accrual of pension wealth under TRS3, but DC assets are subject to considerable volatility if invested in moderate to high-risk funds. For example, the S&P 500 recorded an annual return of -37% 2007, followed by a positive return of 26% in 2008. In contrast, TRS2 enrollees face no investment risk as the size of the retirement benefit is decoupled from investment performance. Their risks are limited to fluctuations in the contribution rate, which is capped at six percent. An employee's pension preference is likely to depend on tolerance for risk, with a more risk-averse employee tending to favor TRS2.

Portability

The portability of retirement benefits is considered here in terms of the degree to which an employee leaving a job (i.e. "separating") can maintain retirement wealth. Looking closely at the net

pension wealth implications of separating before retirement in Figure 2, we see advantages to each plan over different time periods for an employee beginning a career at age 25.

If the employee in **Figure 2** separates between zero and five years of employment, neither plan results in the accrual of significant net pension wealth because the employee is not yet vested. Between five and ten years of employment, an employee will be vested under TRS2, but not under TRS3, and is therefore, if separated, better off under TRS2. If the employee in **Figure 2** separates with between 10 and 20 years of experience, neither plan holds a clear advantage.[34] At age 46, with the accrual of 20 SCY, the TRS3 employee becomes eligible for a benefit increase of approximately 3 percent for each year retirement is delayed, up to age 65. The result is that TRS3 is advantageous if the employee separates between the ages of 45 and 55. At age 55, when the employee has accumulated 30 SCY, it is advantageous to separate under TRS2 unless investment returns are very strong. What drives the sudden increase in TRS2 net pension wealth is that with 30 SCY, the employee is eligible to retire early under relatively generous ERFs.

A new 25-year-old teacher choosing between TRS2 and TRS3 may consider expectations about career length and make a choice accordingly. From a net pension wealth perspective, the teacher would tend to favor TRS2 if separating with between five and 20 years of experience, and TRS3 if separating with between 20 and 30 years of experience.

A different aspect of the relationship between pension plan structure and separation is whether the plans create incentives that could influence the timing of separation. In both plans we observe discontinuous jumps in net pension wealth that are driven by rules that govern defined benefits. Under TRS2, these occur with five years of experience (vesting), and the accrual of 30 years of experience and 55 years of age (which enables early retirement). Under TRS3 we observe similar jumps in net pension

[34] Recall that the employee represented in **Figure 2** is a female with a master's degree who begins her teaching career at age 25. Furthermore, we assume contribution rates of 5 percent for TRS2 and TRS3 respectively, and returns to TRS3 assets of between 2 percent and 8 percent over inflation. Net pension wealth under TRS3 could be higher if higher returns to DC assets are earned.

wealth, but vesting occurs after 10 years of experience and an additional jump occurs with eligibility for an early separation adjustment after 20 years of experience. We expect that an employee will tend to avoid separation if she is close to accumulating a combination of age and experience that would result in one of these discontinuities, because the marginal financial benefit of staying is particularly high in those years.

One TRS2 rule that is not represented on the pension wealth graphs, but which may have a significant influence on separation timing for some employees, is the provision of health care benefits during retirement. Both TRS2 and TRS3 provide a health care benefit. However, under TRS2 a retiree is eligible for coverage only if she retires immediately after separating. Therefore, separating under TRS2 before eligibility for early retirement at age 55 imposes a potentially significant cost in the form of lost health care benefits.

Retirement Timing

While maximizing net pension wealth is not necessarily the primary goal of an employee, we expect retirement timing to correlate with strategies that get the most out of the retirement benefit. Optimal retirement timing (maximizing net pension wealth) for a given combination of age and experience at separation is the same under both TRS2 and TRS3. Both are driven by rules governing eligibility for defined benefits. Perhaps the most important threshold is the accumulation of 30 SCY, which enables early retirement with a relatively generous ERF.[35] When an employee has accumulated 30 SCY and 55 years of age, it is optimal to retire in the same year as separation. Otherwise, it is optimal to delay retirement until age 65. Once an employee becomes eligible for full benefits, she incurs a large cost in the form of foregone pension payments for every year she delays retirement. Under TRS3, however, the magnitude of these incentives is smaller because the defined benefit is approximately half

[35] In 2008, the early retirement factors for teachers with 30 or more years of experience were adjusted to be more generous. See Table 1 in Appendix C for details.

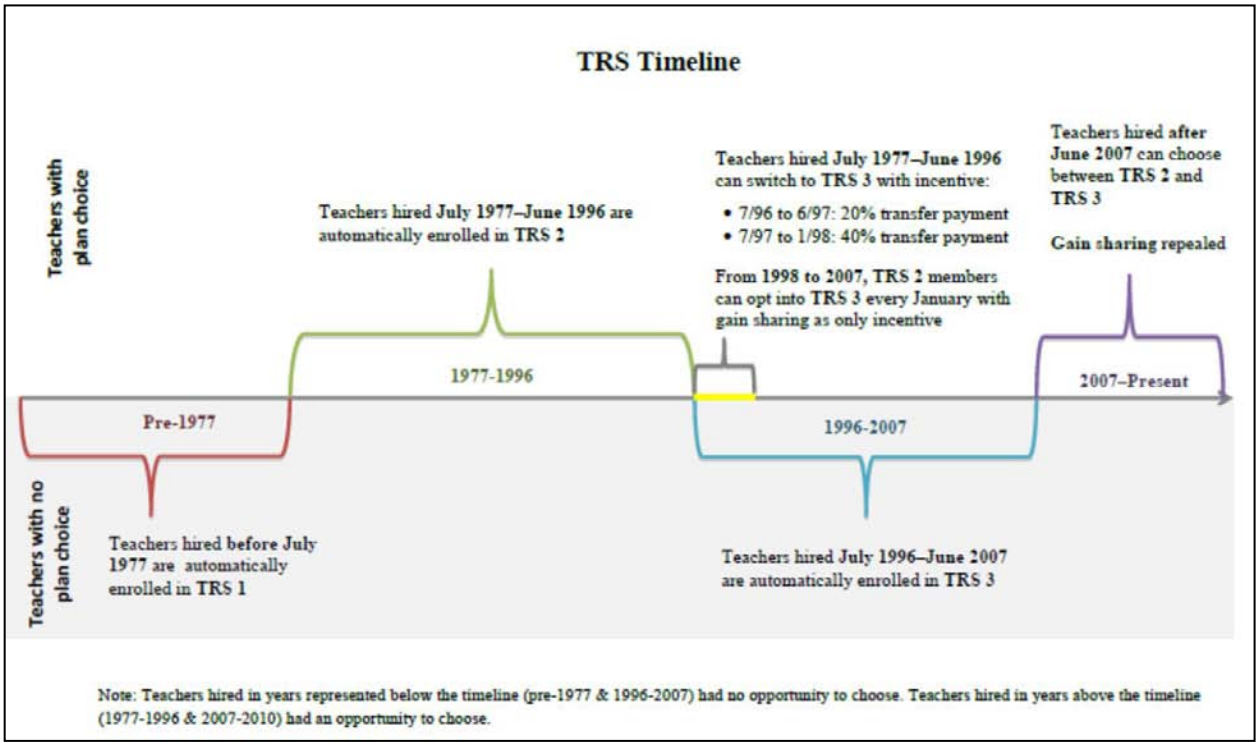
as large. Furthermore, the extent to which an employee may feel financially ready to retire may depend in large part on the investment performance of DC assets.

Observing Teacher Choices between TRS2 and TRS3

Four Enrollment Periods

All active teachers are enrolled in TRS1, TRS2, or TRS3. Teachers' eligibility for these plans depends on when they were hired. As shown in **Figure 3** below, new Washington State teachers have enrolled in the three different pension systems during four distinct time periods: 1) During 1938–1977 all new hires were enrolled into TRS1; 2) During 1977–1996 all new hires were enrolled into TRS2; Since July 1996, these teachers have had the opportunity to transfer to TRS3, and between July 1996 and January 1998 were offered a transfer payment to do so; 3) During 1996–2008 all new teachers were enrolled into TRS3; 4) Since 2008, new hires have been able to choose between TRS2 and TRS3.

Figure 3. Teacher Enrollment Options



During two of these time periods teachers were able to choose between TRS2 and TRS3, and we can analyze teacher preferences for traditional and hybrid pension plans. In the first instance, during 1996–1997, we observe the decision to switch from TRS2 to TRS3 among a relatively older and more experienced group of teachers. During this time period the transfer payment offered to TRS2 enrollees switching to TRS3 was increased once.[36] In the second instance we observe the decisions of newly hired teachers to enroll in TRS2 or TRS3.

Financial Incentives to Switch from TRS2 to TRS3 during 1996-1997

The legislation that established TRS3 in 1996 (HB 1206, Laws of 1995) afforded teachers who enrolled in TRS2 between 1977 and 1996 the opportunity to switch to the TRS3 plan. Teachers switching to TRS3 would receive a transfer payment equal to 20 percent of their accumulated contributions to TRS2. The legislation itself does not provide reason for the transfer payment, but a letter DRS dated April 15, 1996 informing teachers of the transfer payment refer to it as a "20% bonus for transferring to TRS Plan 3." As stated in the 1995 legislation:

> *Members…who request to transfer to plan III by January 1, 1998, shall have their account in the defined contribution portion of plan III… increased by twenty percent of their plan II accumulated contributions as of January 1, 1996.* (Section 303.1.d)

In 1997, the payment for transferring to TRS3 was raised such that employees would have their accounts in the DC portion of TRS3 increased by *forty percent* of their accumulated TRS2 contributions. Again, the legislation (HB 1098, Laws of 1997) does not provide reason for the transfer payment amount. However, a formal DRS communication about the increase mailed to teachers dated May 20, 1997 explains:

[36] It was increased a second time by legislation adopted in 1998, after the transfer period expired. However, TRS2 enrollees were informed of the pending legislation in a letter dated November 20, 1997, from the Don Carlson, Chair of the Joint Committee on Pension Policy.

This legislative change was made because recent actuarial data indicated that the larger transfer payment was required to maintain the neutral fiscal impact that Plan 3 legislation was intended to have.

The memo also included information on each recipient's estimated 1996 account balance and the amount of the 40 percent transfer payment should the teacher decide to transfer. Whatever the state's motivation for changing the size of the transfer payment, from the perspective of teachers enrolled in TRS2, the financial incentives associated with switching to TRS3 changed positively.

In 1998, the financial incentive to transfer to TRS3 was again increased, such that a transferring employee had the DC component of the TRS3 account increased by 65 percent of accumulated TRS2 contributions. The legislation (HB 6306, Laws of 1998) was first read in the legislature on January 15,1998 and signed by the governor on April 15, 1998, well after the deadline to transfer had passed.[37] The increase was applied retroactively to all employees who transferred to TRS3 between July 1996 and January 1998. Although the bill was adopted after the transfer period, TRS2 enrollees were informed of the potential increase in a November 20, 1997 letter from Don Carlson, then a legislator and member of the Joint Committee on Pension Policy. The subject line of the letter read, "*Increase in bonus* for switching from TRS2 to TRS3."

The size of the transfer payments to teachers depended on their accumulated contributions and interest. In general, transferring teachers with more experience and those with higher salaries received larger payments. The average experience level among teachers eligible to transfer to TRS3 in 1996–1997 was 10.5 years. At current salary levels, a teacher with 10 years of experience will have accumulated roughly $36,000 in contributions and interest under TRS2. The corresponding 20 percent, 40 percent, and 65 percent transfer payments would be $7,200, $14,400, and $23,400 respectively. Under the 65

[37] The legislation was passed by comfortable margins: 46 – 1 by the Senate and 64 – 33 by the House of Representatives.

percent payment, a teacher with five years of experience would have received approximately $9,800 and a teacher with 15 years experience approximately $43,000.[38]

Table 2. Timing of Transfer Payment Increases[39]

Date	Action
January 14, 1997	Legislation increasing transfer payment to **40%** introduced in legislature (HB 1098).
February 18, 1997	Memo mailed to TRS2 enrollees refers to **20%** transfer payment.
April 15, 1997	HB 1098 signed by governor, increasing transfer payment to **40%**.
May 20, 1997	Memo mailed to TRS2 enrollees refers to **40%** transfer payment
November 20, 1997	Letter informing teachers that the JCPP was recommending legislation that would increase the transfer payment for TRS3 enrollees.
December 31, 1997	**Deadline to Switch with Transfer Payment**
January 15, 1998	Legislation increasing transfer payment to **65%** introduced in legislature (HB 6306).
April 3, 1998	HB 6306 signed by governor, increasing transfer payment to **65%**.

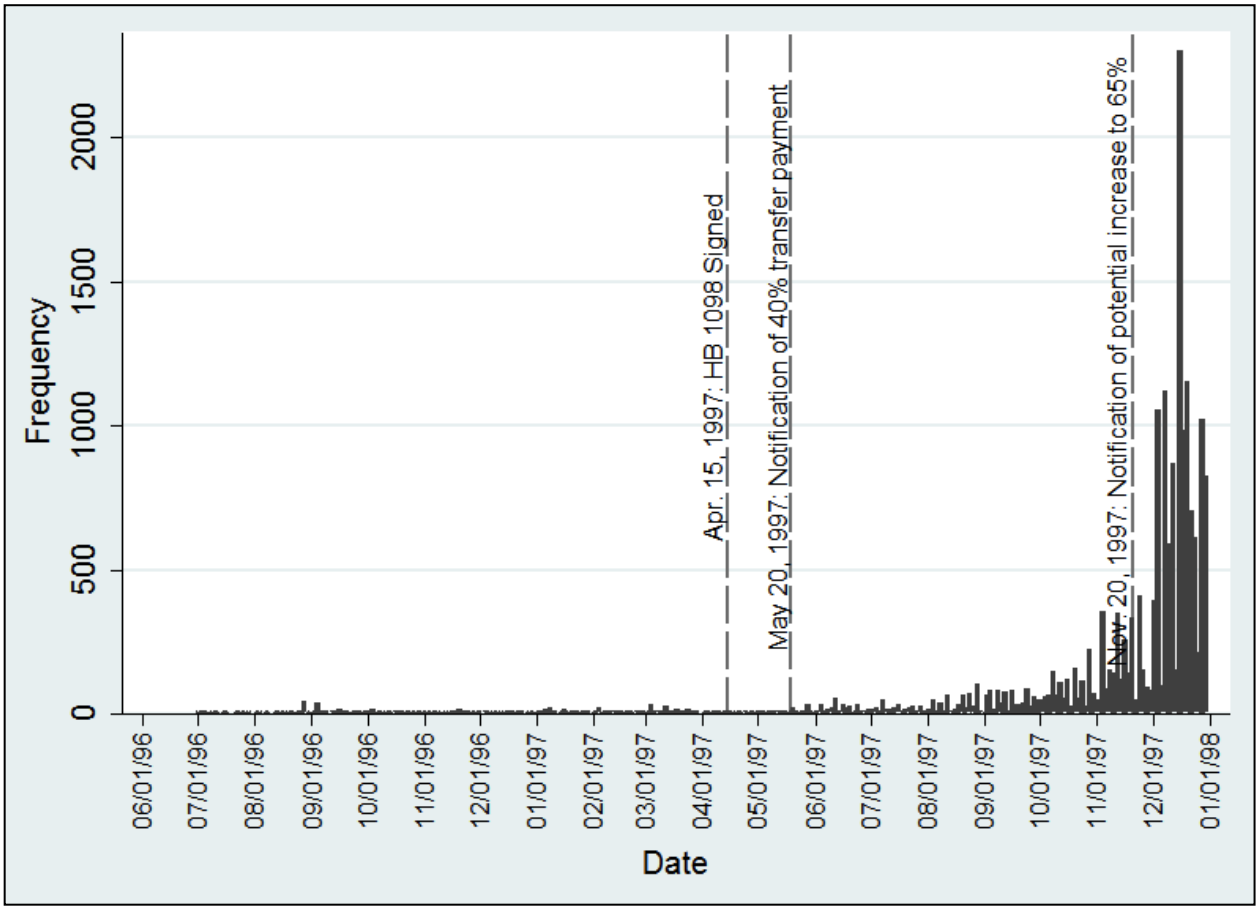
Figure 5 shows the frequency of teacher transfers from TRS2 to TRS3 between July 1, 1996 and December 31, 1997. This descriptive data does not enable inference about the causal relationship between the frequency of teacher transfers and the size of the transfer payment because the transfer deadline never changed. Transfers increased dramatically in December 1997 when teachers are likely to have heard about the potential increase to a 65 percent transfer payment, but many of the same

[38] These figures are a rough approximation of what a transferring teacher is likely to have received. We use a current salary schedule for a teacher with a master's degree, and assume a 6.5 percent contribution rate and 5.5 percent interest accumulation, compounded quarterly. The 6.5 percent contribution rate is based on the average TRS2 contribution rate in the decade preceding 1996. Historical TRS2 contribution rates can be found at http://www.drs.wa.gov/employer/EmployerHandbook/pdf/trs2elected.pdf.

[39] Samples of the letters sent to teachers regarding increases to the transfer payment can be found in Appendix E.

teachers may have switched without the increased payments. More sophisticated statistical techniques would be needed to differentiate between those who were influenced by the payment levels and those who were merely procrastinating.

Figure 4. Frequency of Teacher Transfers from TRS2 to TRS3, July 1996 - December 1997



Data

Washington State offers an ideal case study of teacher pensions and retirement behavior because the state has, at certain points, allowed teachers to choose between two different retirement systems. These choice periods can provide insights into the type of teachers who prefer different retirement plan options. Another advantage is that multiple state agencies maintain records on teachers

that can be linked over multiple years to provide a rich profile of their individual characteristics, behavior, and work environments. This type of panel data allows detailed analysis of how plan structures influence teacher behavior such as separation and retirement timing, and ultimately provides the ability to make inferences about how retirement incentives impact the overall quality of the teacher workforce.

The data for this report derive primarily from teacher-level administrative records from the Washington State Office of Superintendent for Public Instruction (OSPI) S-275 personnel reporting system, Department of Retirement Services (DRS), and Professional Education Standards Board (PESB). These data are supplemented with school- and district-level information from the Washington State Report Card (WSRC) and the National Center for Education Statistics Common Core of Data (CCD). The data used for this study include all public school primary and secondary teachers in Washington State from SY 1996 to SY 2010, with over 100,000 unique teachers and over 800,000 teacher-year observations.

The S-275 data provide a foundation for linking additional data, because they include all teachers throughout the study period—each by year and with unique IDs. The data include information on teacher demographics, assignment, salary, and experience. Teacher certification and endorsement information are from PESB. The data include the type and date of each teacher certification or endorsement as well as the institution that provided it. The match rate for linking datasets was in most cases very high (see Appendix B for details). The DRS retirement data include complete records of all transactions teachers had with DRS from the beginning of their career until December 2010. These data match the S-275 at a rate just over 99.5 percent for SY 1996 to SY 2009, and at 97.0 percent for 2010 when data for only half of the year was available.

The WSRC data contain information on student demographics, student achievement on standardized tests, and education staff characteristics at the school and district levels. The data are

available from SY 2002 to present. The CCD data contain information on student demographics and educational staff by school and district from SY 1987 to present. The CCD LEA Finance Survey provides information on district level finances, which includes revenues and expenditures in different categories such as instruction, administration, etc. Over 95 percent of teachers were matched to school level information in all years. The vast majority of teachers were matched to district level information in all years.

In the analysis below, we focus on two groups of teachers who at some point had an opportunity to choose a retirement plan: those originally hired into TRS2 and those hired from SY 2008 to present. Considering the different timing of their decisions and the different incentives offered, there is good reason to consider these separately. For the choice sub-group hired into TRS2, we present data from SY 1998, which is the year the vast majority made the decision to switch plans. In 1998, over 30,000 teachers were in this group. For the group hired SY 2008 to present, we present data from SY 2010. By that year, over 5,000 new teachers had entered the retirement system.

Descriptive Findings

This section provides descriptive analyses of teacher characteristics and preferences for TRS2 and TRS3 pension plans as well as teacher separation and retirement behavior under TRS2 and TRS3, utilizing the data described in Section VII.

Teacher and School Context Characteristics and TRS Plan Choice

Here we explore the relationship between teacher characteristics and preferences for pension type.[40] This descriptive analysis is intended to detail the landscape of how pension plan preferences were distributed across teachers, schools, and geographic characteristics at or near the time teachers chose between TRS2 and TRS3. We discuss how the choice varies with teacher characteristics in the

[40] Additional data related to the distributions of teacher characteristics by plan are available in Appendix D.

context of existing literature and insights from our analysis of the structures of TRS2 and TRS3. These discussions provide insight into how changing pension structures could potentially reshape the composition of the teacher workforce.

We focus on two groups of teachers: 1) The 1996–1997 choice cohort (30,430 teachers) who were enrolled in TRS2 between 1977–1996 and given the opportunity to transfer to TRS3, and 2) The 2008–2010 choice cohort (6,159 teachers) who as new hires were given a choice between enrolling in TRS2 or TRS3. Keep in mind that the 1996–1997 choice cohort received a financial incentive for switching to TRS3 (see Section VI) and as a group is older and more experienced than the 2008-2010 cohort. Also, teachers in the first cohort who did not actively make a plan choice were defaulted into TRS2, whereas teachers in the 2008–2010 cohort default plan is TRS3 if an active choice is not made.

Overall, we find that teachers in both choice cohorts were more likely to choose TRS3. The proportion of teachers choosing TRS3 is higher in the 1996-1997 cohort (73 percent) than in the 2008–2010 cohort (58 percent). As shown below, the pattern of a stronger preference for TRS3 holds across most subgroups. Also, the pattern of a stronger preference for TRS3 among the 1996–1997 cohort holds across most subgroups. The only exception was among teachers aged 56-60.

School-Level Characteristics

We observe relatively small differences for both choice cohorts between elementary, middle, and high school teachers in pension plan choice. Similarly, there are only small differences for teachers based on geographic location and for those serving in a challenging workplace (as evidenced by the percentage of Title I students served by the school). This last finding is somewhat surprising given that portability of a pension is more likely to be an issue for teachers working at challenging schools since

they might anticipate shorter tenures due to the relatively difficult nature of the work (e.g., Goldhaber et al., 2010; Scafidi et al., 2007).[41]

Table 3. Teacher Plan Choice by School-level Characteristics

	1996–1997 Choice Cohort			2008–2010 Choice Cohort		
	TRS2	TRS3	Obs	TRS2	TRS3	Obs
All Teachers	**0.27**	**0.73**	**30,430**	**0.42**	**0.58**	**6,159**
Elementary	0.27	0.73	13,084	0.44	0.56	2,970
Middle	0.26	0.74	5,018	0.40	0.60	1,065
High School	0.25	0.75	6,631	0.38	0.62	1,613
Other	0.31	0.69	1,836	0.45	0.55	300
Rural	0.25	0.75	6,384	0.49	0.51	974
Town	0.22	0.78	2,658	0.45	0.55	711
City	0.28	0.72	17,527	0.39	0.61	4,266
Non-Title I	0.26	0.74	13,050	0.39	0.61	2,562
Title I	0.28	0.72	10,596	0.44	0.56	3,353

Teacher-Level Characteristics

We observe some interesting differences in the proportion of teachers choosing one plan over another that are correlated with teacher and schooling attributes (see **Table 4**). In both choice cohorts, women were less likely to choose TRS3 than were men. As discussed previously, TRS3 is less likely to appeal to risk averse individuals because the retirement benefit amount is less certain, and studies find that women are more risk averse than men and more likely to chose plans that they do not have to actively manage and/or DB over DC plans (e.g. Brown and Weisbenner, 2009; Clark et al., 2006).[42] A straightforward explanation for the stronger preference for TRS2 among women is that they have longer life expectancies than men, which increases the value of receiving pension payments for life.

[41] TRS3 is somewhat less portable than TRS2 in the short run given that it has a 10-year vesting period compared to five years for TRS2.

[42] In a review of gender differences in economic experiments, Croson and Gneezy (2009) find significant differences in risk preferences. Dohmen and Falk (2011) conduct an experiment analyzing preferences for compensation structures, and find that women tend to sort into less risky compensation schemes.

Table 4. Teacher Plan Choice by Teacher Characteristics

		1996–1997 Choice Cohort			2008–2010 Choice Cohort		
		TRS2	TRS3	Obs	TRS2	TRS3	Obs
All Teachers		**0.27**	**0.73**	**30,430**	**0.42**	**0.58**	**6,159**
Gender	Female	0.28	0.72	21,471	0.43	0.57	4,617
	Male	0.24	0.76	8,959	0.38	0.62	1,542
Race	Asian	0.36	0.64	622	0.41	0.59	210
	Black	0.45	0.55	473	0.45	0.55	115
	Hispanic	0.34	0.66	619	0.36	0.64	254
	Am. Indian	0.35	0.65	254	0.55	0.45	44
	White	0.26	0.74	28,462	0.42	0.58	5,536
Educational Degree	Bachelors	0.30	0.70	13,495	0.43	0.57	3,505
	Master's	0.24	0.76	16,555	0.40	0.60	2,513
	Doctorate	0.42	0.58	175	0.50	0.50	34
Certifications	Math	0.24	0.76	2,283	0.37	0.63	470
	Science	0.25	0.75	3010	0.37	0.63	283
Years	Age	44.38	40.41	30,430	35.5	34.1	6,159
	Experience	10.57	10.42	30,430	3.45	3.01	6,159

We observe significant differences among different ethnic groups in both choice cohorts, but the patterns are inconsistent. In the 1996–1997 cohort, white teachers are more likely than other ethnic groups to transfer to TRS3. However, in the 2008–2010 cohort, both Asians and Hispanics are more likely than Whites to enroll in TRS3. It is not clear what may be driving these differences. In an analysis of the influence of race on investment decision-making, Gutter et al. (1999) find that while investment decision-making behavior differs by race, the differences result from other underlying factors and are not driven by race itself.

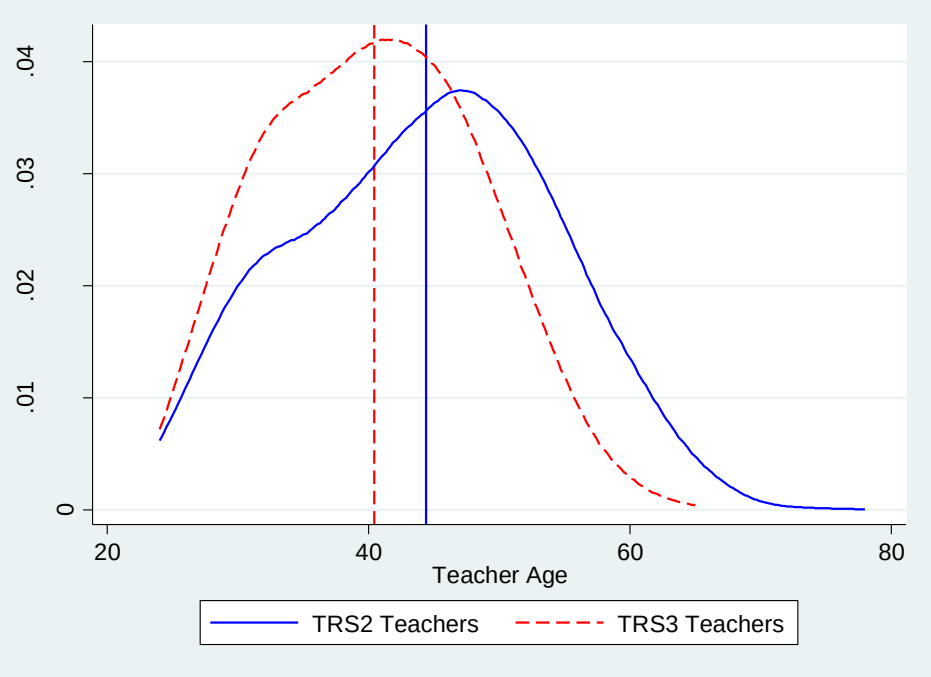
In both choice cohorts, teachers with master's degrees and math or science certifications are more likely to choose TRS3. Teachers with advanced degrees are on a higher salary schedule and it is likely that teachers with math or science backgrounds are more likely to have employment options outside of teaching available to them. Relative earnings may well play a role in plan choice given that

higher paid employees may be more willing to take on financial risks.[43] Brown and Weisbenner (2009), for instance, find that individuals are more likely to choose a DC over DB plan if they are well educated and have higher earnings.[44]

The results for teacher experience are more nuanced, for while salaries rise with experience, suggesting TRS3 should be relatively more desirable, more experienced teachers are also closer to retirement, so there is greater financial risk associated with the DC portion of TRS3, particularly over the short-run. As we see in **Table 5,** there is a similar pattern of plan choice across age and experience in both the choice cohorts with TRS3 being more strongly favored by younger teachers. **Figure 5** shows the distribution of teacher age by plan choice for the 1996–1997 choice cohort.[45] These findings are broadly consistent with existing literature that surveys teachers about their preferences for retirement options (Goldhaber et al., 2010).

[43] Microeconomic theory suggests that a person's risk averseness decreases when wealth increases.
[44] Interestingly, the authors find that this group exhibited a strong preference for the DC plan even when the financial terms were unfavorable. The authors speculate that such sub-optimal decision making among a group of individuals who would purportedly be the most financially sophisticated may result from poor information or understanding, overconfidence and unrealistic expectations of the market, concern about the political risks of DB systems, or placement of a high value on choice for its own sake.
[45] We do not present the age distribution of the 2008–2010 choice cohort because plan choice is made when a teacher is hired, and age does not vary significantly among new hires.

Figure 5. Age Distribution by Plan Choice: 1996–1997 Choice Cohort



Teacher Effectiveness

Perhaps of greatest interest in terms of pension choice is the possibility that teacher preferences for a pension system type might be associated with their effectiveness in the classroom. There is significant policy concern about the overall quality of the teacher workforce and, in particular, whether teaching is drawing talented college graduates (e.g. Corcoran et al., 2004; Goldhaber and Liu, 2003; Hanushek and Pace, 1995; Henke et al., 1996; and LakDawalla, 2001) and speculation that the decline over time in the academic caliber of the teacher workforce may be related, at least in part, to the wage structure in teaching (Goldhaber, 2006; Hoxby and Leigh, 2004). In an analysis of the "push" and "pull" incentives created by DB pension structures in Missouri, Koedel and Podgursky (2012) conclude that these incentives have a small but negative influence on the overall effectiveness of the teacher workforce.

We can begin to explore the connection between teacher effectiveness and pension system choice for a subset of teachers in Washington State. Teachers in grades 4-6 can be matched to their students during the 2007–2010 school years, permitting the estimation of value-added job performance measures for those teaching students math and reading.[46,47] We are able to estimate value-added performance measures for 2,768 teachers in the 1996–1997 choice cohort and 698 teachers in the 2008–2010 cohort. For the 1996–1997 choice cohort, these value-added measures post-date the pension choice period by 10–13 years. For the 2008–2010 choice cohort these value-added measures coincide with the choice period, but the estimates of teacher job performance are based on fewer years of matched student-teacher data.

Figure 6 reports the kernel density distribution of value-added estimates for teachers in math and reading in each choice cohort (Panel A is the 1996–97 choice cohort and Panel B is the 2008–10 choice cohort). The solid line is the effectiveness distribution for teachers choosing TRS2 and the dotted line is the distribution for teachers choosing TRS3.[48] The teacher effectiveness measures are centered at zero and are interpreted in terms of standard deviations of student test scores. For example, a valued added score of 0 means that a teacher is estimated to be as effective as the average teacher in the sample. A teacher having a score of 0.5, on the other hand, suggests that, all else equal, students in that teachers classroom score 50 percent of a standard deviation better than would have been expected given the student, class, and school characteristics that are accounted for in the model.

[46] We cannot calculate effectiveness estimates for a third-grade teacher because we do not have prior test scores for that teacher's students.

[47] The proctor of the state assessment was used as the teacher-student link for at least some of the data used for analysis. The 'proctor' variable was not intended to be a link between students and their classroom teachers so this link may not accurately identify those classroom teachers. However, for the 2009-10 school year, we are able to check the accuracy of these proctor matches using the state's new Comprehensive Education Data and Research System (CEDARS) that matches students to teachers through a unique course ID. Our proctor match agrees with the student's teacher in the CEDARS system for about 95 percent of students in math and 94 percent of students in reading.

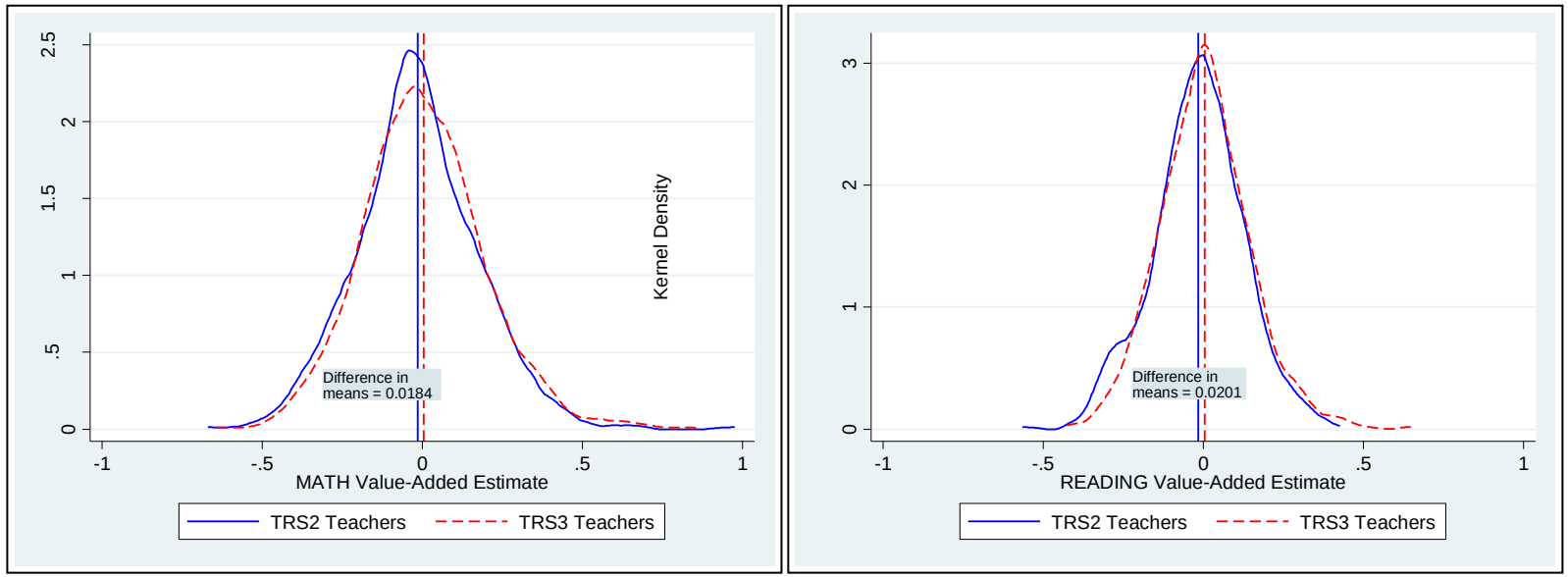
[48] These individual effectiveness estimates reported are adjusted using empirical Bayes methods, which shrink estimates back to the grand mean of the population.

There is significant overlap in the distributions of effectiveness for those choosing one pension system versus another, but there is also a consistent pattern: for each choice cohort and each subject area, the average estimated performance of those teachers choosing TRS3 exceeds the average for teachers choosing TRS2, by about 2 to 3 percent of a standard deviation.[49] To put this figure in perspective, the 2 to 3 percent of a standard deviation differential in teacher effectiveness is similar in magnitude to the estimated difference in effectiveness between a novice teacher and a teacher with one to two years of experience.

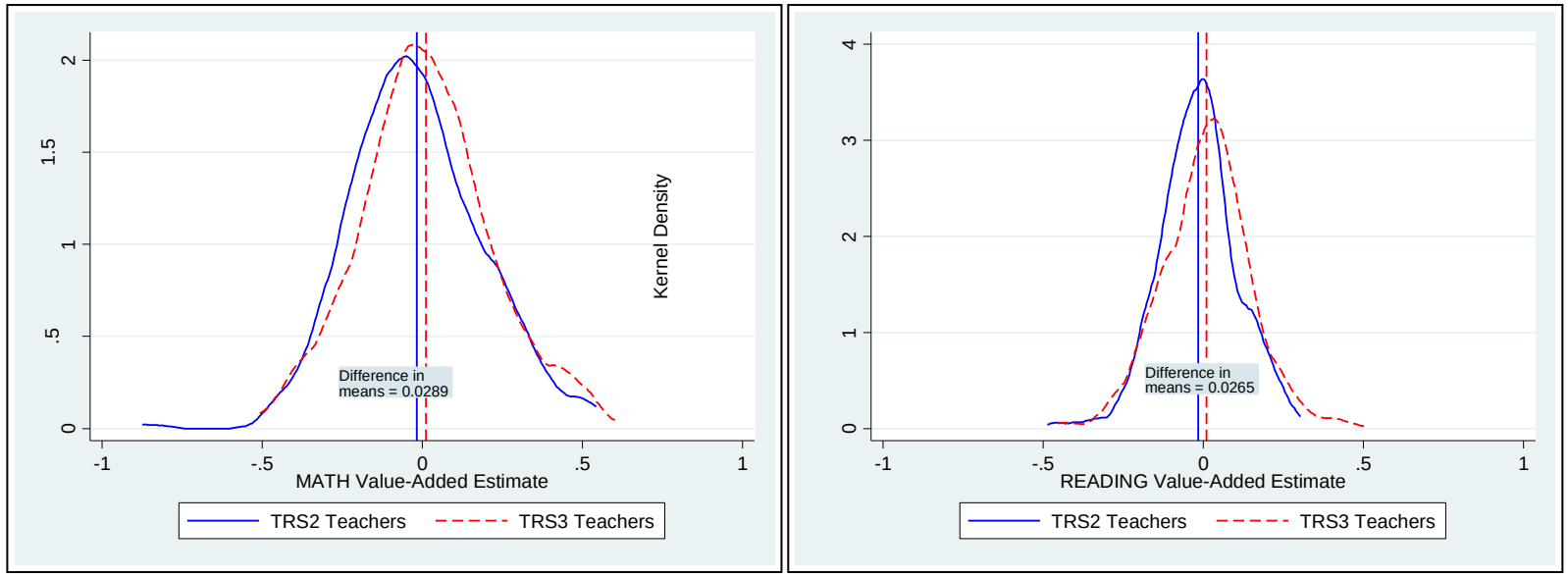
[49] The higher average for the value-added of teachers choosing TRS3 is consistent for a number of model specifications (e.g. the inclusion of school fixed effects, a sub-sample of teachers in which multiple lagged student test scores can be included), though in some model specifications the differences in means are not statistically significant. For more detail on the value-added model specifications that were used to estimate teacher effectiveness, see Goldhaber and Theobald (forthcoming).

Figure 6. Value-Added Estimates by Pension Choice

Panel A. 1996-1997 Choice Cohort



Panel B. 2008-2010 Choice Cohort



Teacher Separation and Retirement Patterns Under Different TRS Plans

As discussed in Section VI, the rules that govern defined benefits in TRS2 and TRS3 incentivize separation timing. For TRS2, the experience thresholds that create discontinuous jumps in net pension wealth are at five years when a teacher becomes vested, and at 30 years when a teacher becomes eligible for early retirement with a generous early retirement factor (ERF). Under TRS3, the important thresholds are at 10 years when a teacher becomes vested, at 20 years when a teacher becomes eligible for early separation adjustments, and at 30 years with eligibility for generous early retirement. Figure 6 shows the percentage of teachers who separate by years of experience. The data include teachers enrolled in TRS2 or TRS3 at some point during the 1996–2010 time period. Since the first teachers to enroll in TRS2 were new hires in 1977, the majority of teachers who enrolled in TRS2 and TRS3 have not yet separated.

Figure 7. Percentage of Teachers who Separate, by Years of Experience

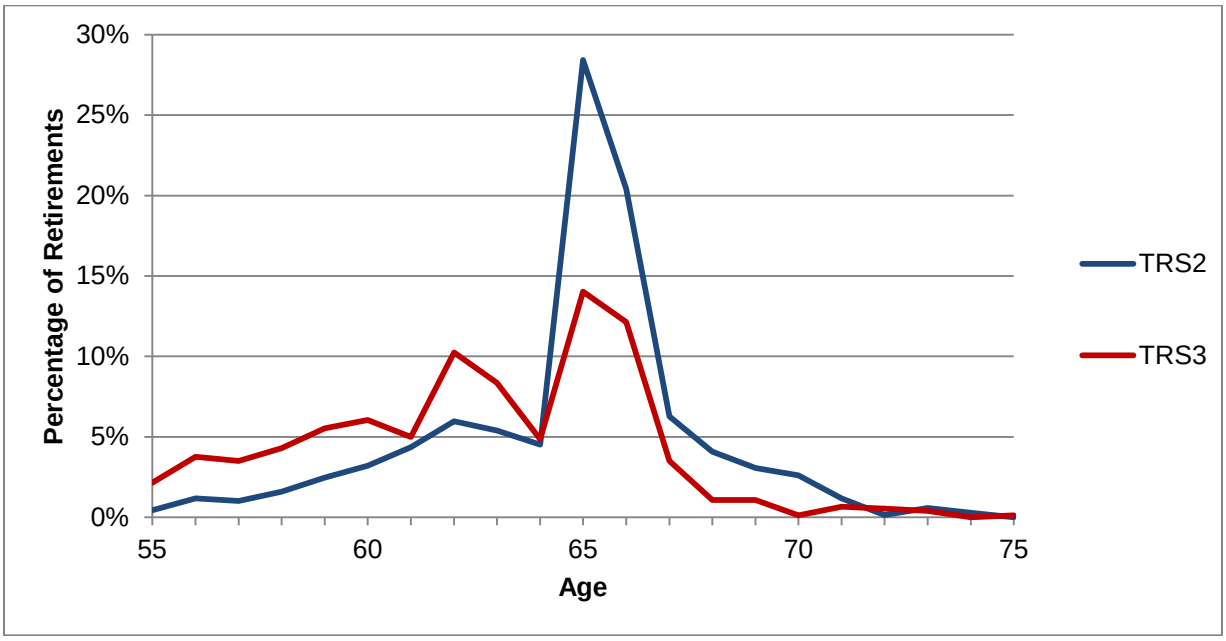
Note: Each vertex in Figure 7 represents the following ratio: (*number of teachers who separated at X years of experience)/(number of teachers with experience level ≥ X*).[50]

[50] The number of teachers with 30 years of experience is small because the earliest a teacher in our sample could have been hired is 1977.

The pattern of separation in Figure 7 offers suggestive evidence that separation timing is influenced by the incentives created by some, though not all, pension plan rules. We see an increase in separations after five years of experience among TRS2 teachers who at that point are vested. Separations among TRS3 teachers do not respond to crossing its vesting threshold at 10 years, and show a delayed and modest increase after crossing the 20-year threshold. It is at the 20-year threshold that TRS3 separations briefly overtake TRS2 separations, which is consistent with where TRS3 net pension wealth overtakes TRS2 net pension wealth in Figure 2. The most dramatic response is to the 30-year threshold, after which separations increase substantially for both plans.

The pension rules that incentivize retirement timing are concerned with both age and experience thresholds. For a given level of experience, age determines retirement eligibility and the size of the ERF. Teachers with 20 or more SCY are eligible to retire as early as age 55, but without 30 or more SCY the ERFs are relatively less generous (between 25 percent and 90 percent depending on age). The youngest age at which a teacher can retire with full benefits is 62, provided at least 30 SCY have been accumulated. For everyone else, full benefits are first available at age 65. Figure 8 suggests that teachers do respond to the retirement timing incentives created by pension rules. In particular, retirements spike at ages 62 and 65 where full benefits become available to teachers depending on their experience levels.

Figure 8. Percentage of Retirements, by Teacher Age



Note: Each vertex in Figure 8 represents the following ratio: (*number of teachers who separated at X years of experience)/(number of teachers with experience level* $\geq X$).[51]

Conclusions and Future Research Directions

Defined benefit and defined contribution retirement plans provide individuals with different pathways to financially secure retirements. Though often ignored, pensions are a significant share of total compensation. Moreover, the structure of pensions creates incentives for teacher mobility and may influence workforce quality if there is a connection between particular pension structures and teacher effectiveness, i.e. some pension structures may be seen as more desirable to more effective teachers.

Researching teacher pensions is important not only because many teacher pension plans are currently underfunded (note, however, that Washington State has one of the more fiscally sound pension systems in the country), but also because of serious disagreements among researchers,

[51] The number of teachers who have reached retirement age is small because the earliest a teacher in our sample could have been hired is 1977.

policymakers, and unions over how changes to current pension systems might influence the quality of the teacher workforce. At present, the research base regarding whether a change in plan type would impact the quality of the teacher workforce is thin and inconclusive. Weller (2011) argues DB teacher pensions improve the overall distribution of teacher quality by increasing retention of experienced teachers. In contrast, Koedel and Podgursky (2012) find that DB pension incentives have a negative effect on the quality of the teacher workforce. Costrell, Johnson, and Podgursky (2009) suggest that "providing new recruits and career-changers (particularly in areas such as math and science) with choices may, at the margin, help attract some of the most mobile and academically gifted candidates who have the best nonteaching options" (p. 221). Teachers' unions (National Education Association, 2012), and teachers themselves (DeArmond and Goldhaber, 2010), tend to show a strong commitment to the traditional DB pension arrangement.

Washington's Teacher Retirement System has offered several cohorts of teachers a choice between a traditional defined benefit and a hybrid defined benefit/defined contribution plan, providing a natural experiment for assessing the implications of pension structure. In this paper we detail how the pension wealth accrual process differs between each of the two pension plans teachers can choose, and provide evidence about the type of individual who prefer each type of plan. The preliminary descriptive comparisons suggest that pension preferences appear to be distributed differently by working environment, gender, race, education, age, experience, and teacher performance. In particular, we observe that higher than average proportions of teachers with master's degrees and math or science certifications chose the hybrid TRS3 pension plan. We also observe that teachers who chose TRS3 are on average slightly more effective (as measured by value-added modeling) than teachers who chose TRS2.

Our findings hint at future research directions. That teacher pension preferences are distributed differently across a number of teacher characteristics suggests that the composition of the workforce is

likely to be influenced by pension structures, and warrants further investigation into the causal relationship between pensions and workforce composition.

References

Aaronson, Daniel, Lisa Barrow, and William Sander. 2007. "Teachers and student achievement in the Chicago Public High Schools." *Journal of Labor Economics* 25(1):95–135.

Allegreto, Sylvia A, Sean P Corcoran, and Lawrence Mishel. 2008. *The Teaching Penalty: Teacher Pay Losing Ground*. Washington, DC: Economic Policy Institute.

Asch, Beth, Steven J Haider, and Julie Zissimopoulos. 2005. "Financial incentives and retirement: evidence from federal civil service workers." *Journal of Public Economics* 89(2-3):427–440.

Barro, Josh, and Stuart Buck. 2010. "Underfunded Teacher Pension Plans: It's Worse Than You Think." *Manhattan Institute for Public Policy, Civic Report* 61(April):1–17.

Bodie, Zvi, Alan J Marcus, and Robert C Merton. 1988. "Defined Benefit versus Defined Contribution Pension Plans : What are the Real Trade-offs ?" Pp. 139–162 in *Pensions in the U.S. Economy*, edited by Zvi Bodie, John B Shoven, and David A Wise. University of Chicago Press.

Boyd, Donald, Hamilton Lankford, Susanna Loeb, and James Wyckoff. (Forthcoming) "Analyzing the Determinants of the Matching of Public School Teachers to Jobs : Disentangling the Preferences of Teachers and Employers." *Journal of Labor Economics*.

Brown, J R, and Scott J Weisbenner. 2009. "Who Chooses Defined Contribution Plans?" Pp. 131–161 in *Social Security Policy in a Changing Environment*, edited by Jeffrey Brown, Jeffrey Liebman, and David A Wise. University of Chicago Press.

Buessing, Marric, and Mauricio Soto. 2006. *The State of Private Pensions: Current 5500 Data*. Issue Brief 42. Center for Retirement Research, Boston College.

Bullock, Nicole. 2011. "US public pensions face $2,500bn shortfall." *Financial Times*.

Chan, Sewin, and Ann Huff Stevens. 2004. "Do changes in pension incentives affect retirement? A longitudinal study of subjective retirement expectations." *Journal of Public Economics* 88(7-8):1307–1333.

Clark, Robert L, Linda S Ghent, and Ann A McDermed. 2006. "Plan Choice among University Faculty." *Southern Economic Journal* 72(3):560–577.

Corcoran, Sean P, William N Evans, and Robert S Schwab. 2004. "Women, the Labor Market, and the Declining Relative Quality of Teachers." *Journal of Policy Analysis and Management* 23(3):449–470.

Costrell, Robert M, and Michael Podgursky. 2007. *Efficiency and Equity in the Time Pattern of Teacher Pension Benefits*. Urban Institute, CALDER.

Costrell, Robert M, and Michael Podgursky. 2009. “Peaks, Cliffs, and Valleys: The Peculiar Incentives in Teacher Retirement Systems and Their Consequences for School Staffing.” *Education Finance and Policy* 4(2):175–211.

Croson, Rachel, and Uri Gneezy. 2009. “Gender Differences in Preferences.” *Journal of Economic Literature* 47(2):448–474.

DeArmond, Michael, and Dan Goldhaber. 2010. “Scrambling the Nest Egg: How Well Do Teachers Understand Their Pensions, and What Do They Think about Alternative Pension Structures?” *Education Finance and Policy* 5(4):558–586.

Dohmen, Thomas, and Armin Falk. 2011. “Performance Pay and Multidimensional Sorting: Productivity, Preferences, and Gender.” *American Economic Review* 101(2):556–590.

Dorsey, Stuart. 1995. “Pension Portability and Labor Market Efficiency: A Survey of the Literature.” *Industrial and Labor Relations Review* 48(2):276–292.

Even, William E, and David A Macpherson. 1996. “Employer Size and Labor Turnover: The Role of Pensions.” *Industrial and Labor Relations Review* 49(4):707–728.

Fitzpatrick, M. D. (2011). “How Much Do Public School Teachers Value Their Retirement Benefits ?” Department of Policy Analysis and Management, Cornell University, Working Paper.

Friedberg, Leora, and Anthony Webb. 2005. “Retirement and the Evolutions of Pension Structure.” *Journal of Human Resources* 40(2):281–308.

Furgeson, Joshua, Robert P Strauss, and William B Vogt. 2006. “The Effects of Defined Benefit Pension Incentives and Working Conditions on Teacher Retirement Decisions.” *Education Finance and Policy* 1(3):316–348.

Goldhaber, Dan. 2007. “Teachers Matter, But Effective Teacher Quality Policies are Elusive: Hints from Research for Creating a More Productive Teacher Workforce.” Section 10 in *Handbook of Research in Education Finance and Policy*, edited by Helen F Ladd and Edward Fiske. Routledge.

Goldhaber, Dan D, and Albert Yung-Hsu Liu. 2003. “Occupational Choices and the Academic Proficiency of the Teacher Workforce.” Pp. 53–75 in *Developments in School Finance 2001-2002*, edited by Jr. William Fowler.

Goldhaber, Dan, Betheny Gross, and Daniel Player. 2010. “Teacher career paths, teacher quality, and persistence in the classroom: Are public schools keeping their best?” *Journal of Policy Analysis and Management* 30(1):57–87.

Goldhaber, Dan, and Roddy Theobald. Forthcoming. “Managing the Teacher Workforce in Austere Times: The Implications of Teacher Layoffs.” *Education Finance and Policy*.

Graebner, William. 1978. “The Economic and Social Function of the Teachers’ Pension.” *History of Education Quarterly* 18(4):397–417.

Gustman, Alan L, Olivia S Mitchell, and Thomas L Steinmeier. 1994. “The Role of Pensions in the Labor Market: A Survey of the Literature.” *Industrial and Labor Relations Review* 47(3):417–438.

Gutter, Michael S., Jonathan J. Fox, and Catherine P Montalto. 1999. “Racial differences in investor decision making.” *Financial Services Review* 8:149–162.

Hansen, Janet S. 2010. “An introduction to teacher retirement benefits.” *Education Finance and Policy* 402–437.

Hanushek, Eric A. 1992. “The Trade-Off between Child Quantity and Quality.” *Journal of Political Economy* 100(1):84–117.

Hanushek, Eric A, and Richard R Pace. 1995. “Who Chooses to Teach (and Why)?” *Economics of Education Review* 14(2):101–117.

Haverstick, Kelly, Alicia H Munnell, Geoffrey Sanzenbacher, and Mauricio Soto. 2010. “Pension type, tenure, and job mobility.” *Journal of Pension Economics and Finance* 9(04):609–625.

Henke, Robin R, Susan P Choy, Sonya Geis, and Stephen P Broughman. 1996. *Schools and Staffing in the U.S.: A Statistical Profile, 1993-94*. Washington, DC: Department of Education, National Center fro Education Statistics.

Hoxby, Caroline M, and Andrew Leigh. 2004. “Pulled Away or Pushed Out? Explaining the Decline of Teacher Aptitude in the United States.” *American Economic Review* 94(2):236–240.

Ippolito, R A. 2001. “Pension Incentives and Sorting Effects: New Developments in Pensions, and Pension Economics.” *Institute for The Study of Labor, Conference on Pension Reform and Labor Markets,* Berlin.

Koedel, Cory, Jason A Grissom, Shawn Ni, and Michael Podgursky. 2011. “Pension-Induced Rigidities in the Labor Market for School Leaders.” *CESifo Working Paper Series* (3605):1–42.

Koedel, Cory, Shawn Ni, and Michael Podgursky. 2012. “Who Benefits from Pension Enhancements?” (July): University of Missouri, Columbia, Working Paper.

Koedel, Cory, and Michael Podgursky. 2012. “Teacher Pension Systems, the Composition of the Teaching Workforce , and Teacher Quality.” (February):CALDER Working Paper.

Lakdawalla, Darius. 2001. “The Declining Quality of Teachers.” NBER Working Paper No. 8263.

Long, Cindy. 2012. “Why a 401(k) is No Replacement for a Pension.” *NEA Today*, March.

Ni, Shawn, and Michael Podgursky. 2011. “Teacher Pension Incentives and the Timing of Retirement.” University of Missouri Working Paper Series No. 11.

Novy-Marx, Robert, and Joshua Rauh. 2011. “Public Pension Promises: How Big Are They and What Are They Worth?” *Journal of Finance* 66(4):1211–1249.

Nyce, Steven a. 2007. “Behavioral effects of employer-sponsored retirement plans.” *Journal of Pension Economics and Finance* 6(03):251–285.

Pew Center on the States. 2010. *The trillion dollar gap: Underfunded state retirement systems and the roads to reform*. Washington D.C.

Rivkin, Steven G, Eric A Hanushek, and John F Kain. 2005. “Teachers, Schools, and Academic Achievement.” *Econometrica* 73(2):417–458.

Rockoff, Jonah E. 2004. “The Impact of Individual Teachers on Students’ Achievement: Evidence from Panel Data.” *American Economic Review* 94(2):247–252.

Salop, Joanne, and Steven Salop. 1976. “Self Selection and Turnover in the Labor Market.” *Quarterly Journal of Economics* 90:620–627.

Sanders, William, and Sandra P Horn. 1998. “Research findings from the Tennessee Value-Added Assessment System (TVAAS) database: Implications for educational evaluation and research.” *Journal of Personnel Evaluation in Education* 12(3):247–256.

Sanders, William L, June C Rivers, and Morgan Hall. 1996. *Cumulative and Residual Effects of Teachers on Future Student Academic Achievement: Summary of Findings*. Knoxville, TN.

Shiller, Robert J. 2006. “Life-cycle Personal Accounts Proposal for Social Security: An Evaluation of President Bush’s Proposal.” *Journal of Policy Modeling* 28(4):427–444.

Washington State Office of the State Actuary. 2011. *Actuarial Valuation Report 2010*.

Weller, Christian E. 2011. *What Does the Literature Tell Us About the Possible Effect of Changing Retirement Benefits on Public Employee Effectiveness?* Political Economy Research Institute, University of Amherst.

Yao, Rui, Michael S Gutter, and Sherman D Hanna. 2005. “the Financial Risk Tolerance of Blacks, Hispanics and Whites.” *Financial Counseling and Planning* 16(2):51–62.