# PENSION STRUCTURE AND EMPLOYEE TURNOVER: EVIDENCE FROM A LARGE PUBLIC PENSION SYSTEM

DAN GOLDHABER, CYRUS GROUT, AND KRISTIAN L. HOLDEN*

Public pension systems in many U.S. states face large funding shortfalls, and policymakers have considered moving toward defined contribution (DC) pension structures in the interest of reducing the likelihood of future shortfalls. Concerns exist, however, that such changes might increase levels of employee turnover. The empirical evidence on the relationship between pension structure and turnover is mixed, and is quite limited in the case of public-sector plans. The authors study a single class of public-sector employees (teachers) who are enrolled in either a traditional defined benefit (DB) plan or a hybrid DB-DC plan during overlapping periods of time. Contrary to conventional wisdom, the authors find little evidence that the introduction of the hybrid plan increased employee turnover; in fact, they find that turnover is lower among teachers who transferred out of the DB plan into the hybrid plan. Employers may benefit by shifting the debate away from plan structure per se and toward a discussion of how to provide employees with pension plans they will highly value.

Public pension systems in many U.S. states face large funding shortfalls as the accrual of retirement benefits promised in the form of defined benefit (DB) pensions has outpaced the accrual of assets in states' pension funds. Recent estimates place the shortfall of assets relative to accrued liabilities in the trillions of dollars (Novy-Marx and Rauh 2011), and pressure to enact reforms that will reduce the likelihood of such shortfalls recurring in the future is increasing. One option is to move away from traditional DB pension structures and toward defined contribution (DC) structures, under which retirement benefits are not determined by a formula based on salary

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and experience, but instead depend on the investment returns on contributions made to individual retirement accounts. This movement could involve the adoption of employer-sponsored DC plans, such as 401(k)s, or, similar to the reform we study in this article, the adoption of a hybrid pension plan with both DB and DC components.

Shifting toward DC pension structures, however, raises concerns about increasing employee turnover.[1] The "backloading" of employee compensation that is typical of traditional DB pension structures—under which employees accrue benefits more rapidly toward the end of their careers—creates a financial incentive to stay rather than quit. It also creates an incentive for "stayers," who are less likely to exit employment prematurely, to seek employment with employers providing this type of compensation. Hence, economic theory supports the expectation that movement toward DC pension structures might increase employee turnover (Salop and Salop 1976; Ippolito 1987, 2002). That said, this influence could be moderated if employees are not particularly forward-looking or know little about their pension plans, or if they value other real or perceived dimensions of a plan (such as portability).

In contrast to the prevailing theory and conventional wisdom on the matter, the empirical evidence on the relationship between pension structure and employee turnover is mixed, and, in the case of public-sector pensions, quite limited. The analysis presented in this article addresses some limitations of the existing literature by focusing on a shift in public-sector pension policy in Washington State. We analyze a single class of public-sector employees (teachers) who since 1996 have been enrolled in either a traditional DB plan or a hybrid plan with DB and DC features. As described below, employees have enrolled in these plans under a variety of contexts, and we are able to observe patterns of behavior during extended and overlapping periods of time.

## Background

### Washington State's Teacher Retirement System

Washington's Department of Retirement Services (DRS) currently operates three plans under its Teacher Retirement System: TRS1, TRS2, and TRS3. The plan in which an employee is enrolled depends primarily on when he or she was hired. Prior to 1977, new hires were enrolled in TRS1, a traditional DB plan. Between 1977 and 1996, new hires were enrolled in TRS2, which, like TRS1, is a traditional DB plan, but offers somewhat less generous benefits and sets employee eligibility for retirement with full benefits at

[1]For instance, in a 2011 statement to the Committee on Ways and Means, the National Education Association maintained that, "Defined benefit plans are a proven tool for retaining accomplished public sector professionals" (National Education Association 2011).

a later age.[2] In 1996, the state created TRS3, a hybrid DB-DC plan. All new hires between 1996 and 2007 were enrolled in TRS3, and existing TRS2 employees were given the option to transfer into TRS3.[3] In 2007, TRS2 was reopened to new hires, who were allowed to enroll in either TRS2 or TRS3.

Our analysis focuses on teachers enrolled in TRS2 or TRS3; key features of these plans are outlined in Table 1.[4] TRS2 provides a lifetime annuity in retirement based on accumulated years of service (YOS) and final average salary (FAS): $Annual\ Benefit = 0.02 * YOS * FAS$. FAS is calculated over a teacher's 60 highest-paid consecutive months of employment. An employee becomes eligible to receive retirement benefits (i.e., vested) with the accumulation of 5 YOS. Any vested teacher may retire and begin collecting benefits at age 65. With the accumulation of 20 YOS an employee may retire as early as age 55, but with reduced benefits. With the accumulation of 30 YOS, an employee can retire with full benefits at age 62.

Similar to TRS2, the DB component of TRS3 provides a lifetime annuity in retirement, but it is half as large: $Annual\ Benefit = 0.01 * YOS * FAS$. An employee becomes vested in TRS3 with the accumulation of 10 YOS.[5] With the accumulation of 20 or more YOS, the nominal value of the DB increases by approximately 3% during each year between separation from employment and retirement. The DB component of TRS3 is funded exclusively by employer contributions, and all employee contributions are placed into an individual DC account. The value of an employee's DC assets upon retirement is determined by asset allocation decisions (employees can choose from a limited menu of options and make adjustments as they see fit), investment performance, and contribution levels. Employees can choose from among six contribution plans, which range from 5 to 15% of salary.[6]

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[2]Under TRS1, an employee can retire with full benefits at any age with the accumulation of 30 years of service (YOS), at age 55 with 25 or more YOS, or at age 60 with 5 or more YOS. Under TRS2, an employee can retire with full benefits at age 62 with the accumulation of 30 YOS or at age 65 with 5 or more YOS. TRS2 also increased the number of years over which final average salary is calculated from 2 years to 5 years.

[3]Employees who transferred between July 1, 1996, and December 31, 1997, received a "transfer bonus payment" equal to 65% of their accrued contributions to TRS2 (as of January 1, 1996). Employees with 5 or more YOS as of the end of the 1996 school year had their vesting status grandfathered in under TRS3; the 10-year vesting period applied to less experienced employees. Approximately 75% of eligible employees chose to transfer to TRS3 during this period. For more about pension choice in Washington State, see Goldhaber and Grout (2014).

[4]Since few active employees are currently enrolled in TRS1, we restrict the analysis in this article to those enrolled in TRS2 or TRS3.

[5]Two exceptions to the 10-year vesting period for TRS3 exist: TRS2 employees who became vested under TRS2 before July 1, 1996, and transferred to TRS3 maintain their vested status under TRS3; TRS3 employees with 5 YOS in which at least 12 months of service were earned after age 44 are vested after 5 years.

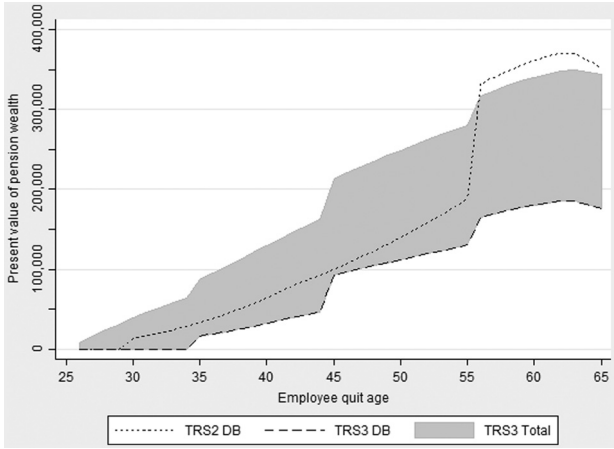
[6]Two contribution rate plans adjust automatically with age, shifting upward at age 35 and 45 (for more detail, see Goldhaber, Grout, Pennucci, and Bignell 2012).

*Table 1.* Key Features of TRS2 and TRS3

| *Feature* | *TRS2* | *TRS3* | |
|---|---|---|---|
| Membership definition | Hired 1977–1996 (*default*)<br>Hired 2007–present (*opt in*) | Hired 1977–1996 (*option to transfer*)<br>Hired 1996–2007 (*mandated*)<br>Hired 2007–present (*default*) | |
| Type | Traditional defined benefit | DB component | DC component |
| Vesting period | 5 years | 10 years | N/A |
| Employee contributions | Set by legislature depending on status of pension fund | N/A | 5–15% (employee's choice) |
| Employer contributions | Set by legislature depending on status of pension fund | Identical to TRS2 contributions | N/A |
| Annual benefit formula | *0.02**(AFC)*(YOS) | *0.01**(AFC)*(YOS) | N/A |
| Retirement eligibility | 65 years of age, or<br>62 years of age & 30 YOS (full benefit), or<br>55 years of age & 20 YOS (reduced benefit) | 65 years of age, or<br>62 years of age & 30 YOS (full benefit), or<br>55 years of age & 10 YOS (reduced benefit) | Withdrawal ages and penalties for early withdrawal dependent on federal tax rules |

*Notes:* AFC, average final compensation; YOS, years of service.

*Figure 1.* Pension Wealth of a Representative Teacher by Age at Exit




*Notes:* The TRS2 and TRS3 DB plots represent the present value of the stream of benefits the representative teacher would collect in retirement if she exited employment at a given age. The TRS3 Total plot represents the present value of both the DB and DC component of TRS3, with the upper bound defined by an assumption of 8% nominal investment returns on DC assets. For simplicity of presentation, we do not account for the fact an unvested employee may withdraw his or her contributions to TRS2 upon exiting employment, which would result in positive retirement wealth if exiting with between 1 and 4 YOS.

## Pension Wealth Accrual under TRS2 and TRS3

Here, we present the accrual of pension wealth under TRS2 and TRS3 for a representative teacher. Specifically, we calculate the present value of pension wealth at each potential age of exit from the Washington public school teaching workforce for a female teacher who begins her career at age 25. The pension wealth calculations are presented in Figure 1.[7] The values of the TRS2 DB and TRS3 DB curves at age 45, for instance, represent the present value of the DB annuity payment stream received in retirement if the teacher were to quit at age 45; the point on the TRS3 Total curve represents the sum of the TRS3 DB curve and the additional value of the assets in the teacher's DC account if the teacher were to quit at age 45. TRS3 pension wealth is presented as a range to reflect that the level of investment returns earned on DC account assets is uncertain. The lower bound of the area representing TRS3 pension wealth reflects only the value of the DB component of TRS3. The upper bound assumes the representative teacher contributes 5% of her income to her DC account and earns 8% nominal returns on account assets. The true value of the DC component is uncertain because it is dependent on investment returns. An individual's valuation of the benefits provided by TRS2 and TRS3 will vary with expectations about investment returns and the extent to which he or she is risk averse.

[7]A Technical Appendix detailing the pension wealth calculations is available upon request.

To understand how DB pensions backload compensation, consider how TRS2 and TRS3 structure the accrual of retirement benefits, as displayed in Figure 1. The first structural feature is vesting. As described above, teachers enrolled in TRS2 and TRS3 must become vested to be eligible to receive a DB annuity in retirement. Teachers in TRS2 become vested after 5 YOS. Teachers in TRS3 become vested in the DB component of the plan with 10 YOS, but vesting rules do not apply to the DC component of TRS3; individual members retain ownership over those assets at all levels of tenure.[8] In each year of service prior to vesting, a forward-looking teacher will consider the future shift in pension wealth associated with becoming vested, which imposes an opportunity cost on quitting.[9] In other words, vesting rules create a financial incentive for an unvested employee to stay rather than quit.

The second structural feature is early retirement eligibility. Members become eligible to retire at age 62 with full retirement benefits, or as early as age 55 with a modestly reduced annual DB annuity, when they accumulate 30 YOS.[10] If a teacher retired at age 62 with 30 YOS and a final average salary of $60,000, she would start collecting an annuity three years *before* the age of 65 (worth a total of $108,000 under TRS2 or $54,000 under TRS3)—the age at which she would be eligible to collect full retirement benefits with only 29 YOS. This feature results in the large upward shifts in the present value of pension wealth we see at age 55 in Figure 1. The early retirement benefit imposes large opportunity costs to quitting at all levels of tenure below 30 YOS, under both TRS2 and TRS3. The opportunity costs are significantly smaller under TRS3, however, because the size of its DB is half as large.

A third structural feature is relevant to the backloading of TRS3, but not TRS2. As described above, the size of the DB annuity of a teacher who exits employment with 20 or more YOS under TRS3 will increase by approximately 3% each year until retirement. Again, the forward-looking teacher will account for the opportunity cost of quitting prior to accruing 20 YOS. Although this feature creates an incentive to stay for teachers with less than 20 YOS, it also lowers the opportunity cost of leaving for a teacher with more than 20 YOS.

In addition to the rules related to vesting and the accumulation of 20 and 30 YOS, two other factors contribute to backloaded patterns of pension wealth accrual under DB pension structures. The first is that a DB annuity is vulnerable to inflation. When a teacher leaves a DB plan before retirement,

[8]TRS2 members, whether they are vested or not, can withdraw from the pension system and keep their own accrued contributions, which earn 5.5% returns compounded quarterly.

[9]Regarding a forward-looking teacher's perception of pension wealth, note that public educators have unusually high job security. To be fired, a teacher must receive an unsatisfactory performance evaluation, which rarely occurs (Goldhaber and Theobald 2013). Therefore, a teacher's evaluation of pension wealth accrual is unlikely to be influenced by uncertainty about being retained.

[10]Teachers can retire as early as age 55 with 10 YOS (under TRS3) or 20 YOS (under TRS2) but receive a significantly reduced annual benefit equal to only 36.5% of their full annuity.

the *nominal value* of her DB annuity stays fixed. Therefore, the *real value* of that annuity will be eroded by inflation until the teacher begins retirement. For example, under 2.5% inflation, a $20,000 annuity, as defined by a teacher's FAS and YOS upon separating in the year 2000, would have a real value of less than $14,000 if retirement began 15 years later in 2015. For the forward-looking teacher, this erosion caused by inflation creates a financial incentive to stay rather than quit. Second, a teacher who quits prematurely will likely forego real wage growth (which would contribute toward a larger DB annuity) that would have been experienced had she stayed. Again, these factors contribute to TRS2 being more backloaded than TRS3 because the DB annuity of TRS2 is twice as large as the DB annuity of TRS3.

## Pension Structure and Turnover: Theory and Evidence

The long-standing, widely accepted theory behind backloaded compensation states that employers create a wage profile that pays workers less when they are young and more when they are old to induce greater long-run commitment from employees who will remain with a firm in order to collect backloaded pay (Lazear 1979; Gustman and Steinmeier 1995). Ippolito (2002: 275) characterized these incentives as forming an implicit contract between employer and employee: "Workers sacrifice wages in exchange for a 'stay' pension but are awarded a lower 'quit' pension if they depart prematurely; thereby imposing a high cost to quitting." In this way, traditional DB pension structures create financial incentives designed to directly influence an employee's propensity to quit. Additionally, the presence of these financial incentives may influence the types of workers who select into employment—backloaded compensation may attract employees who are less likely to leave prematurely (Salop and Salop 1976; Ippolito 2002).

This prevailing theory does not consider that employees may value the compensation provided by differing pension plan structures more or less highly (Brown and Weisbenner 2014), and that this valuation may also influence employee turnover. For instance, employees may value having personal control over investments or the tangibility of personally held assets. They may also value a DC plan more highly if they have high expectations of investment returns. If these factors are true, movement toward DC pension structures could exert a *negative* influence on employee turnover.

The prevailing theory is also complicated by the fact that employees respond to *perceptions* about their pensions that may be inaccurate. Chan and Stevens (2008), for instance, found that individuals who are well-informed about their pensions are quite responsive to their pensions' financial incentives. Those who are ill-informed, however, are not only irresponsive to their pensions' actual incentives, they are responsive to their own misperceptions. Research has demonstrated that pension plans are, in fact, often misunderstood by the employees enrolled in them (Gustman and Steinmeier 2004; Chan and Stevens 2008; Brown and Weisbenner 2014).

This finding is consistent with evidence from Washington State: in a survey of teachers, DeArmond and Goldhaber (2010) found that only 74% of TRS2 members and 46% of TRS3 members correctly identified their pension plan type (i.e., DB, DC, or hybrid). Misperceptions about pension systems are perhaps not surprising; Glaeser and Ponzetto (2014) suggested that some of the complexities of DB systems are designed to "shroud" the magnitude of pension benefits to taxpayers as a means of increasing the overall level of teacher compensation beyond what would be likely if the increases were transparent. It is possible that the magnitude of the benefits is also shrouded to many teachers, particularly if they are far from retirement eligibility. The bottom line is that the relationship between pension structure and employee turnover may be less straightforward than what is immediately suggested by economic theory.

The empirical evidence on the relationship between pension structure and turnover is mixed, and it is extremely limited in the case of public-sector pensions.[11] Several studies found evidence of lower turnover under DB pension structures than under DC pension structures. In the only published public-sector analysis, Ippolito (2002) studied employee turnover following a 1984 reform to the Federal Employee Retirement System and found results suggesting that moving from a traditional DB pension structure toward a DC pension structure led to higher rates of employee turnover. Using data from the Survey of Income and Program Participation, Haverstick, Munnell, Sanzenbacher, and Soto (2010) found that employees enrolled in DC plans with between 5 and 10 years of tenure were significantly more likely to change jobs than were employees enrolled in DB plans. The authors did not find significant differences between DB and DC turnover among employees with less than 5 years of experience. A recent working paper found that first-year employee retention rates fell when Utah replaced its traditional DB plan with less-generous hybrid and DC options in 2011 (Clark, Hanson, and Mitchell 2015). Last, using data from the Retirement Attitude Survey, Nyce (2007) found that employees enrolled in DB pension plans were significantly more likely than DC plan participants to indicate a high probability of staying with their employers.

Several other studies suggested a weaker relationship between pension structure and employee turnover. Gustman and Steinmeier (1993, 1995) found that firms that provide employer-sponsored pensions to their employees have lower turnover than those who provide no pension, and that the effect on turnover is similar under both DB and DC plan structures. They posit that it is higher levels of compensation that drive lower rates of employee turnover in pensioned firms, not the structure of those pensions. Even and Macpherson (1996) also found a negative relationship between

[11]One reason that public-sector evidence is limited is that relatively few public employees are enrolled in DC pension plans. While the private sector moved away from DB pensions in the 1980s and 1990s (Buessing and Soto 2006), the great majority of state-level public-sector employees remain enrolled in traditional DB plans (Pew Center on the States 2010).

pension plan provision and turnover, for both DB and DC plans. Although they did not directly compare turnover rates under DB and DC plans, they did find that the negative relationship between firm size and turnover is stronger among firms providing DC pension plans than it is among firms providing DB plans. Finally, in an analysis of a single employer (a large public university) transitioning from a DB pension plan to a DC plan, Goda, Jones, and Manchester (2016) reported a negative relationship between DC plan enrollment (relative to DB enrollment) and turnover once selection effects had been accounted for. That said, more mobile employees were more likely to select into the new DC plan.

These mixed findings are perhaps not terribly surprising given the empirical challenges associated with identifying the influence of pension plan structure on employee turnover. Most analyses of plan structure rely on cross-firm comparisons because firms do not tend to offer multiple pension plans to employees (e.g., Gustman and Steinmeier 1993; Even and Macpherson 1996; Nyce 2007; Haverstick et al. 2010). The identification of pension-structure effects in cross-firm comparisons is difficult if the relationship between firms' pension structures and the level of employee turnover is endogenous. Only two of the studies discussed above took advantage of within-employer variation in pension structure: Ippolito (2002) and Goda et al. (2016). Ippolito's analysis is limited in that it compared the behavior of employees using longitudinal data from time periods roughly a decade apart—December 1986 to December 1987 and March 1996 to February 1998—and attempted to account for the influence of U.S. labor market conditions that may have changed during that time period.

The analysis presented in our article addresses these limitations in several ways. First, we analyze a single class of public-sector employees (teachers) rather than relying on comparisons across different types of employers. Second, total compensation is the same under the two plans in terms of salary and employer contributions, and the plans are designed to provide a similar level of retirement benefits to employees.[12] This similarity allows us to avoid conflating the effects of pension structure on turnover with the effects of the nominal level of compensation. Third, as described above, employees have been enrolled in these plans under various contexts and over extended periods of time. As described later in the Empirical Approach section, this factor allows us to examine evidence on the relationship between pension structure and turnover using multiple sources of identification, each of which provides evidence addressing the research question.

## Data

Our analysis relies primarily on two state-level data sources from Washington State. The first is confidential Teacher Retirement System

[12]As stated in the House Bill Report of the legislation that established TRS3 (HB 1206, Laws of 1995), the intention was to "create a plan that is comparable in cost to Plan II."

(TRS) data maintained by the Department of Retirement Services (DRS). These data are used to determine each teacher's plan enrollment (TRS2 or TRS3) and enrollment context (i.e., transfer, mandate, or choice as new hire). The DRS data cover dates prior to January 2010 for teachers actively employed at any point during July 1, 1996, through December 31, 2009.[13] These data are merged with the second data set, administrative records from the Office of the Superintendent of Public Instruction (OSPI) S-275 personnel reporting system, which provides information on teacher characteristics, assignment type, assignment location (school and district), salary, and experience level. The S-275 records allow us to construct a panel of observations for each year in which an individual is employed as a public school teacher in Washington during the school years ending between 1985 and 2014. These administrative records are supplemented with school and district-level data from the National Center for Education Statistics' Common Core of Data (CCD), including school and district size, school level, and school demographics.

The study sample is restricted to teachers who were hired between July 1985 and September 2008,[14] were employed by a public school district in Washington State during at least one year between the school years ending in 1986 and 2014 (allowing us to identify them in the S-275 data), and enrolled in either TRS2 or TRS3. Teachers are distinguished from other employee classifications using assignment codes in the S-275 data, and individuals whose primary position assignment is not associated with a teaching position in at least one year are excluded from the analysis in our primary model specifications.[15] Furthermore, we exclude teacher observations in years when too few hours are worked to accumulate a full year of service credit, and for teachers over 55 years of age. The latter exclusion is intended to avoid conflating attrition from the profession in Washington State with attrition from the workforce in general as individuals approach retirement age.[16] In other words, we are interested in studying the plans' "stay" incentives (e.g., backloaded compensation) rather than their "quit" incentives (e.g., early retirement opportunities).[17] The study sample comprises 70,456 unique teachers and 671,748 teacher-year observations, though our analyses utilize a series of subsets of this panel of data.

[13]Teachers hired after 1977 who left the profession prior to July 1996 are categorized as TRS2 enrollees, as they would not have had the opportunity to transfer to TRS3.

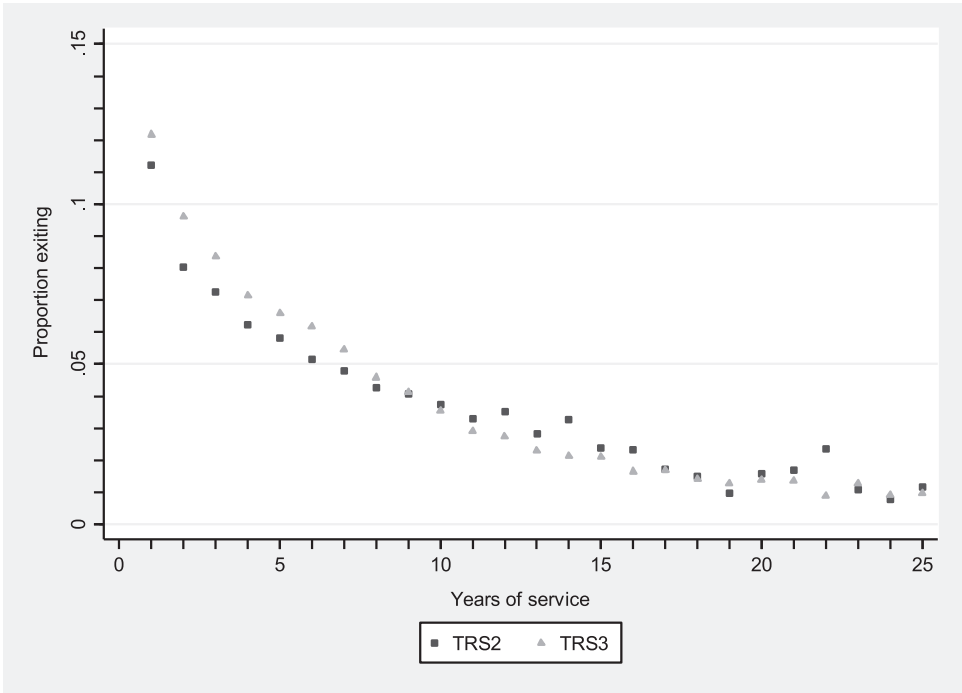
[14]We exclude teachers employed before 1985 because we do not have information on the employment status of teachers prior to the 1984–1985 school year.

[15]Classroom teaching positions do not include positions such as counselor or administrator, which we consider to be distinct types of professions. As a robustness check, we estimate models with and without classroom teaching restrictions in place and find qualitatively similar results.

[16]We have also estimated our models without these restrictions and the results are qualitatively similar.

[17]For instance, a large opportunity cost to staying exists once an employee becomes eligible to retire with full benefits because the teacher who stays an additional year forgoes the collection of her DB annuity in that year.

*Figure 2.* Proportion Exiting Employment by Pension Plan and Year of Service




*Notes:* The points in each plot should be interpreted as summary statistics. We caution against using comparisons across plans to make inferences about employee turnover because the time periods and enrollment contexts associated with the TRS2 and TRS3 plots differ systematically.

Teachers are identified as "separating" in school year $x$ if they are not observed in the S-275 records in year $x + 1$. As we describe below, we allow teachers who exit and reenter the workforce to inform our model estimates.[18] The overall quit propensities in our study sample are presented in Figure 2 by years of service and pension plan enrollment. Among teachers in both plans, the propensity to quit steadily declines with years of experience. In the context of Figure 2, comparing quit rates across plans is problematic because varying enrollment contexts, teacher characteristics, and time periods are not accounted for. That said, the attrition profiles of employees in TRS2 and TRS3 are quite similar.

[18]It is quite common to observe a teacher exit and then return in a later year (Beaudin 1993; Grissom and Reininger 2012), and we observe this in our data as well; over 23% of first-time exits in our sample re-appear in the sample within 3 years. The likelihood of returning, however, levels off relatively quickly. For example, 70% of teachers who are observed returning over a 15-year window (i.e., looking at those who separate prior to 2000) do so within 3 years and fewer than 10% of first-time separators are observed returning after an absence of 8 or more years.

## Empirical Approach

We study how the introduction of TRS3 (a hybrid DB-DC plan) has influenced patterns of turnover among Washington State teachers who have otherwise been enrolled in a traditional DB plan (TRS2). As previously discussed, the prevailing economic theory predicts that the adoption of TRS3 should result in increased levels of employee turnover because TRS3 is less backloaded than TRS2, thus creating financial incentives to stay rather than quit. The influence of these financial incentives may be moderated, however, if employees have a limited understanding of pension rules or if they value the compensation provided by the hybrid plan structure more highly than that provided by traditional DB structure.

The pension context in Washington State provides several sources of identification to study the relationship between pension plan enrollment (in TRS2 or TRS3) and employee turnover. We address the following questions below: 1) Did the introduction of TRS3 in 1997 result in a corresponding shift in first-year attrition? 2) Do teachers who chose to transfer from TRS2 to TRS3 in 1997 exhibit different levels of turnover than those who opted to stay in TRS2? 3) Do teachers hired just before the introduction of TRS3 exhibit different levels of turnover than those hired just after? 4) Do new hires who are able to choose between TRS2 and TRS3 exhibit differential levels of turnover? Each of these analyses provide evidence addressing the more general question of how the introduction of TRS3 has influenced employee turnover.

### Shifts in First-Year Turnover

If the introduction of TRS3 has influenced employee turnover, one would expect to observe a shift in the level of turnover in 1997, after which new hires were mandated into TRS3. To test this proposition, we specify the following simple logit model:

$$Quit_i = \sum_{t=1987}^{2007} (\sigma_t 1(FY = t)) + \beta_1' T_i + \beta_2' S_i + \varepsilon_i, \quad (1)$$

where $\sigma_t$ is a vector of parameters to be estimated, and $1(FY = t)$ is a vector of indicator variables equal to 1 if an individual was hired in year $t$, and $T_i$ and $S_i$ are vectors of teacher and school characteristics. The dependent variable $Quit_i = 1$ if the teacher exits after the first year of employment, and 0 otherwise.[19] We test the differences $\hat{\sigma}_t - \hat{\sigma}_{t-1}; t = 1988, 1989, \ldots 2007$. Of particular interest is the difference $\hat{\sigma}_{1997} - \hat{\sigma}_{1996}$. To account for the possibility that nonrandom selection into the pension system (by teachers with

[19]We also estimate specifications where $Quit_i = 1$ if the teacher exits within 2, 3, and 4 years of employment. We find patterns of turnover that are very similar to the primary specifications and present only the results for first-year turnover in the main text (see Appendix Table A.1).

particular backgrounds or who teach at particular types of schools) may be related to differences in the propensity to quit, we also estimate models without controls for teacher and school characteristics. Our results are little changed based on the inclusion or exclusion of teacher and school covariates.[20]

The focus on first-year turnover (as opposed to turnover among more experienced teachers) allows us to compare a group of teachers mandated into TRS2 (those hired prior to July 1996) to a group of teachers mandated into TRS3 (those hired after July 1996). A limitation of this approach is that the identification of the model rests on the admittedly strong assumption that year-to-year variation in other time-related factors (such as labor market conditions) does not influence first-year quit rates. Fortunately, this assumption is easy to test, as we observe extended periods of time in which pension structure does not change. Finding significant differences between $\hat{\sigma}_t$ and $\hat{\sigma}_{t-1}$ where $t \neq 1997$ would invalidate the approach.

### Teachers with the Option to Transfer from TRS2 to TRS3

Teachers were given the option to transfer from TRS2 to TRS3 following the introduction of TRS3 in the 1997 school year. As of the 1998 school year, 77% of eligible teachers in the study sample had transferred to TRS3, and very few transferred after 1998. If pension structure was influencing employee turnover, we would expect to observe differences between the quit propensities of teachers enrolled in TRS2 and TRS3. As discussed above, pension structure may influence turnover through both the self-selection of employees into each plan and the true or perceived financial incentives created by each plan. We are interested in capturing the net effect of these influences.[21]

To test whether teachers who chose to stay in TRS2 exhibit a different propensity to quit than do teachers who chose to transfer to TRS3, we specify the following discrete hazard model:

$$(2) \qquad p_{it} = \frac{e^{\sum_{t=1997}^{2013}(\sigma_t 1(YEAR=t)) + \sum_{t=1997}^{2013}(\gamma_t 1(YEAR=t)*TRS3_i) + \beta_1' T_i + \beta_2' S_i}}{1 + e^{\sum_{t=1997}^{2013}(\sigma_t 1(YEAR=t)) + \sum_{t=1997}^{2013}(\gamma_t 1(YEAR=t)*TRS3_i) + \beta_1' T_i + \beta_2' S_i}}$$

where $p_{it}$ is the probability that teacher $i$ quits in year $t$, $TRS3_i$ is an indicator variable equal to 1 if teacher $i$ transferred to TRS3, $\sigma_t$ and $\gamma_t$ are vectors of parameters to be estimated, and $T_i$ and $S_i$ are vectors of teacher and school characteristics. The vector of coefficients $\hat{\gamma}_t$ tests whether the quit propensity of teachers transferring to TRS3 is significantly different from

[20]A regression discontinuity approach around the cut point of July 1, 1996, is not possible because very few teachers start in the months of June or July (less than 1%).

[21]While we are interested in each of these influences independently, our data do not allow us to isolate one from another.

that of teachers staying in TRS2 in school year $t$. As individuals are observed multiple times in the panel of data, error terms are clustered at the individual level.

We estimate Equation (2) on the entire sample of teachers eligible to transfer from TRS2 to TRS3, as well as on two subsamples defined by a teacher's accumulated YOS as of the 1996 school year: teachers with 1 to 5 YOS and teachers with 5 or more YOS. The subsample estimations account for the possibility that transfer decisions and quit propensities are both related to experience level and allow us to compare patterns of attrition among employees with similar levels of experience.

This approach to comparing patterns of turnover under TRS2 and TRS3 has several strengths. First, identification of this model does not require strong assumptions about the influence of employer characteristics (as in cross-firm comparisons) or time-varying factors related to employee turnover. Second, we are able to observe patterns of turnover during an extended period of time (1998–2013). Third, the sample consists of relatively experienced teachers who are more likely than inexperienced teachers to be knowledgeable about their pension plans. Finally, we expect our results to be driven in part by selection, which provides insight into an important policy question: If an employer introduces a less backloaded pension plan for its employees, what are the implications of allowing existing employees to transfer into the new plan?

### Teachers Hired Just Before and Just After the Introduction of TRS3

Next, we compare the quit propensities of teachers hired just before and just after the introduction of TRS3. If the introduction of TRS3 influenced teachers' propensity to quit, teachers hired in 1996 (who were enrolled in TRS2 and either stayed in TRS2 or transferred to TRS3) should exhibit a pattern of turnover different from teachers hired in 1997 (all of whom were mandated into TRS3). To test this proposition, we specify the following discrete hazard model:

$$p_{it} = \frac{e^{\sum_{t=1}^{T}(\sigma_t 1(YOS=t)) + \sum_{t=1}^{T}(\gamma_t 1(YOS=t)*1997_i) + \beta_1' T_i + \beta_2' S_i}}{1 + e^{\sum_{t=1}^{T}(\sigma_t 1(YOS=t)) + \sum_{t=1}^{T}(\gamma_t 1(YOS=t)*1997_i) + \beta_1' T_i + \beta_2' S_i}} \tag{3}$$

where $p_{it}$ is the probability that teacher $i$ quits in year-of-service $t$, $1(YOS = t)$ is a vector of indicator variables equal to 1 if $YOS = t$, $1997_i$ is a variable equal to 1 if an individual was hired in 1997, and $\sigma_t$ and $\gamma_t$ are vectors of parameters to be estimated. The estimated coefficients $\hat{\gamma}_t$ test whether the propensity to quit in year-of-service $t$ is significantly different among teachers in the 1997 cohort.

An advantage of this approach is that it compares the behavior of teachers hired in proximate years, thus other factors related to the pattern of turnover during teachers' careers are less likely to differ dramatically. A second advantage is that we are able to model the pattern of turnover over an

extended period of time (17 YOS). A limitation of comparing the 1996 and 1997 cohorts is that the introduction of TRS3 affects both cohorts: 70% of teachers hired in 1996 transferred to TRS3 by the end of the 1998 school year. As such, differences in the level of turnover identified by the model are likely to be muted compared to a context in which the 1996 cohort was strictly mandated into TRS2.

### New Hires Who Can Choose between TRS2 and TRS3

Next, we consider newly hired teachers who have been able to choose between TRS2 and TRS3 since the 2008 school year. Teachers must indicate a choice within 90 days, and those who do not indicate a choice are defaulted into TRS3.[22] If plan structure is affecting employee separation decisions, turnover should differ between TRS2 and TRS3 enrollees. As in the analysis of teachers able to transfer from TRS2 to TRS3, we would expect the results to be driven in part by teachers self-selecting into plans.[23] To compare the pattern of turnover between TRS2 enrollees and TRS3 enrollees, we specify the following discrete hazard model:

$$(4) \qquad p_{it} = \frac{e^{\sum_{t=1}^{T}(\sigma_t 1(YOS=t)) + \sum_{t=1}^{T}(\gamma_t 1(YOS=t)*TRS3_i) + \beta_1' T_i + \beta_2' S_i}}{1 + e^{\sum_{t=1}^{T}(\sigma_t 1(YOS=t)) + \sum_{t=1}^{T}(\gamma_t 1(YOS=t)*TRS3_i) + \beta_1' T_i + \beta_2' S_i}},$$

where $TRS3_i = 1$ indicates enrollment in TRS3 and the other variables are as specified above. Similar to Equation (3), the estimated coefficients $\hat{\gamma}_t$ test whether the propensity to quit in year-of-service $t$ is significantly different among teachers who chose TRS3 as new hires. Because teachers are observed in multiple school years, errors are clustered at the individual level.

This comparison mimics an interesting choice context, wherein a new employee is choosing between two employers who provide differently structured pension plans but are otherwise identical.[24] We observe the behavior of teachers—in both plans—who are hired in the same school years (2008 and 2009) and by the same employers, making the model less vulnerable to bias from the influence of unobserved variation in employer and time-related factors. That the new hire's plan choice is endogenous is not a concern given that we are interested in capturing any effects driven by

[22]Among 2008–2009 hires in our study sample, 39% opted into TRS2 and 18% defaulted into TRS3.

[23]To be clear, this enrollment context is quite different from that analyzed above, where teachers had the option to transfer from TRS2 to TRS3. Those teachers were relatively experienced, the default setting (i.e., the result of taking no action) was to stay in TRS2, and the time period was roughly a decade earlier.

[24]Our observations deviate from this firm-choice context in that those who do not indicate a plan choice within 90 days of enrollment are defaulted into TRS3. Some proportion of these defaulters almost certainly would have enrolled in TRS2 had it been the default setting or had they been compelled to indicate a choice.

self-selection to better understand how overall retention rates differ across plan types.

Our comparison has a few limitations. The sample size is small and the number of years over which we observe employee turnover is relatively short (6 YOS). Additionally, results may be biased if the propensity to default is associated with the propensity to quit. As a robustness check, we also estimate models that exclude the 18% of teachers who defaulted into TRS3.

## Results

The results from each of the empirical approaches outlined above are presented below. Our primary presentation of the results is graphical, and the regression output underlying each figure (as well as output from alternative model specifications) is presented in tables in the Appendix.

### Shifts in First-Year Turnover

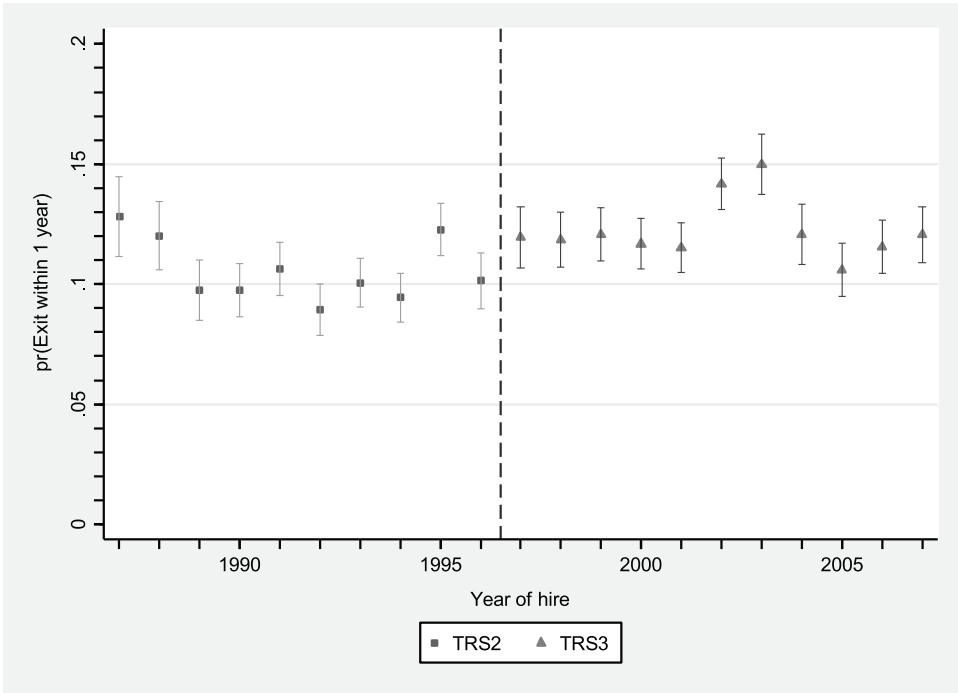
We look for evidence of a shift in the pattern of early-career turnover following the introduction of TRS3 in the 1997 school year. The results from the estimation of the model in Equation (1) are presented in Figure 3. Year-of-hire is represented on the horizontal axis and the predicted probability of exit is represented on the vertical axis. The probability of exiting within one year of service is significantly higher among 1997 hires than 1996 hires ($p = 0.040$).[25]

As discussed above, the identification of this model relies on the assumption that unobserved variation in other time-related factors does not differentially influence early-career quit rates in 1996 and 1997. The plot in Figure 3 clearly demonstrates that this assumption is violated—the propensity to quit is significantly different in numerous adjacent years when pension structure does *not* change. For instance, we find statistically significant differences between both $\hat{\sigma}_{1995} - \hat{\sigma}_{1994}$ and $\hat{\sigma}_{2002} - \hat{\sigma}_{2001}$, in spite of the fact that pension structure did not change during that time period. As such, it would be inappropriate to attribute the differences between $\hat{\sigma}_{1996}$ and $\hat{\sigma}_{1997}$, or the general upward shift in the level of turnover in 1995, to the introduction of TRS3. This issue cannot be addressed by adjusting the specification of the model unless those adjustments are able to fully account for the other time-varying factors that appear to be influencing year-to-year quit rates.

When the model is estimated using a single indicator for belonging to a post-1997 cohort, the coefficient on that indicator is positive and significant. The average predicted probability of quitting after one year of service is 2.2 percentage points higher among the post-1997 cohorts, but it is difficult to attribute this to the introduction of TRS3 with a great deal of confidence.

[25]We estimate the model without controls for teacher and school characteristics, and the results are very similar.

*Figure 3.* Predicted Probability of First-Year Exit by Year of Hire




*Notes:* The plot represents point estimates derived from the estimation of Equation (1) and represents the output presented in column (1) of Appendix Table A.1. The vertical bars around the point estimates represent 95% confidence intervals.

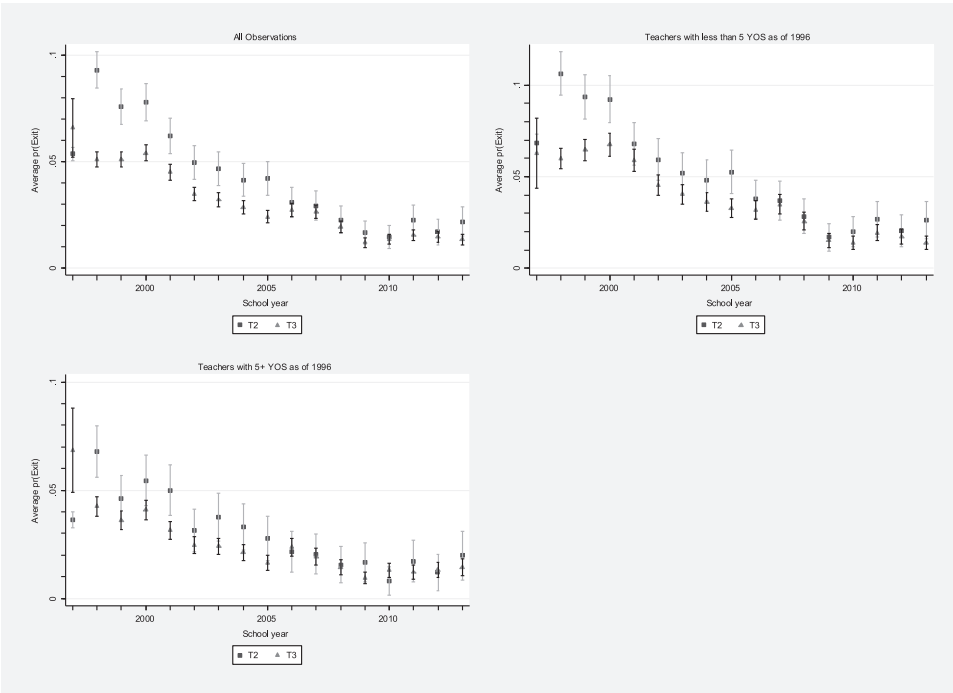
As a robustness check, we also modeled early-career attrition under a difference-in-difference approach that compares the propensity to quit in 1996 among teachers with 1 YOS with the propensity to quit among teachers with 2 YOS; that value is then compared with the same difference found for 1997. This approach requires a stable relationship (across years) in the distance between first- and second-year quit propensities for identification, however—an assumption that is not supported by the data.

Although these results invalidate our approach to identifying differences in the pattern of turnover attributable to pension structure, they do have interest in their own right. Our findings indicate that year-to-year variation in early-career turnover can be substantial even when pension structure and compensation levels are stable. Future analyses of employee turnover should be cautious in interpreting findings informed by year-to-year shifts in turnover.

### Teachers with the Option to Transfer from TRS2 to TRS3

Here, we model the propensity to quit among experienced teachers enrolled in TRS2 who were given the opportunity to transfer to TRS3

*Figure 4.* Probability of Exit among Teachers with the Opportunity to Transfer to TRS3



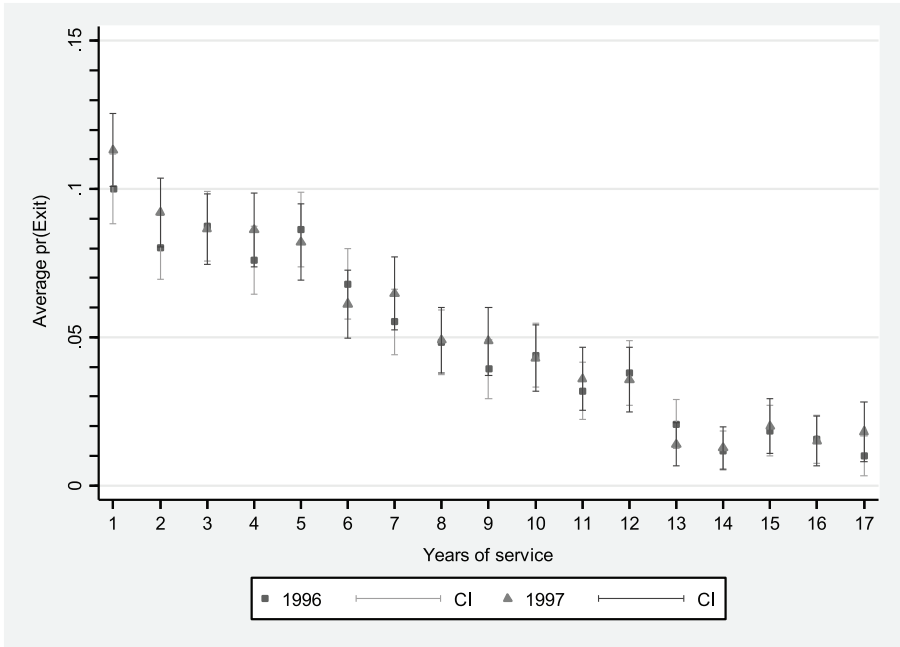

*Notes:* The plots are point estimates derived from the estimation of Equation (2) and represent the output presented in columns (3), (4), and (5) of Appendix Table A.2. The vertical bars around the point estimates represent 95% confidence intervals.

following its introduction in the 1997 school year. Results from the estimation of Equation (2) are presented in Figure 4 for all teachers in the study sample, and separately for teachers with less than 5 YOS (as of the 1996 school year) and teachers with 5 or more YOS. Regression output for each of these models is presented in Table A.2 in the Appendix.

We find large and significant differences in the propensity to quit between teachers enrolled in TRS2 and TRS3. During the period 1998 to 2005, the teachers who stayed in TRS2 are significantly more likely to exit in each year. In those years, the predicted propensity to quit is between 1.3 and 4.2 percentage points lower among teachers who transferred to TRS3. These differences are quite large considering that baseline levels of turnover during 1998 to 2005 ranged between 5.9% and 2.1%. The 1997 school year is the only year in which the predicted probability of exit is higher among teachers who transferred to TRS3.[26] The results for the sub-sample estimations of teachers with less than 5 YOS and 5 or more YOS are quite

[26]Less than 5% of teachers had transferred to TRS3 as of the end of the 1997 school year, and a significant number of them may have been motivated to transfer to TRS3 early because they knew they were quitting at the end of the school year.

*Figure 5.* Predicted Probability of Exit by Years of Service for 1996 and 1997 Cohorts




*Notes:* The plots are point estimates derived from the estimation of Equation (3) and represent the output presented in column (3) of Appendix Table A.3. The vertical bars around the point estimates represent 95% confidence intervals.

similar to the full-sample results. These findings run counter to the conventional wisdom that movement toward DC pension structures will necessarily result in increased levels of turnover. In fact, they suggest that DC pension structures can potentially reduce levels of turnover.

### Teachers Hired Just Before and Just After the Introduction of TRS3

Here we compare the pattern of turnover among employees hired just before the introduction of TRS3 (the 1996 cohort) to the pattern of turnover among those hired just after its introduction (the 1997 cohort). As noted above, the former group was initially enrolled in TRS2 and given the option to transfer to TRS3 (approximately 70% did so). The latter group was mandated into TRS3. Results from the estimation of Equation (3) are represented in Figure 5.

We find that teachers in the 1997 cohort are marginally more likely to exit in the first year of service, but we find no statistically significant differences in the propensity to quit in any other year of service (see Table A.3 in the Appendix). The results from this comparison should be interpreted with caution for two reasons. First, as discussed above, we find that

early-career quit rates exhibit significant variation from one year to the next independent of any changes to pension structure, and it is possible that year effects are obscuring pension structure effects.[27] Second, as indicated by the 95% confidence intervals in Figure 5, the predicted quit propensities are not very precise. For instance, in the third year of service the propensity to quit among the 1997 cohort is anywhere between 2.4 percentage points lower and 2.6 percentage points higher than the propensity to quit among the 1996 cohort.

To obtain more precise estimates we run two alternative specifications of Equation (3). First, we estimate a model in which the 1997 cohort indicator is *not* interacted with each service year (see column (4) of Appendix Table A.3). The coefficient on the 1997 cohort indicator is positive (the odds ratio is 1.070) and statistically significant ($p$ value = 0.05), suggesting a slightly higher overall propensity to quit.[28] Second, we expand the number of cohorts included in the regression by comparing teachers hired in 1995 *and* 1996 with those hired in 1997 *and* 1998 (see column (5) of Appendix Table A.3). When including the two additional cohorts, we find that the propensity to quit is significantly *lower* among the 1997 and 1998 cohorts for some service years. When this second model is estimated with a non-interacted cohort indicator, the coefficient on the 1997–1998 cohort indicator is small (the odds ratio is 1.000) and statistically insignificant ($p$ value = 0.99).

Overall, because of the limitations of this comparison, we cannot rule out the possibility that the introduction of TRS3 has resulted in slightly higher rates of turnover (i.e., 1 percentage point) than would have existed had all teachers remained in TRS2. That said, we fail to find evidence in this comparison that consistently supports the notion that the introduction of TRS3 influenced the level of turnover.

### New Hires Who Can Choose between TRS2 and TRS3

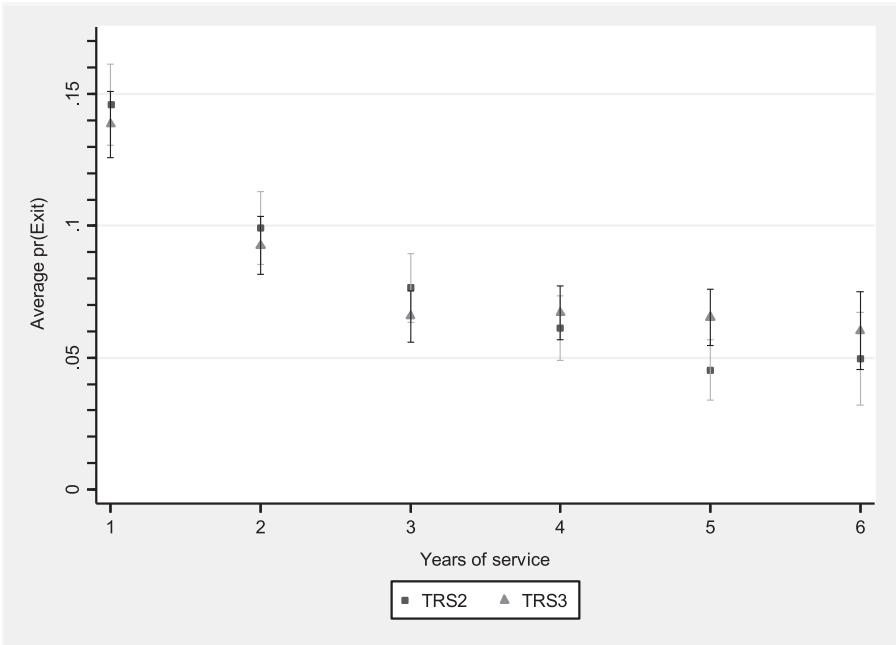
Our final analysis compares patterns of turnover among new hires who since the 2008 school year have been able to choose between TRS2 and TRS3. Results from the estimation of Equation (4) are presented in Figure 6, and the underlying regression results are presented in column (3) of Table A.4 in the Appendix.

In each of the first 3 years of service, teachers enrolled in TRS3 are slightly *less* likely to quit (by between 0.7 and 1.1 percentage points) than are teachers enrolled in TRS2, whereas TRS3 teachers with 4 and 6 YOS are slightly more likely to quit (by between 0.6 and 1.1 percentage points) than

[27]As a placebo test, we estimate Equation (2) on teachers hired in 1997 and 1998, all of whom were mandated into TRS3. We find qualitatively similar results, with a statistically significant difference in the propensity to quit in the first year of service, and insignificant differences in all other years.

[28]We also estimate the model as a Cox proportional hazard model and obtain a nearly identical hazard ratio of 1.073 that is significant at the 5% level.

*Figure 6.* Probability of Exit for 2008 and 2009 Hires by Plan Type and Years of Service




*Notes:* The plots are point estimates derived from the estimation of Equation (4) and represent the output presented in column (3) of Appendix Table A.4. The vertical bars around the point estimates represent 95% confidence intervals.

are their colleagues in TRS2.[29] Teachers with 5 YOS in TRS3, however, are significantly more likely to quit than are teachers in TRS2 (by 2.0 percentage points). When we exclude from the estimation sample individuals who defaulted into TRS3 rather than indicating a choice, the difference in the first-year quit propensity becomes statistically significant. The coefficients in this model are otherwise very similar to those in the primary specification (see column (4) of Appendix Table A.4).

As in the previous comparison, the point estimates presented in Figure 6 are imprecise. For instance, in the third year of service the propensity to quit among TRS3 enrollees is anywhere between 3.4 percentage points lower and 1.2 percentage points higher than the propensity to quit among TRS2 enrollees. We again estimate an alternative model specification in which the indicator variable $TRS3_i$ is not interacted with the year-of-service indicator variables $YOS_{it}$. The results from the estimation of this alternative

[29]Part of our sample includes an unusual period when a non-trivial number of Washington State teachers received reduction in force (RIF) notices, which notify a teacher that he or she may be laid off prior to the next school year. In the study sample, 943 individuals received RIF notices and 110 were ultimately laid off. Because uncertainty about continued employment may influence a teacher's perception of pension wealth, we estimate the primary specification for Comparison 3 excluding these individuals as a robustness check. We find the results to be very similar.

specification are presented in column (5) of Appendix Table A.4. The coefficient on the non-interacted TRS3 indicator is small (the odds ratio is 0.998) and statistically insignificant ($p$ value = 0.98).

Although we cannot rule out the possibility that the level of turnover under TRS2 and TRS3 in any particular school year might differ *slightly*, we again fail to find evidence that supports the notion that the introduction of TRS3 has significantly influenced levels of turnover.

## Discussion and Conclusion

The large funding shortfalls currently being experienced by many public pension systems have generated interest in pension reforms to decrease the likelihood of future shortfalls. These reforms typically involve movement away from traditional DB pension structures toward DC pension structures; conventional wisdom states that such a movement will have the undesirable effect of increasing employee turnover. This notion is supported by theoretical arguments about the influence of backloaded pension structures on employee turnover, but factors related to employee perceptions and preferences may moderate these influences if employees know little about their pension plans or if they value the compensation provided by alternative plan structures more highly.

The empirical evidence on the relationship between pension structure and turnover is mixed, and previous analyses face several limitations. First, while the debate around pension structure primarily resides in the realm of state-level public pension plans, previous analyses of pension structure and turnover have generally involved private sector or federal employees. Second, previous work has tended to rely on variation in pension structure across employers or over time to identify its influence on employee turnover. This approach may be problematic if the relationship between firms' pension structures and the level of employee turnover is endogenous, or if time-related factors influencing turnover are not properly accounted for. The analysis presented in this article addresses some of these limitations by studying a single class of public-sector employees (teachers) who are enrolled in a traditional DB plan or hybrid DB-DC plan during overlapping periods of time.

Overall, we find little evidence to support the conventional wisdom that movement toward a DC pension structure will necessarily increase employee turnover.[30] More specifically, the patterns of turnover during the first 17 years of service among employees hired just before the introduction of the hybrid plan compared with those hired just after the introduction of the plan do not differ consistently. Furthermore, the quit behavior of new hires who are able to choose between the two plans is quite similar across

[30]To be clear, we do not study movement to a pure DC plan, and it is difficult to speculate whether such a plan would have had an impact on turnover that differed from what we found.

plans. Finally, among teachers given the opportunity to transfer to the hybrid plan following its introduction in the 1997 school year, we find that those choosing to transfer exhibit significantly *lower* rates of turnover than do those choosing to stay in the traditional DB plan.

Although these findings run counter to conventional wisdom, they are within the range of expected potential outcomes (given the potential influence of employee preferences and perceptions) and are not without precedent in the empirical literature. As previously discussed, Gustman and Steinmeier (1993) and Even and McPherson (1996) both found that employees enrolled in employer-sponsored pension plans have lower rates of turnover than do un-pensioned employees, regardless of pension structure. And in analyzing the behavior of employees transferring from a DB plan to a DC plan, Goda et al. (2016) also found lower rates of turnover among transferring employees after controlling for a positive selection effect between turnover and DC plan enrollment. Gustman and Steinmeier (1993) noted that pension-covered jobs tend to pay higher levels of compensation than workers could find elsewhere and argued that it is this compensation premium, not backloaded pension structures, that drives lower turnover rates.

To the extent that it is the *level* of compensation rather than the *structure* of compensation that drives employee retention, both employers and employees may benefit by shifting away from specific debates about plan structure and toward the broader question of how to provide pension plans with features that employees value. This approach is precisely what Washington State did in creating TRS3. As described in the House Bill Report on the legislation that created TRS3 (HB 1206, Laws of 1995), the state surveyed employers and employees in the Tier 2 system (which included PERS2 and TRS2) in 1991 and 1992 and identified three prevailing concerns among employees: 1) they felt they would not have a good return on their contributions if they left before the age of 65, 2) younger employees felt they were contributing to a plan from which they would not benefit, and 3) they found the Tier 2 system to be paternalistic and inflexible. PERS3 and TRS3 were created with the intention of addressing these concerns. This perspective might explain why the teachers who transferred from TRS2 to TRS3 exhibited significantly lower levels of turnover—those who transferred may have *felt* more highly compensated than those who opted to stay in TRS2.[31]

Gaining a better understanding of which pension plan features are valued by current employees is an important area for future work as it can help policymakers and employers structure plans that are more effective at attracting and retaining employees. Overall, our analysis raises questions

[31]The transfer–stay choice context allows the assertion that those who transferred to TRS3 experienced a positive change in the utility value of compensation whereas those who stayed in TRS2 did not. We cannot say whether the utility value of compensation is higher or lower (in absolute terms) for either group, however, because both stayers and movers were able to choose the plan they valued more highly.

about whether the pension plan feature that has received the most attention in scholarly research examining plans' effects on employee retention—the degree of backloading in DB pensions—is in fact a significant driver of employee turnover.

## Appendix

*Table A.1.* Early-Career Quit Propensities Before and After Introduction of TRS3

| *Variable* | *(1)* *Exit within 1 year* | *(2)* *Exit within 2 years* | *(3)* *Exit within 3 years* | *(4)* *Exit within 4 years* |
|---|---|---|---|---|
| **Year hired** | | | | |
| 1987 | 0.110 | −0.010 | −0.049 | −0.036 |
| | (0.095) | (0.079) | (0.073) | (0.070) |
| 1988 | 0.034 | −0.067 | −0.014 | −0.015 |
| | (0.089) | (0.073) | (0.067) | (0.064) |
| 1989 | −0.208** | −0.243*** | −0.174*** | −0.166*** |
| | (0.092) | (0.074) | (0.067) | (0.064) |
| 1990 | −0.209** | −0.268*** | −0.344*** | −0.320*** |
| | (0.085) | (0.069) | (0.064) | (0.061) |
| 1991 | −0.107 | −0.245*** | −0.201*** | −0.169*** |
| | (0.082) | (0.067) | (0.061) | (0.058) |
| 1992 | −0.306*** | −0.425*** | −0.364*** | −0.252*** |
| | (0.087) | (0.072) | (0.064) | (0.060) |
| 1993 | −0.171** | −0.234*** | −0.199*** | −0.173*** |
| | (0.080) | (0.065) | (0.059) | (0.056) |
| 1994 | −0.244*** | −0.258*** | −0.247*** | −0.180*** |
| | (0.082) | (0.067) | (0.061) | (0.058) |
| 1995 | 0.058 | −0.028 | −0.002 | 0.062 |
| | (0.076) | (0.063) | (0.058) | (0.055) |
| 1996 | −0.163* | −0.174** | −0.050 | 0.038 |
| | (0.086) | (0.069) | (0.062) | (0.059) |
| 1997 | 0.026 | 0.041 | 0.098 | 0.217*** |
| | (0.084) | (0.068) | (0.062) | (0.059) |
| 1998 | 0.017 | −0.016 | 0.078 | 0.160*** |
| | (0.080) | (0.065) | (0.059) | (0.056) |
| 1999 | 0.039 | 0.100 | 0.135** | 0.170*** |
| | (0.077) | (0.062) | (0.057) | (0.055) |
| 2000 | (Reference) | (Reference) | (Reference) | (Reference) |
| | — | — | — | — |
| 2001 | −0.016 | 0.025 | 0.039 | 0.077 |
| | (0.076) | (0.061) | (0.056) | (0.053) |
| 2002 | 0.230*** | 0.146** | 0.121** | 0.172*** |
| | (0.071) | (0.058) | (0.054) | (0.051) |
| 2003 | 0.298*** | 0.181*** | 0.190*** | 0.245*** |
| | (0.075) | (0.062) | (0.057) | (0.055) |
| 2004 | 0.039 | 0.023 | 0.059 | 0.125** |
| | (0.083) | (0.066) | (0.060) | (0.058) |
| 2005 | −0.112 | −0.063 | 0.017 | 0.058 |
| | (0.081) | (0.064) | (0.058) | (0.056) |
| 2006 | −0.013 | −0.058 | −0.051 | −0.077 |
| | (0.079) | (0.063) | (0.058) | (0.056) |
| 2007 | 0.037 | −0.022 | −0.071 | −0.110** |

*(continued)*

*Table A.1.* Continued

| *Variable* | *(1) Exit within 1 year* | *(2) Exit within 2 years* | *(3) Exit within 3 years* | *(4) Exit within 4 years* |
|---|---|---|---|---|
| | (0.079) | (0.064) | (0.058) | (0.056) |
| Age at hire | 0.025*** | 0.009*** | −0.003** | −0.011*** |
| | (0.002) | (0.001) | (0.001) | (0.001) |
| Female | 0.033 | 0.144*** | 0.252*** | 0.312*** |
| | (0.031) | (0.025) | (0.023) | (0.022) |
| **Ethnicity** | | | | |
| Asian | 0.180** | 0.158** | 0.152*** | 0.195*** |
| | (0.078) | (0.064) | (0.058) | (0.055) |
| Black | 0.121 | 0.193** | 0.287*** | 0.298*** |
| | (0.099) | (0.080) | (0.073) | (0.070) |
| Hispanic | −0.052 | −0.026 | −0.081 | −0.115* |
| | (0.085) | (0.068) | (0.063) | (0.060) |
| Native American | −0.068 | −0.099 | −0.136 | −0.190* |
| | (0.151) | (0.125) | (0.115) | (0.110) |
| White | (Reference) | (Reference) | (Reference) | (Reference) |
| | — | — | — | — |
| Advanced degree | −0.660*** | −0.776*** | −0.864*** | −0.940*** |
| | (0.027) | (0.022) | (0.020) | (0.019) |
| Salary ($10,000s) | −0.405*** | −0.227*** | −0.121*** | −0.058*** |
| | (0.019) | (0.016) | (0.015) | (0.014) |
| **School level** | | | | |
| Elementary | (Reference) | (Reference) | (Reference) | (Reference) |
| | — | — | — | — |
| Middle | 0.265*** | 0.235*** | 0.213*** | 0.209*** |
| | (0.035) | (0.029) | (0.026) | (0.025) |
| High | 0.384*** | 0.393*** | 0.415*** | 0.423*** |
| | (0.041) | (0.034) | (0.031) | (0.030) |
| Other | 0.332*** | 0.278*** | 0.271*** | 0.260*** |
| | (0.068) | (0.057) | (0.053) | (0.051) |
| % Under-represented minority | 0.140** | 0.089 | 0.093* | 0.085* |
| | (0.068) | (0.056) | (0.051) | (0.049) |
| Students (100s) | −0.005 | −0.008*** | −0.009*** | −0.010*** |
| | (0.004) | (0.003) | (0.003) | (0.003) |
| Observations | 60,330 | 60,330 | 60,330 | 60,330 |
| Pseudo-$R^2$ | 0.0415 | 0.0378 | 0.0422 | 0.0492 |
| Log-Likelihood | −20619 | −28109 | −32386 | −34760 |

*Notes:* Coefficients are reported as log-odds ratios. Standard errors in parentheses, clustered at the individual level.
***Significant at the 1% level; ** at the 5% level; * at the 10% level.

*Table A.2.* Quit Propensities of Teachers Who Could Transfer from TRS2 to TRS3

| *Variable* | *(1)* | *(2)* | *(3)* | *(4)* | *(5)* |
|---|---|---|---|---|---|
| **School year** | | | | | |
| 1998 | 0.573*** | 0.576*** | 0.544*** | 0.420*** | 0.605*** |
| | (0.061) | (0.062) | (0.062) | (0.077) | (0.111) |
| 1999 | 0.334*** | 0.339*** | 0.317*** | 0.270*** | 0.204 |

*(continued)*

*Table A.2.* Continued

| *Variable* | *(1)* | *(2)* | *(3)* | *(4)* | *(5)* |
|---|---|---|---|---|---|
| | (0.068) | (0.068) | (0.069) | (0.083) | (0.131) |
| 2000 | 0.362*** | 0.369*** | 0.354*** | 0.254*** | 0.385*** |
| | (0.070) | (0.070) | (0.071) | (0.087) | (0.126) |
| 2001 | 0.115 | 0.119 | 0.111 | −0.087 | 0.307** |
| | (0.080) | (0.080) | (0.081) | (0.104) | (0.136) |
| 2002 | −0.110 | −0.125 | −0.130 | −0.217* | −0.167 |
| | (0.090) | (0.091) | (0.091) | (0.112) | (0.174) |
| 2003 | −0.157* | −0.191** | −0.191** | −0.348*** | 0.047 |
| | (0.095) | (0.095) | (0.096) | (0.121) | (0.165) |
| 2004 | −0.266*** | −0.315*** | −0.312*** | −0.415*** | −0.069 |
| | (0.103) | (0.103) | (0.103) | (0.130) | (0.175) |
| 2005 | −0.231** | −0.296*** | −0.291*** | −0.298** | −0.238 |
| | (0.105) | (0.105) | (0.106) | (0.128) | (0.198) |
| 2006 | −0.521*** | −0.611*** | −0.610*** | −0.619*** | −0.480** |
| | (0.125) | (0.125) | (0.126) | (0.153) | (0.233) |
| 2007 | −0.553*** | −0.662*** | −0.655*** | −0.625*** | −0.512** |
| | (0.129) | (0.130) | (0.130) | (0.157) | (0.244) |
| 2008 | −0.789*** | −0.918*** | −0.918*** | −0.871*** | −0.776*** |
| | (0.149) | (0.150) | (0.150) | (0.182) | (0.285) |
| 2009 | −1.078*** | −1.230*** | −1.230*** | −1.385*** | −0.683** |
| | (0.176) | (0.176) | (0.177) | (0.235) | (0.285) |
| 2010 | −1.193*** | −1.359*** | −1.365*** | −1.198*** | −1.416*** |
| | (0.190) | (0.190) | (0.191) | (0.220) | (0.415) |
| 2011 | −0.715*** | −0.900*** | −0.907*** | −0.872*** | −0.635** |
| | (0.158) | (0.158) | (0.159) | (0.197) | (0.297) |
| 2012 | −0.994*** | −1.195*** | −1.203*** | −1.116*** | −0.985*** |
| | (0.184) | (0.185) | (0.186) | (0.225) | (0.362) |
| 2013 | −0.717*** | −0.938*** | −0.945*** | −0.845*** | −0.462 |
| | (0.168) | (0.168) | (0.170) | (0.205) | (0.300) |
| (Plan = TRS3)*(Year = 1997) | 0.252** | 0.221* | 0.253** | −0.004 | 0.696*** |
| | (0.118) | (0.120) | (0.120) | (0.172) | (0.167) |
| (Plan = TRS3)*(Year = 1998) | −0.616*** | −0.620*** | −0.557*** | −0.500*** | −0.414*** |
| | (0.064) | (0.064) | (0.065) | (0.082) | (0.112) |
| (Plan = TRS3)*(Year = 1999) | −0.389*** | −0.394*** | −0.327*** | −0.276*** | −0.181 |
| | (0.072) | (0.072) | (0.073) | (0.089) | (0.136) |
| (Plan = TRS3)*(Year = 2000) | −0.365*** | −0.372*** | −0.301*** | −0.214** | −0.231* |
| | (0.073) | (0.074) | (0.074) | (0.093) | (0.130) |
| (Plan = TRS3)*(Year = 2001) | −0.316*** | −0.321*** | −0.249*** | −0.023 | −0.416*** |
| | (0.085) | (0.086) | (0.086) | (0.111) | (0.143) |
| (Plan = TRS3)*(Year = 2002) | −0.361*** | −0.354*** | −0.274*** | −0.170 | −0.185 |
| | (0.099) | (0.099) | (0.099) | (0.124) | (0.184) |
| (Plan = TRS3)*(Year = 2003) | −0.395*** | −0.377*** | −0.296*** | −0.157 | −0.417** |
| | (0.104) | (0.105) | (0.105) | (0.136) | (0.177) |
| (Plan = TRS3)*(Year = 2004) | −0.399*** | −0.378*** | −0.294** | −0.197 | −0.413** |
| | (0.114) | (0.114) | (0.114) | (0.146) | (0.192) |
| (Plan = TRS3)*(Year = 2005) | −0.600*** | −0.572*** | −0.489*** | −0.406*** | −0.498** |
| | (0.118) | (0.119) | (0.120) | (0.147) | (0.219) |
| (Plan = TRS3)*(Year = 2006) | −0.163 | −0.122 | −0.035 | −0.096 | 0.128 |
| | (0.135) | (0.135) | (0.136) | (0.170) | (0.244) |
| (Plan = TRS3)*(Year = 2007) | −0.146 | −0.103 | −0.019 | 0.021 | −0.038 |
| | (0.141) | (0.141) | (0.142) | (0.174) | (0.260) |
| (Plan = TRS3)*(Year = 2008) | −0.210 | −0.159 | −0.070 | −0.035 | −0.061 |
| | (0.164) | (0.164) | (0.165) | (0.203) | (0.305) |

*(continued)*

*Table A.2.* Continued

| *Variable* | *(1)* | *(2)* | *(3)* | *(4)* | *(5)* |
|---|---|---|---|---|---|
| (Plan = TRS3)*(Year = 2009) | −0.389** | −0.330* | −0.240 | −0.048 | −0.560* |
| | (0.198) | (0.198) | (0.199) | (0.265) | (0.318) |
| (Plan = TRS3)*(Year = 2010) | −0.146 | −0.086 | 0.010 | −0.309 | 0.506 |
| | (0.208) | (0.209) | (0.209) | (0.254) | (0.432) |
| (Plan = TRS3)*(Year = 2011) | −0.476*** | −0.412** | −0.313* | −0.279 | −0.343 |
| | (0.177) | (0.178) | (0.179) | (0.225) | (0.324) |
| (Plan = TRS3)*(Year = 2012) | −0.233 | −0.167 | −0.071 | −0.138 | 0.104 |
| | (0.203) | (0.203) | (0.204) | (0.254) | (0.382) |
| (Plan = TRS3)*(Year = 2013) | −0.576*** | −0.505*** | −0.409** | −0.608** | −0.320 |
| | (0.191) | (0.191) | (0.193) | (0.245) | (0.324) |
| Age in 1996 | | −0.030*** | −0.033*** | | |
| | | (0.002) | (0.002) | | |
| Experience in 1996 | | −0.086*** | −0.084*** | | |
| | | (0.005) | (0.005) | | |
| Female | | | 0.486*** | 0.527*** | 0.446*** |
| | | | (0.030) | (0.040) | (0.048) |
| **Ethnicity** | | | | | |
| White | | | (Reference) | (Reference) | (Reference) |
| | | | — | — | — |
| Asian | | | 0.019 | 0.058 | 0.066 |
| | | | (0.082) | (0.101) | (0.150) |
| Black | | | 0.401*** | 0.237** | 0.560*** |
| | | | (0.090) | (0.117) | (0.130) |
| Hispanic | | | 0.076 | 0.175* | −0.083 |
| | | | (0.078) | (0.096) | (0.146) |
| Native American | | | −0.116 | −0.103 | −0.021 |
| | | | (0.145) | (0.194) | (0.215) |
| Advanced degree holder | | | −0.673*** | −0.686*** | −0.571*** |
| | | | (0.025) | (0.033) | (0.040) |
| **School level** | | | | | |
| Elementary | | | (Reference) | (Reference) | (Reference) |
| | | | — | — | — |
| Middle | | | 0.094*** | 0.091** | 0.107** |
| | | | (0.032) | (0.042) | (0.052) |
| High | | | 0.213*** | 0.229*** | 0.141** |
| | | | (0.040) | (0.051) | (0.065) |
| Other | | | 0.144** | 0.091 | 0.259** |
| | | | (0.068) | (0.089) | (0.104) |
| % Under-represented minority | | | −0.232*** | −0.234*** | −0.262** |
| | | | (0.068) | (0.088) | (0.110) |
| School size (100s of students) | | | −0.008** | −0.005 | −0.004 |
| | | | (0.003) | (0.004) | (0.006) |
| Observations | 235,594 | 235,594 | 235,594 | 112,447 | 117,712 |
| Pseudo-$R^2$ | 0.0265 | 0.0412 | 0.0582 | 0.0501 | 0.0336 |
| Log-Likelihood | −36007 | −35465 | −34836 | −19843 | −14137 |

*Notes:* Coefficients are reported as log-odds ratios. Standard errors in parentheses, clustered at the individual level. Column (4) restricts the estimation sample to teachers with less than 5 YOS. Column (5) restricts the estimation sample to teachers with 5 or more YOS.
***Significant at the 1% level; ** at the 5% level; * at the 10% level.

*Table A.3.* Quit Patterns among Teachers Hired Before and After Introduction of TRS3

| *Variable* | *(1)* *1996 vs. 1997* | *(2)* *1996 vs. 1997* | *(3)* *1996 vs. 1997* | *(4)* *1996 vs. 1997* | *(5)* *1995–96 vs. 1997–98* |
|---|---|---|---|---|---|
| **Years of service** | | | | | |
| 1 | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| | — | — | — | — | — |
| 2 | −0.249*** | −0.249*** | −0.245** | −0.240*** | −0.397*** |
| | (0.096) | (0.097) | (0.098) | (0.068) | (0.063) |
| 3 | −0.165* | −0.165* | −0.150 | −0.227*** | −0.390*** |
| | (0.100) | (0.099) | (0.101) | (0.071) | (0.066) |
| 4 | −0.341*** | −0.341*** | −0.306*** | −0.308*** | −0.535*** |
| | (0.106) | (0.106) | (0.107) | (0.075) | (0.070) |
| 5 | −0.215** | −0.213** | −0.166 | −0.263*** | −0.398*** |
| | (0.106) | (0.106) | (0.108) | (0.076) | (0.069) |
| 6 | −0.489*** | −0.486*** | −0.427*** | −0.552*** | −0.518*** |
| | (0.117) | (0.117) | (0.118) | (0.084) | (0.073) |
| 7 | −0.720*** | −0.718*** | −0.652*** | −0.638*** | −0.750*** |
| | (0.127) | (0.127) | (0.128) | (0.089) | (0.080) |
| 8 | −0.866*** | −0.862*** | −0.793*** | −0.858*** | −0.982*** |
| | (0.138) | (0.139) | (0.139) | (0.098) | (0.089) |
| 9 | −1.088*** | −1.086*** | −1.012*** | −0.969*** | −1.148*** |
| | (0.150) | (0.150) | (0.151) | (0.104) | (0.096) |
| 10 | −0.974*** | −0.971*** | −0.896*** | −0.978*** | −0.922*** |
| | (0.147) | (0.148) | (0.148) | (0.107) | (0.090) |
| 11 | −1.306*** | −1.302*** | −1.231*** | −1.241*** | −1.291*** |
| | (0.173) | (0.173) | (0.174) | (0.122) | (0.108) |
| 12 | −1.132*** | −1.128*** | −1.050*** | −1.152*** | −1.409*** |
| | (0.166) | (0.166) | (0.167) | (0.121) | (0.116) |
| 13 | −1.750*** | −1.745*** | −1.675*** | −1.923*** | −1.808*** |
| | (0.221) | (0.222) | (0.223) | (0.172) | (0.142) |
| 14 | −2.330*** | −2.326*** | −2.254*** | −2.291*** | −2.023*** |
| | (0.298) | (0.298) | (0.299) | (0.210) | (0.161) |
| 15 | −1.863*** | −1.863*** | −1.794*** | −1.824*** | −2.204*** |
| | (0.246) | (0.247) | (0.248) | (0.175) | (0.180) |
| 16 | −2.031*** | −2.031*** | −1.969*** | −2.055*** | −2.256*** |
| | (0.278) | (0.278) | (0.279) | (0.204) | (0.191) |
| 17 | −2.494*** | −2.495*** | −2.425*** | −2.173*** | −2.238*** |
| | (0.362) | (0.362) | (0.362) | (0.230) | (0.198) |
| 18 | −2.793*** | −2.794*** | −2.705*** | −2.745*** | −2.450*** |
| | (0.454) | (0.454) | (0.455) | (0.453) | (0.235) |
| 1997 Cohort | | | | 0.068* | |
| | | | | (0.040) | |
| (1997 Cohort)*(YOS = 1) | 0.166* | 0.163* | 0.157* | | 0.009 |
| | (0.091) | (0.091) | (0.092) | | (0.059) |
| (1997 Cohort)*(YOS = 2) | 0.163 | 0.160 | 0.167 | | 0.112 |
| | (0.104) | (0.104) | (0.105) | | (0.070) |
| (1997 Cohort)*(YOS = 3) | −0.013 | −0.014 | 0.004 | | 0.095 |
| | (0.109) | (0.109) | (0.109) | | (0.074) |
| (1997 Cohort)*(YOS = 4) | 0.139 | 0.137 | 0.155 | | 0.138* |
| | (0.117) | (0.117) | (0.117) | | (0.080) |
| (1997 Cohort)*(YOS = 5) | −0.056 | −0.059 | −0.038 | | −0.190** |
| | (0.120) | (0.120) | (0.121) | | (0.083) |
| (1997 Cohort)*(YOS = 6) | −0.112 | −0.116 | −0.098 | | −0.266*** |

*(continued)*

*Table A.3.* Continued

| *Variable* | *(1) 1996 vs. 1997* | *(2) 1996 vs. 1997* | *(3) 1996 vs. 1997* | *(4) 1996 vs. 1997* | *(5) 1995–96 vs. 1997–98* |
|---|---|---|---|---|---|
| | (0.141) | (0.141) | (0.141) | | (0.092) |
| (1997 Cohort)*(YOS = 7) | 0.165 | 0.165 | 0.187 | | −0.005 |
| | (0.150) | (0.150) | (0.151) | | (0.099) |
| (1997 Cohort)*(YOS = 8) | 0.014 | 0.012 | 0.030 | | −0.021 |
| | (0.173) | (0.173) | (0.173) | | (0.115) |
| (1997 Cohort)*(YOS = 9) | 0.220 | 0.219 | 0.243 | | 0.177 |
| | (0.185) | (0.185) | (0.186) | | (0.120) |
| (1997 Cohort)*(YOS = 10) | −0.038 | −0.037 | −0.008 | | −0.362*** |
| | (0.192) | (0.192) | (0.194) | | (0.128) |
| (1997 Cohort)*(YOS = 11) | 0.108 | 0.107 | 0.139 | | −0.236 |
| | (0.225) | (0.225) | (0.226) | | (0.152) |
| (1997 Cohort)*(YOS = 12) | −0.075 | −0.076 | −0.048 | | −0.159 |
| | (0.223) | (0.223) | (0.225) | | (0.163) |
| (1997 Cohort)*(YOS = 13) | −0.427 | −0.429 | −0.397 | | −0.348 |
| | (0.342) | (0.342) | (0.343) | | (0.214) |
| (1997 Cohort)*(YOS = 14) | 0.057 | 0.054 | 0.086 | | −0.216 |
| | (0.411) | (0.411) | (0.411) | | (0.237) |
| (1997 Cohort)*(YOS = 15) | 0.066 | 0.068 | 0.100 | | 0.075 |
| | (0.337) | (0.337) | (0.338) | | (0.248) |
| (1997 Cohort)*(YOS = 16) | −0.060 | −0.060 | −0.018 | | −0.012 |
| | (0.396) | (0.396) | (0.398) | | (0.275) |
| (1997 Cohort)*(YOS = 17) | 0.583 | 0.584 | 0.628 | | 0.181 |
| | (0.459) | (0.459) | (0.460) | | (0.350) |
| Age in first year (YOS = 1) | | | −0.019*** | −0.019*** | |
| | | | (0.003) | (0.003) | |
| Female | | | 0.431*** | 0.431*** | |
| | | | (0.048) | (0.048) | |
| **Ethnicity** | | | | | |
| White | | | (Reference) | | |
| | | | — | | |
| Asian | | | 0.126 | 0.125 | |
| | | | (0.113) | (0.113) | |
| Black | | | 0.206 | 0.207 | |
| | | | (0.132) | (0.132) | |
| Hispanic | | | 0.162 | 0.161 | |
| | | | (0.127) | (0.127) | |
| Native American | | | −0.167 | −0.167 | |
| | | | (0.222) | (0.222) | |
| Advanced degree holder | | | −0.757*** | −0.757*** | |
| | | | (0.041) | (0.041) | |
| **School level** | | | | | |
| Elementary | | (Reference) | (Reference) | | |
| | | — | — | | |
| Middle | | 0.040 | 0.137*** | 0.137*** | |
| | | (0.051) | (0.051) | (0.051) | |
| High | | 0.079 | 0.195*** | 0.195*** | |
| | | (0.061) | (0.063) | (0.063) | |
| Other | | −0.151 | −0.023 | −0.022 | |
| | | (0.115) | (0.116) | (0.116) | |
| % Under-represented minority | | −0.072 | −0.115 | −0.114 | |
| | | (0.111) | (0.115) | (0.115) | |

*(continued)*

*Table A.3.* Continued

| *Variable* | *(1)* *1996 vs. 1997* | *(2)* *1996 vs. 1997* | *(3)* *1996 vs. 1997* | *(4)* *1996 vs. 1997* | *(5)* *1995–96 vs. 1997–98* |
|---|---|---|---|---|---|
| School size (100s students) | | −0.003 | −0.003 | −0.003 | |
| | | (0.005) | (0.006) | (0.006) | |
| Observations | 51,442 | 51,442 | 51,442 | 51,442 | 114,506 |
| Pseudo-$R^2$ | 0.0454 | 0.0456 | 0.0689 | 0.0449 | 0.0435 |
| Log-Likelihood | −11107 | −11105 | −10834 | −11113 | −24937 |

*Notes:* Coefficients are reported as log-odds ratios. Standard errors in parentheses, clustered at the individual level. For the model in column (5) the variable label "1997 Cohort" is an indicator of belonging to the 1997 or 1998 cohorts. Each other column is estimated on the sample including only the 1996 and 1997 Cohorts.
***Significant at the 1% level; ** at the 5% level; * at the 10% level.

*Table A.4.* Quit Propensities of New Hires Who Can Choose between TRS2 and TRS3

| *Variable* | *(1)* | *(2)* | *(3)* | *(4)* | *(5)* |
|---|---|---|---|---|---|
| **Years of service** | | | | | |
| 1 | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| | — | — | — | — | — |
| 2 | −0.450*** | −0.449*** | −0.443*** | −0.443*** | −0.452*** |
| | (0.099) | (0.099) | (0.099) | (0.099) | (0.065) |
| 3 | −0.745*** | −0.744*** | −0.727*** | −0.725*** | −0.787*** |
| | (0.113) | (0.113) | (0.113) | (0.113) | (0.074) |
| 4 | −0.992*** | −0.991*** | −0.967*** | −0.966*** | −0.871*** |
| | (0.126) | (0.126) | (0.126) | (0.126) | (0.078) |
| 5 | −1.310*** | −1.309*** | −1.284*** | −1.282*** | −0.996*** |
| | (0.149) | (0.149) | (0.149) | (0.149) | (0.086) |
| 6 | −1.237*** | −1.236*** | −1.192*** | −1.189*** | −1.020*** |
| | (0.201) | (0.201) | (0.201) | (0.201) | (0.117) |
| Choice = TRS3 | | | | | −0.002 |
| | | | | | (0.050) |
| (Plan = TRS3)*(YOS = 1) | −0.065 | −0.064 | −0.058 | −0.156* | |
| | (0.083) | (0.083) | (0.083) | (0.092) | |
| (Plan = TRS3)*(YOS = 2) | −0.080 | −0.079 | −0.073 | −0.119 | |
| | (0.104) | (0.104) | (0.104) | (0.114) | |
| (Plan = TRS3)*(YOS = 3) | −0.165 | −0.164 | −0.162 | −0.106 | |
| | (0.124) | (0.124) | (0.125) | (0.134) | |
| (Plan = TRS3)*(YOS = 4) | 0.100 | 0.101 | 0.100 | 0.071 | |
| | (0.138) | (0.138) | (0.138) | (0.149) | |
| (Plan = TRS3)*(YOS = 5) | 0.387** | 0.388** | 0.389** | 0.371** | |
| | (0.162) | (0.162) | (0.162) | (0.172) | |
| (Plan = TRS3)*(YOS = 6) | 0.226 | 0.227 | 0.211 | 0.163 | |
| | (0.232) | (0.232) | (0.233) | (0.248) | |
| Age in first year | | 0.001 | 0.003 | 0.002 | 0.003 |
| | | (0.003) | (0.003) | (0.003) | (0.003) |
| Female | | | 0.303*** | 0.324*** | 0.303*** |
| | | | (0.062) | (0.070) | (0.062) |
| **Ethnicity** | | | | | |
| White | | | (Reference) | (Reference) | (Reference) |
| | | | — | — | — |

*(continued)*

*Table A.4.* Continued

| *Variable* | *(1)* | *(2)* | *(3)* | *(4)* | *(5)* |
|---|---|---|---|---|---|
| Asian | | | −0.007 | 0.043 | −0.009 |
| | | | (0.127) | (0.137) | (0.127) |
| Black | | | 0.125 | 0.208 | 0.127 |
| | | | (0.196) | (0.210) | (0.196) |
| Hispanic | | | 0.041 | −0.035 | 0.039 |
| | | | (0.135) | (0.151) | (0.135) |
| Native American | | | −0.970** | −1.012** | −0.974** |
| | | | (0.381) | (0.406) | (0.381) |
| Advanced degree holder | | | −0.167*** | −0.162*** | −0.167*** |
| | | | (0.050) | (0.055) | (0.050) |
| **School level** | | | | | |
| Elementary | | | (Reference) | (Reference) | (Reference) |
| | | | — | — | — |
| Middle | | | 0.068 | 0.073 | 0.069 |
| | | | (0.069) | (0.077) | (0.069) |
| High | | | 0.350*** | 0.388*** | 0.350*** |
| | | | (0.080) | (0.087) | (0.080) |
| Other | | | 0.376*** | 0.459*** | 0.382*** |
| | | | (0.126) | (0.136) | (0.126) |
| % Under-represented minority | | | −0.196* | −0.142 | −0.197* |
| | | | (0.110) | (0.122) | (0.110) |
| School size (100s students) | | | −0.004 | −0.004 | −0.004 |
| | | | (0.007) | (0.007) | (0.007) |
| Observations | 22,183 | 22,183 | 22,183 | 18,229 | 22,183 |
| Pseudo-$R^2$ | 0.0222 | 0.0222 | 0.0277 | 0.0211 | 0.0270 |
| Log-Likelihood | −6434 | −6434 | −6397 | −5235 | −6402 |

*Notes:* Coefficients are reported as log-odds ratios. Standard errors in parentheses, clustered at the individual level. The regression in column (4) excludes individuals who defaulted into TRS3 rather than indicating an active preference for the plan.
***Significant at the 1% level; ** at the 5% level; * at the 10% level.

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