Effects of a Transition to a Defined Contribution Retirement Plan on Teacher Separations in Alaska

Jen Sidorova, Reason Foundation
Evgenia Gorina, University of Texas at Dallas
Anil Niraula, Reason Foundation
Marc Joffe, Reason Foundation

Abstract

In 2005, Alaska enacted one of the most radical retirement system reforms in the public sector by discontinuing enrollment into its defined-benefit pension plan and creating a 401(k)-style defined contribution plan for all new public workers hired after July 1, 2006. The reform represented a significant change in accrual patterns, a reduction in benefit generosity, and a transfer of investment risk from the employer to the employees. Using individual-level data for all Alaska teachers in the Teacher Retirement System (TRS) before and after the retirement benefit change (2005–2017), we assess the effects of the reform on teacher mobility out of employment with the Alaska K-12 system. Using a panel of member-specific data, we examine short-run and longer-run effects of a radical benefit redesign on the labor market behavior of public educators. Contrary to expectations, we document a decrease in separations after the reform in the short run while also showing weaker but still negative longer-term impacts of the reform on teacher separations from public sector employment as educators.

Introduction

Retirement benefits are a significant part of the compensation package offered to an employee upon hire. When retirement benefits change, these changes can influence employment within and across sectors. Rational choice theory predicts that when the value of a compensation package declines, worker turnover should go up, reflecting a decline in the attractiveness of current employment (Freeman 1980; Groot and Verberne 1997). Does the rational choice model apply to the behavior of public educators after a radical benefit redesign? Given the increasingly diverse work-related motivations, needs, and determinants of job satisfaction among millennial workers, do the effects of a benefit-reducing retirement system reform differ by teacher age?

Public sector jobs have traditionally offered retirement benefits through defined-benefit retirement plans (DB) in the form of guaranteed monthly payments in perpetuity. In contrast, private sector jobs typically offer retirement benefits through defined contribution plans (DC) whereby monthly payments in retirement depend on the balance the retiree's personal retirement account and are paid until the funds are exhausted.[1] Historically, private sector has offered higher wages, particularly at the top of the income distribution, and the public sector has compensated for the wage disparity with relatively more generous deferred retirement benefits as part of the compensation package (Gyourko and Tracy 1989; Lyons and Lav 2007; Quinn 1982; Munnell et al. 2011; Edwards 2011).

When the Alaska Legislature enacted its retirement system reform in 2006, over 90% of public sector workers nationwide were covered by a DB plan (Munnell et al. 2007). This percentage has changed slightly as more states and localities have started offering hybrid retirement arrangements with optional DC and cash balance plans, but it is still hovering around

[1] The private sector used to offer defined-benefit retirement plans but has largely moved toward 401K-style - defined contribution (DC) plans since the 1970s (Anderson and Brainard 2004).

90% (Munnell, cite). Close to 85% of all public sector retirement assets are held in state-administered retirement systems (U.S. Census Bureau Survey of Public Sector Pensions, cite), and public educators are the largest category of beneficiaries covered by defined-benefit plans (U.S. Census Bureau 2014 Annual Survey of Public Employment & Payroll data, cite).

Similar to educators in other states, K-12 teachers in Alaska are the largest and most mobile category of public sector workers. Research finds that they exhibit higher turnover than their continental counterparts, with high attrition in the first years of employment with an average turnover of about 20% (Vazquez Cano et al. 2019), relative to the national average of 8%. Given that the average turnover rate of Alaska public workers is below 7% (DLWD 2020), teacher turnover is high. But importantly, this 20% turnover includes moves within school districts, between districts, and exits from the public K-12 system.

As mentioned above, Alaska's radical retirement reform discontinued new worker enrollment into the DB plan and offered new hires a DC retirement plan as the only option. The main trigger for this contentious pension reform was a low level of DB plan funding and political tensions related to the unwillingness of the state to bridge the funding gap. The only state that had pursued a similar reform path before Alaska was Michigan, which closed its DB plan for new hires in 1997 (see Quinby 2019).[2] Quinby's (2019) analysis of the effects of Michigan's

[2] After the Great Recession of 2007–2009 damaged investment returns and exposed troublesome levels of retirement plan funding in other states' retirement systems[2] (Andronov et al. 2015, Munnell and Aubry 2015, Andronov and Raux 2018), many states pursued some form of retirement benefit changes (NASRA 2018, Gorina and Hoang 2020). The pension reforms differed in design and scope. Many states introduced defined-contribution plans and hybrid plans with the DC component as options for retirement. Yet, with the exception of Alaska in 2006, Michigan in 1997, and Oklahoma in 2015, no other state has offered a mandatory state-administered defined-contribution retirement plan for all new hires (see NASRA 2019 for all DC plans in state-administered retirement systems).

transition to a defined contribution on worker separations shows that the Michigan reform increased worker separations within 10 years by about 5% on average. The retention behavior of older professional workers having been affected by the reform and younger workers being unaffected by it.

Similar to Quinby (2019), we examine teacher behavior in the aftermath of a retirement system reform. Working with data for all Alaska educators employed by the public K-12 system from 2005 to 2017, we model their responsiveness to the reform both in the short term and in the long term. Given the differences between Michigan and Alaska in reform timing, vesting requirements, generational characteristics of the labor force, our focus on K-12 teachers, rather than on general employees, and finally our analysis of separations from the public sector employment rather than turnover that includes moves within the sector, we offer distinct new knowledge on the responsiveness of the public educator workforce to a radical benefit redesign. In contrast to Quinby (2019), we show negative associations of the pension reform with worker separations from public employment as teachers in Alaska. We interpret the findings as a reflection of generational differences in the expectations from public sector employment.

Alaska Pension Reform

In 2005, the Alaska Legislature enacted one of the most radical retirement system reforms in the public sector by discontinuing enrollment into the defined-benefit pension plan and creating a 401(k)-style defined contribution plan for all covered state employees and teachers hired after July 1, 2006. The reform represented a significant change in benefit accrual patterns, a relative reduction in benefit generosity for the new plan entrants, and a transfer of investment risk from the employer to the employee. Since Alaska teachers are not covered by the Social Security system, their transition to the DC plan effectively reduced their retirement security, relative to their peers

in Alaska's defined-benefit plan with guaranteed annuities and relative to most educators in other states who are covered by Social Security.

The new retirement plan (Tier IV)[3] had an 8% employee contribution rate and a generous 7% employer contribution requirement, in contrast to the 8.65% contribution rate for the employee and a floating contribution rate for the employer[4] in the DB plan. The new plan also included a gradual five-year vesting process for employer contributions, in contrast to the DB plan with non-incremental five-year vesting.

Effects of Retirement Benefit Changes on Workers

Prior research offers mixed empirical evidence on the effects of benefit redesign on the labor market of public workers. Some studies show evidence that changes in retirement benefits increase employee turnover (Gustman et al. 1994; Lazear and Moore 1988; Even and Macpherson 1996; Harris and Adams 2007) and affect worker motivation (Lazear 1990; Montizaan et al. 2010; Montizaan et al. 2015). Lewis and Stoycheva (2016) show that moving federal workers to a DC plan in the 1990s increased exits of middle-aged workers by about a third, and they interpret the change as a desired outcome of increasing federal worker mobility. As mentioned above, Quinby (2019) documents an increase in older worker turnover and no effects on younger workers within the first 10 years after a DC switch in Michigan in 1997. Goldhaber et al. (2017) demonstrate weak differences in the retention patterns between a DB and an optional hybrid DB-DC plan for teachers in Washington while also documenting statistically significant negative turnover effects of the DC plan choice by teachers. Looking at the effects of

[3] http://doa.alaska.gov/drb/your_rnb/employee/whatplan_m_i_n.html#.X5tJR9BKhaS
[4] Floating contribution rate was accounted for by changing actuarial determined contributions http://doa.alaska.gov/drb/pdf/trs/handbook/2011/TRS_handbook_2011_web.pdf page 6.

pension benefit enhancements in Missouri in the 1990s, Koedel and Xiang (2017) find no effects of these enhancements on teacher retention. Kong et al.'s (2018) research, however, suggests that Missouri's benefit enhancements sped up teacher retirement by 0.4 years. Quinby and Wettstein (2019) show an increase in separations by a quarter following benefit reductions in Rhode Island in 2005. The analysis of pension reform effects at the state level signals that benefit reductions produce higher turnover in states with more college-educated public sector workers (Gorina and Hoang 2020).

Quinby and Sanzenbacher (2020) and Quinby et al. (2018) find that public sector retirement systems with more-generous benefits are able to attract individuals with higher qualifications. Fuchsman et al. (2020) offer experimental evidence, based on a nationally representative survey of teachers, that, on average, educators would need to be compensated with a 2.7% pay increase to be indifferent between being enrolled in a DB and DC plan. Importantly, early-career teachers are indifferent about plan enrollment, whereas mid-career teachers and late-career teachers value defined benefit plans more than defined contribution arrangements.

Conceptual Framework

To develop the hypotheses, we proceed from the assumption that educators will recognize benefit change as a reduction in benefit generosity and an increase in portability. DB and DC plans create different expectations regarding one's retirement. In a DB plan, benefits are calculated according to a known formula.[5] At any stage of employment, the worker can plan for their retirement based on a guaranteed amount of future benefits from the state in perpetuity. There is

[5] For Alaska PERS, DB calculation formula is: 2% x AMS x years of service up to 10 and all years served prior to July 1, 1986; plus 2.25% x AMS x years of service over ten served after July 1, 1986; plus 2.5% x AMS x years of service over twenty. Here, AMS is average monthly salary. Other public pension plans will have other formulas, but in general, they depend on the number of years of service multiplied by a coefficient. Some plans also allow for cost-of-living-adjustments (COLAs) that are either predetermined or sporadic. All these conditions are known to the plan members in advance.

little uncertainty about the expected value of retirement benefits, aside from the level and frequency of post-retirement cost of living adjustments.

With a DB plan, the risk of not saving enough for retirement lies with the employer, whereas with a 401k plan, the risk rests with the employee. Although the amount of wealth generated under the DB or the DC plan ultimately depends on portfolio experience, assumptions and maintenance, the DB undoubtedly offers the employee a lower financial risk. The shift of such risk from the employer to the employee should reduce the expected value of the retirement benefits and be perceived as a reduction in the generosity of the pension plan.

A well-functioning DB plan, however, can improve the retention of high-quality workers by a "pull and push" mechanism (Shultz and Wang 2011). Guaranteed benefits that increase over time with longer job tenure will "pull" experienced mid-career employees to stay with their current employer and motivate them to work hard not to lose their position (Costrell et al. cite). Moreover, by withholding benefits from employees who are eligible to retire but keep working, DB plans "push" them out of employment to make room for younger workers.

If the plan is poorly funded, however, the financial burden on the employer can impact workers in indirect ways. Since the employer is responsible for making guaranteed payments, in the event of low investment returns, the plan sponsor can redirect the available funds from other projects to pensions. This can result in decreasing salaries and reduced investment in maintaining and improving work conditions. These aspects of a DB plan's impact on job tenure are hard to disentangle, but should not be ignored.

In contrast with the DB plan, the DC plan's expected outcome is uncertain. While the employer contributions are guaranteed, retirement income depends on the market performance of

the portfolio.[6] Typically, unless otherwise specified by a particular plan, the employer's contributions are predetermined and are not based on the performance of the retirement account investments. Since market uncertainty is always present, an employee cannot be confident of their benefit amounts from the DC plan. As a result, employees bear the risk that their retirement funds will not be sufficient to provide them with the benefits they envisioned under specific assumptions about longer-term investment returns. Therefore, DC-enrolled workers may have to delay retirement or find supplemental sources of income.

Some features of a DC plan can be highly attractive, however. The most prominent of them is benefit portability. The pension account can be rolled over to a new employer's pension plan if the worker changes careers. This feature of a DC plan minimizes the costs associated with changing jobs and may lead to a higher job turnover. On the other hand, it also means that workers who value mobility of benefits will find this feature attractive. Hires might be attracted to the portability of a DC plan, but then stay for other reasons if the employment is right for them. As a result, DC-plan portability can serve as an effective recruitment tool. Turnover in DC plans can reflect the behavior of two types of workers: those who separate because they view DC benefits as insufficient for compensating for the lower wages of the public sector and those who separate because they are taking advantage of benefit portability.

Although a retirement system's transition from a DB to a DC funding mode can be perceived as a reduction in benefit generosity as it decreases the expected value of the overall compensation package, it does not necessarily have to affect retention negatively. Given the barriers to entry and significant differences in working conditions in the educator labor market

[6] A DC plan portfolio can be rebalanced to maintain appropriate risk throughout its lifespan. This can be done when new information regarding asset market performance emerges. This does not change the fact that the employee carries all the risk.

(Hanushek and Rivkin 2010), educators may view the opportunity costs of changing current employment to be high while also discounting the losses of future retirement benefits. In addition, prior research notes that a typical public sector worker may be relatively uninformed of their own benefit changes and the effects of these changes on post-employment benefits (Gustman et al. 2010; PEW 2018). Inattention to the nature and generosity of retirement benefits may be a particularly strong factor in the employment decision calculus of younger workers (Quinby 2019, PEW 2016)

Hypotheses

We proceed from the expectations of rational choice theory and the conceptual framework above that interpret a DC transition as a reduction in benefit generosity, an increase in financial risk, and an increase in portability. Assuming that employees interpret a DB-DC transition rationally, **we expect the reform to trigger an increase in teacher separations (H1).**

Since the effects of increased benefit portability act in the same direction as the perception of reduced generosity, disentangling these effects may be empirically impossible (in the absence of definitive data on employee explanations of their quit decisions). In terms of the dominant mechanism, however, in the case of a DC transition for new hires only, rather than a reduction of benefits for existing workers, we assume that the new entrants will recognize their retirement benefit type and value at the time of making employment decisions rather than after they begin employment. Therefore, we expect the effect of a reduction in benefit generosity will influence the new hires before they decide to accept employment as teachers in Alaska rather than after they start their jobs.

Learning about the retirement system's generosity, however, may also happen on the job. Teachers may also pay more attention to the benefit package as they become older. Maturation

effects on public sector worker retirement preferences have been noted before (Fuschman et al. 2020, Quinby 2019, Lewis and Stoycheva 2016) and need to be modeled more carefully. The effects of maturation may play out side by side with the effects of vesting requirements.

Given the incremental vesting requirements of the DC plan and the non-incremental vesting in the DB plan, we expect teacher separations to be markedly different by plan within the first five years on the job. In the first five years, benefit losses faced by a DC-enrolled leaver will be lower than benefit losses of a DB-enrolled leaver. As a result, **DC plan members will exhibit relatively higher mobility within the first five years than DB plan members.** (**H2**)

Yet, the mobility of DC plan members will still be relatively constrained until they fully vest in five years. The separation trends will diverge with time, **with DC members departing at increasingly higher rates after vesting** (**H3**). DB plan members will be pulled to stay employed to gain maximum benefits, which get accumulated at a faster pace in the later years of employment (Costrell et al year, Goldhaber et al. 2017), whereas DC members will not face this high retirement benefit penalty upon departure. (For more detailed explanation of the differences in the DC and DB incentives, see Quinby (2019).)

A comparative analysis of DB and DC membership in other states shows elements of self-selection into DC by education (Brown and Weisbenner 2014). When given a choice, workers with higher levels of education may be drawn to the DC plan by the opportunities to manage retirement asset investments (pull factor). A decrease in the value of the compensation package, however, may also be expected to push educators of higher quality out of the public sector in search of employment with a more generous compensation package (push factor). Since the effects of education on a DC plan membership will depend on the relative strength of the push and pull factors, our last hypothesis is exploratory. All else equal, we expect that **a DC transition of the**

Alaska retirement system will make educator employment relatively less attractive to the new entrants of high quality (**H4**). If, however, the valuation of the compensation package of the DC plan still exceeds the benefits of alternative private sector employment for educators, we will observe positive self-selection of Alaska educators into the DC plan by education. (This version of the paper will not yet include a test of H4).

Data

To examine the proposed hypothesis, we use longitudinal personnel records for members of the Teacher Retirement System (TRS) from the Alaska Department of Education & Early Development (DEED). The data include individual-level records for public school employees of PERS between 2005 and 2017. All teachers hired before and on June 30, 2006 were enrolled in the DB plan, while those hired on or after July 1, 2006 were enrolled in the DC plan. Our dataset contains 130,000 observations of plan members hired between 1951 and 2017 that were employed in at least one year of the observation period from 2005 to 2017. Table 1 presents the dataset descriptive statistics.

We observe that 70% of educators in Alaska were women, 88% identified as White and 47% had a master's degree or more. An average teacher was 45 years old and had 11 years of experience. The jobs represented in the sample are diverse, ranging from teachers of different skills and levels (ESL and special education teachers, head teachers, etc.) to administrative and support personnel (business managers, nurses, recreation therapists, etc.). About half of the sample has a master's degree (47%). About two-thirds of the observations (65%) were of employees hired before the retirement benefit reform and were therefore enrolled in the DB plan, with the remaining individuals hired after June 30, 2006.

Table 1. Descriptive Statistics

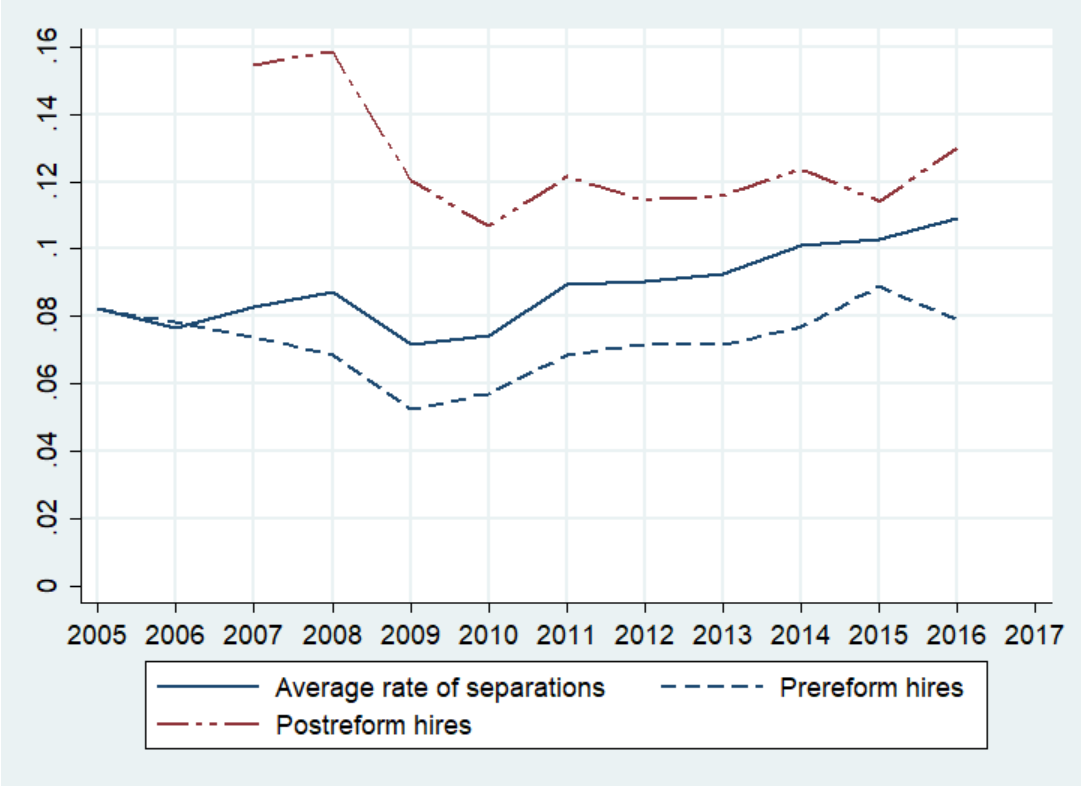
Variable name	Mean	SD	Min	Max
Separated	0.08	-	0	1
Male	0.70	-	0	1
White	0.88	-	0	1
Alaska native	0.96	-	0	1
Masters or more	0.47	-	0	1
Age	45	11	18	84
Years of experience	11	8	0	40
Salary (in nominal $)	63,280	12,064	1	235,000
DC-enrolled	0.36	-	0	1

We define separation as ceasing participation in either of the state retirement plans. This measure of separation is quite different from a measure of turnover that tracks job changes and includes shifts from one school to another. Our separation measure is a rate of separation from the teaching profession in the public K-12 system in Alaska. Figure 1 presents average separation rates for Alaska educators and separation rates by plan membership by year from 2005 to 2016.

We observe that the overall turnover rate increased over time, and so did the turnover for both groups of DB and DC plan members. The separation rates are notably higher for DC plan members, with numbers particularly high for the calendar years 2007–2008, which coincide with the first two years of hire for the DC plan. As expected, we see a drop in separations over the

Great Recession, with the DB-enrolled workers' turnover rates beginning to recover after 2009, and the DC-enrolled workers' turnover beginning to recover after 2010. The aggregate turnover rate includes all types of separations including retirements, letting go of workers because of restructuring and managerial decisions, as well as voluntary separations (Speer et al. 2019).

Figure 1. Teacher separations by year and plan type



The aggregate trend, however, masks variation in quit rates by worker characteristics other than plan membership. Table 2 shows that workers separating from the DC plan tend to be younger, more educated, with fewer years of experience, and with higher salaries. Table 2 also presents the characteristics of those who were hired and separated within a year and a half before the reform (January 1, 2005–June 30, 2006) and a year and a half after the reform (July 1–

December 31, 2007). Differences between the group averages are small and not significant statistically, with the exception of the years of experience for the DB and DC 2005–2007 hires.

Table 2: Separating worker characteristics by plan membership

Variable name	All leavers		2005-2007 hire leavers	
	DB plan	DC plan	DB plan	DC plan
Age	51 years	41 years	42 years	41 years
Male	29%	30%	30%	29%
Masters or more	45%	49%	45%	46%
Years of Experience	15 years	5 years	7 years	6.6 years
Salary	57,000	66,000	54,000	59,000

It should be noted that we can observe full separation trends only for those DB-enrolled workers who were hired between January 1, 2005 and June 30, 2006. Although we do know the hire dates for those who have continued employment throughout 2005–the first year of data availability–we do not observe the behavior of those who were hired and separated before January 2005. It means that we have a very limited control group of DB-enrolled worker employment trajectories for comparison with the DC-enrolled worker behavior. This limitation precludes the use of a conventional difference-in-differences approach that would allow for a causal interpretation of the findings.

Empirical Strategy

Modeling teacher separations in the context of Alaska retirement reform poses several analytical challenges and makes the family of survival analysis models more fitting than logistic regression. We are looking at event data where separations may or may not occur and where time is a discrete variable measured annually. Some teachers enter the observation period after working in Alaska schools for years and reach the end of the observation period without experiencing separation. These observations are right-censored. Teachers who left before the beginning of the observation period cause another difficulty for a conventional logistic regression because they produce a downward bias in the estimates of turnover for the group of educators enrolled in the DB plan when the turnover rate is estimated on the observed separations only. Teachers who enter the observation period late because they are hired after 2005 are left-censored. Since we are tracking observations over time from different starting points and for different periods of time, we need to rely on event history analysis to model time to the event of separation.

Since the conceptual model for turnover includes both time-invariant and time-varying predictors of turnover (Speer et al. 2019), we use the Cox proportional hazards model to accommodate all types of predictors including time. The Cox proportional hazards model has the following general form:

$$\frac{h(t)}{h_0(t)} = exp(b_1 dc + b_2 v_2 + b_i x_i + b_p d_p)$$

where h (t) is the expected hazard at time t, h_0 (t) is the baseline hazard that is the hazard when all of the predictors ***dc, v,*** $\boldsymbol{x_i}$ **,** $\boldsymbol{d_p}$ are equal to zero. ***dc*** is a binary variable equal to 1 for all

hires after July 1, 2006 and zero otherwise; ***v*** is a binary variable equal to 1 for all vested workers and 0 otherwise. x is a vector of individual-level time-invariant and time-varying controls like race, gender, nativity status, generation, age, education, years of experience, and salary. The hazard ratio for each predictor is estimated as exp (b_i). To account for the non-independence of observations across districts, we include district-level fixed effects. To account for the non-independence of observations across time, we cluster standard errors by individual.

The hazard ratio for ***dc*** shows the additional risk of separation for a DC-enrolled worker relative to the risk of a DB-enrolled worker who is the reference category, holding other variables constant. The hazard ratio for ***v*** shows the additional risk of separation for vested workers relative to non-vested workers, ceteris paribus. In the case of continuous predictors, the exp (b_i) represents the effect on the hazard of separation, given a one-unit increase in the value of the predictor. If a hazard ratio is close to 1, the effect of the predictor is zero. A hazard ratio larger than one means that the predictor increases the risk of separation, controlling for all other variables in the model.[7] A hazard ratio less than one means that the predictor reduces the risk of separation, all else equal. The smaller the less-than-one hazard ratio gets, the stronger its negative effect on the risk of separation.[8]

The dependent variable $Separation_i$ is equal to 0 as long as a worker is present in the dataset and turns to 1 in the last year when the individual is observed. This measure of turnover excludes all moves from school to school and from district to district within Alaska. As the data

[7] https://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_Survival/BS704_Survival6.html (will remove at a later stage)

[8] For example, a hazard ratio of 0.5 means a 50 % decrease in the probability of separation and a hazard ratio of 0.2 means a five-times drop in the probability of separation (0.2=1/5 of the risk, relative to the baseline hazard).

run from 2005 to 2017, year 2016 is the last year included in the model because it is the last year for which we can determine leavers (that is observations absent from 2017).

Turnover includes all types of separations such as retirements, involuntary turnover due to managerial decisions or attrition due to organizational restructuring, unavoidable turnover due to military service, migration, or other reasons that make it unavoidable, and finally voluntary turnover due to the employee decision (Speer et al. 2019). We acknowledge that not all of these departures will be indicative of the influences of a plan design. We are not able to control for involuntary and unavoidable turnover directly, but we proceed by assuming that contextual and organizational factors will influence the DC- and the DB-enrolled educators similarly. To distinguish separations due to retirement from other types of separations, we include binary variables of educator generation based on their year of birth. The results of the Cox proportional hazards models are presented in Tables 3 and 4.

We begin the analysis from Table 3, which offers evidence for the testing of the first hypothesis. We observe that the hazard ratio of separation for the DC-enrolled group of Alaska educators is less than one, meaning that DC-enrolled employees are less likely to separate than the reference category that is DB-enrolled workers. The hazard ratio in the baseline model for the full sample is 0.247, indicating that the risk of separation for a DC-enrolled teacher is only a quarter of the risk of separation for the DB-enrolled educators, other things equal. This estimate is robust to the inclusion of district-level fixed effects and generational variables. As expected, all generational variables are significant and substantively strong, indicating the highest hazard ratios for separations for the silent generation, followed by baby boomers and Gen Xers.

Table 3. Cox proportional hazards models predicting separations from Alaska K-12 system

	Full sample base model		Full sample with district fixed effects		Full sample with district fixed effects and generational controls	
	Hazard ratio	p-value	Hazard Ratio	p-value	Hazard Ratio	p-value
Age	0.867	0.000	0.868	0.000	0.752	0.000
Age squared	1.002	0.000	1.002	0.000	1.002	0.000
Male	1.069	0.005	1.024	0.341	1.046	0.071
White	1.077	0.039	1.140	0.000	1.113	0.005
Alaska native	0.763	0.000	0.873	0.001	0.911	0.019
Masters or more	0.974	0.229	0.983	0.448	0.993	0.753
Years of experience	1.004	0.019	1.003	0.099	1.004	0.013
Salary (log)	0.717	0.000	0.709	0.000	0.720	0.000
DC plan membership	**0.247**	**0.000**	**0.232**	**0.000**	**0.285**	**0.000**
Vested	0.136	0.000	0.148	0.000	0.158	0.000
Silent generation					46.59	0.000
Baby boomer					17.33	0.000
Generation X					3.410	0.000
District fixed effects	No		Yes		Yes	
# observations	119,357		119,357		119,357	
# separations	10,560		10,560		10,560	
# individuals (clusters)	19,672		19,672		19,672	
Wald Chi 2	4,169		4,461		6,485	
Pseudo Log Likelihood	-110,513		-111,269		-109,388	

Note: Standard errors are clustered at the level of individual teacher.

The model also shows that white teachers and male teachers are more likely to separate whereas Alaska native teachers (versus educators from other states) and teachers with higher salaries are less likely to separate from employment. Education does not have an effect on separations in any model, which is surprising. Years of experience is very close to one suggesting close to zero

effects on the hazard of separation. Overall, we document that DC plan enrollment does not increase teacher separation—H1 is not supported. Next, we examine how the effects of the DC-enrollment differ by vesting status.

Table 4: Cox proportional models predicting separations from the Alaska K-12 system by vesting status.

	Non-vested		Vested only	
	Hazard Ratio	p-value	Hazard Ratio	p-value
Age	0.814	0.000	0.717	0.000
Age squared	1.001	0.000	1.003	0.000
Male	1.172	0.000	0.982	0.599
White	0.853	0.002	1.407	0.000
Alaska native	0.959	0.320	0.222	0.000
Masters or more	0.891	0.001	1.022	0.498
Years of experience	1.019	0.000	1.00	0.074
Salary (log)	0.780	0.000	0.693	0.000
DC plan membership	**0.092**	**0.000**	**0.257**	**0.000**
Silent generation	45.77	0.000	31.60	0.000
Baby boomer	16.05	0.000	13.228	0.000
Generation X	3.75	0.000	2.176	0.000
District fixed effects	Yes		Yes	
# observations	16,837		102,520	
# separations	4,404		6,156	
# individuals (clusters)	8,087		14,225	
Wald Chi 2	2,987		3,371	
Pseudo Log Likelihood	-38,686		-62,997	

In Table 4, we observe that the hazard ratio for non-vested DC-enrolled workers is about 0.1, meaning that DC-membership reduces the baseline hazard of separation by about 10 times for

non-vested workers. In contrast, the hazard ratio for vested workers is about a quarter of the baseline risk, suggesting that the DC membership reduces the risk of separation of vested workers by about four times. These findings do not support hypothesis 2 where we expected higher mobility for DC members before vesting, given their gradual vesting and relatively smaller benefits to lose if they leave before vesting. After vesting, DC member mobility is higher than before vesting but again, it remains four times smaller than the mobility of DB workers. Vesting is a marked point of difference for teacher mobility for DC workers and DB workers alike. Though these findings go contrary to our expectations in H2, they offer evidence that DC-enrolled worker separations do increase after vesting, based on the comparison of the magnitude of the effects (hazard ratios of 0.092 and 0.247). In other words, less of a difference in separation behavior is observed between members of the DC and DB plans over time. H3 is not supported.

Discussion

To examine the impact of a transition from the defined-benefit retirement system to a defined-contribution retirement system in the public sector, we study the effects of the Alaska TRS reform, which discontinued enrollment into its defined-benefit pension plan and created a 401(k)-style defined contribution plan for all new public workers hired after July 1, 2006. Using a long panel of member-specific data we look at the effects of a radical benefit redesign on the labor market behavior of public educators.

The findings suggest that a move from the DB to the DC structure decreases worker mobility, particularly among non-vested plan hires. Whether perception of relative benefit generosity or the lack of recognition of benefit portability is influencing separation decisions is still a question we are not able to answer. Before we discuss the generalizability of these findings

to other pension systems across the United States, we need to discuss them in the context of the specific reform in Alaska.

An important feature of this reform is that teachers in Alaska were not enrolled in Social Security. Therefore, upon retirement, they do not get any income other than that generated by their pension plans and personal savings. This is important because Social Security is a guaranteed monthly benefit that establishes an income "floor" in retirement. This element of guarantee makes it similar to DB pensions. However, although Alaska has an opportunity to enroll its teachers in Social Security, it has not done so yet. This makes the reform in Alaska quite different from a similar reform in Michigan (Quinby 2019), where teachers are enrolled in Social Security.

The lack of Social Security benefits can be critical to both enrollment and retention because this is a small guaranteed benefit that most private sector workers enjoy. Therefore, when choosing employment at Alaska TRS, workers forgo the potential private sector benefits that are likely to have both Social Security and a DC retirement plan. The lack of any guaranteed element, like Social Security or a DB plan on the one hand puts a lot of expectations on the performance of the DC plan and on the other hand offers teachers a way to actively engage in their investment management.

From the standpoint of the worker, the main difference between DB and DC plans in the public sector is that traditional pensions guarantee a certain amount of income in retirement. No matter how poorly retirement plans perform in the market, retirees receive a monthly paycheck. The DC plan guarantees a certain level of monthly contributions from both employee and employer, but does not promise any specific outcome. Therefore, any risk associated with underperforming investments is carried by the employee—the critical distinction between the two plans.

When reviewing a pension reform or creating a plan for a new reform, one needs to account for specific changes in the plan at hand. Except for a difference in risk that happens with the shift of responsibility of plan underperformance from employer to employee, one needs to account for a difference in the expected outcome. If the expected total wealth consumed throughout retirement in the DC plan is different than that of the DB plan, then the total value of employee compensation changes in that respect as well. These specifics can vary from plan to plan. Future research could take a closer look at how benefits under the DB structure differ in their expected value from the benefits under a DC plan. This can be accomplished by calculating expected outcomes for a prototypical TRS retiree before and after the reform to gain a better understanding of financial incentives and motivations of workers, as well as to evaluate the fiscal trade-offs for both pension plans and workers.

In addition to calculating the expected values of retirement packages and comparing them between the two plans, it is also worth looking at the current levels of employer and employee contributions. Currently, Alaska TRS employer contribution is 12.56% for both DB and DC plans, whereas employee contribution is at 8% for the DC and 8.65% for the DB plan. These numbers have to be compared to the best practices of DC plans in the industry to evaluate the viability and attractiveness of the plan.

For example, if roughly 20% of salary is an adequate amount that is expected to guarantee at least XX% of salary after retirement, then anything below that amount in contributions will make a DC plan substandard. A closer analysis of the DB plan formulas and their comparison with the DC plan portfolio is another direction of research that can clarify the expected benefits of both plans and see how they compare against each other. Research on the valuation of retirement benefits by educators, similar to experimental evidence by Fuschman et al (2020), is likely to help

understand salary versus deferred benefit tradeoffs better and can help adapt retirement systems to the demands of the workforce that, as we observe, appears to value defined-benefit retirement plans less than we would expect.

Importantly, while a pension reform may decrease turnover, it is not necessarily a desired outcome. Long-term tenured employees might be costlier to the employer, whereas their productivity might be similar to the new hires. Knowing when employee performance reaches its peak and flattens out is important in choosing a retirement plan structure that creates incentives for timely retirement of long-term employees with decreasing productivity. The impact of reforms can, therefore, be evaluated based on whether a critical number of workers are staying with the employer throughout the peak of their productivity.

All findings on the impact of pension benefits on workers have to be interpreted in light of other robust findings in the literature confirming that workers are frequently not fully informed of their benefits and changes in them. As noted in the prior literature, nearly half of workers with pension coverage do not know whether the plan is defined-benefit or defined-contribution. If this is the case, employees are not equipped to make informed decisions and their decisions are likely to be driven by other unobservable factors.

The urgency of further research of the topic is highlighted by the prospect of the "new normal" of low investment returns in the years to come. Since a plan's performance is directly related to its portfolio performance, it is likely that the fiscal health of conventional defined-benefit public pension plans will continue to deteriorate. This might compel plans to make changes to their plan design and funding principles rather than relying on overly optimistic investment return assumptions to lower the present value of their accumulated retirement obligations.

References

Anderson, G. W., & Brainard, K. (2004). Profitable prudence: the case for public employer defined benefit plans. Pension Research Council. *The Wharton School, University of Pennsylvania*.

Andonov, A., Eichholtz, P., & Kok, N. (2015). Intermediated investment management in private markets: Evidence from pension fund investments in real estate. *Journal of Financial Markets, 22*, 73-103.

Andonov, A., & Rauh, J. D. (2018). The return expectations of institutional investors.

Brown, Jeffrey R., and Scott J. Weisbenner. 2014. Why do individuals choose defined contribution plans? Evidence from participants in a large public plan. *Journal of Public Economics* **116**:35–46.

Center for Retirement Research (CRR) at Boston College. 2019. Public Plans Data.

Manuel Vazquez Cano, Hella Bel Hadj Amor, and Ashley PiersonCano https://files.eric.ed.gov/fulltext/ED598351.pdf

Department of Labor and Workforce Development.

Edwards, C. (2011). Employee compensation in state and local governments. *Retrieved from* https://www.cato.org/sites/cato.org/files/pubs/pdf/tbb-59.pdf

Even, W. E., & Macpherson, D. A. (1996). Employer size and labor turnover: The role of pensions. *ILR Review, 49*(4), 707-728.

Freeman, R. B. (1980). The exit-voice tradeoff in the labor market: Unionism, job tenure, quits, and separations. *The Quarterly Journal of Economics, 94*(4), 643-673.

Fuchsman, Dillon, Josh B. McGee, and Gema Zamarro. (2020). Teachers' Willingness To Pay For Retirement Benefits: A National Stated Preferences Experiment. (EdWorkingPaper:

20-313). Retrieved from Annenberg Institute at Brown University: https://doi.org/10.26300/m3b7-nn67

Gorina, E. (2018). City Revenue Structure and Unfunded Pension Liabilities. State and Local Government Review 50 (3): 189-202.

Gorina, E., & Hoang, T. (2019). Pension Reforms and Public Sector Turnover. *Journal of Public Administration Research and Theory*.

Groot, W., & Verberne, M. (1997). Aging, job mobility, and compensation. *Oxford economic papers, 49*(3), 380-403.

Gustman, A. L., Mitchell, O. S., & Steinmeier, T. L. (1994). The role of pensions in the labor market: A survey of the literature. *ILR Review, 47*(3), 417-438.

Gustman, A. L., Steinmeier, T. L., & Tabatabai, N. (2010). *Pensions in the health and Retirement Study*: Harvard University Press.

Gyourko, J., & Tracy, J. (1989). Public sector bargaining and the local budgetary process. In: National Bureau of Economic Research Cambridge, Mass., USA.

Hanushek, E. A., & Rivkin, S. G. (2010). Generalizations about using value-added measures of teacher quality. *American Economic Review, 100*(2), 267-271.

Harris, D. N., & Adams, S. J. (2007). Understanding the level and causes of teacher turnover: A comparison with other professions. *Economics of Education Review, 26*(3), 325-337.

Hyatt, H. R., & Spletzer, J. R. (2016). The shifting job tenure distribution. *Labour Economics, 41*, 363-377.

Koedel, C., & Xiang, P. B. (2017). Pension enhancements and the retention of public employees. *ILR Review, 70*(2), 519-551.

Lazear, E. P. (1990). Pensions and Deferred Befefits as Strategic Compensation. *Industrial Relations: A Journal of Economy and Society, 29*(2), 263-280.

Lazear, E. P., & Moore, R. L. (1988). Pensions and turnover. In *Pensions in the US Economy* (pp. 163-190): University of Chicago Press.

Lewis, G. B., & Stoycheva, R. L. (2016). Does pension plan structure affect turnover patterns? *Journal of Public Administration Research and Theory, 26*(4), 787-799.

Lyons, K., & Lav, I. J. (2007). *The problems with property tax revenue caps*: Center on Budget and Policy Priorities.

McLoy et al. 2019. Turnover modeling and event history analysis https://www-cambridge-org.libproxy.utdallas.edu/core/services/aop-cambridge-core/content/view/22E61499D7D375E557D3E2C4127EFBD3/S1754942619000567a.pdf/turnover_modeling_and_event_history_analysis.pdf

Mitchell and Lee. 2015. https://www.cambridge.org/core/journals/industrial-and-organizational-psychology/article/some-reservations-about-a-rational-choice-model-predicting-employee-turnover/A224ADC73CDEA49630409B8CF6FF1962

Montizaan, R., Cörvers, F., & De Grip, A. (2010). The effects of pension rights and retirement age on training participation: Evidence from a natural experiment. *Labour Economics, 17*(1), 240-247.

Montizaan, R., de Grip, A., Cörvers, F., & Dohmen, T. (2015). The impact of negatively reciprocal inclinations on worker behavior: Evidence from a retrenchment of pension rights. *Management Science, 62*(3), 668-681.

Munnell, A. H., & Aubry, J.-P. (2015). The funding of state and local pensions: 2014-2018. *Center for Retirement Research, State and Local Pension Plans*(45).

Munnell, A. H., Aubry, J.-P., Hurwitz, J., & Quinby, L. (2011). Can State and Local Pensions Muddle Through? *Issue in Brief*(15).

Munnell A, Kelly Harvestick, Mauricio Soto. 2007. WHY HAVE DEFINED BENEFIT PLANS SURVIVED IN THE PUBLIC SECTOR? https://crr.bc.edu/wp-content/uploads/2007/12/slp_2.pdf

Pew Charitable Trusts. (2016). Public workers preparing for retirement: Top findings from a survey of Michigan's state employees. Issue Brief. Washington, DC. Retrieved May 3, 2019, from https://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2016/05/publicworkers-preparing-for-retirement.

Pew Charitable Trusts (PEW). 2018. The state pension funding gap: 2016.. Retrieved from https://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2018/04/the-state-pension-funding-gap-2016

Pfeffer, F. T., & Hertel, F. R. (2015). How has educational expansion shaped social mobility trends in the United States? *Social Forces, 94*(1), 143-180.

Quinby, L. D. (2019). Do Deferred Retirement Benefits Retain Government Employees? *Journal of Policy Analysis and Management*.

Quinn, J. (1982). Compensation in the public sector: The importance of pensions. *Public finance and public employment, edited by RH Haveman. Detroit, MI: Wayne State University Press*.

Shultz, K. S., & Wang, M. (2011). Psychological perspectives on the changing nature of retirement. *American Psychologist, 66*(3), 170.

Snell, R. 2009. State Retirement System Defined Contribution Plans. https://www.ncsl.org/Portals/1/Documents/employ/StateGovtDCPlansSept2009.pdf

Speer, A. B., Dutta, S., Chen, M., & Trussell, G. (2019). Here to stay or go? Connecting turnover research to applied attrition modeling. *Industrial and Organizational Psychology*, *12*(3), 277-301.

Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). A coming crisis in teaching. *Teacher supply, demand, and shortages in the US*, 1-101.

NASRA. 2019. Defined Contribution Plans Administered by State Retirement Systems.

https://www.nasra.org/files/Topical%20Reports/DC%20plans/statewidedcplans.pdf