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Pension Choices and the Savings Patterns of Public School Teachers

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I. Introduction

In most U.S. states retirement benefits constitute an important component of compensation for public school teachers, and the structure of teacher retirement systems has been the subject of a prominent public policy debate. A primary factor driving the debate is that many teacher retirement systems are significantly under-funded, placing (sometimes) debilitating financial pressure on states and localities. For example, the generosity and consistent underfunding of public pensions in Detroit, MI are seen as one of the primary reasons for its recent declaration of bankruptcy (Rushe, 2013).[1]

The prevalence of underfunded state pension systems has resulted in discussion about the prudence of moving from traditional defined benefit (DB) systems towards defined contribution (DC) systems, which are by definition fully funded. While moving towards DC-type pension systems would not address existing shortfalls, it would reduce the likelihood of pension-driven fiscal problems arising in the future.

Calls for reform have also stemmed from the notion that the restructuring of teacher pension systems could make the profession more attractive and improve the quality of the workforce. Recent research in education finance has argued that fiscally neutral pension reforms could improve the quality of the workforce by addressing financial incentives that produce undesirable patterns of attrition (Costrell & Podgursky, 2009; Koedel, Podgursky, & Shi, 2013), and by allocating higher proportions of compensation to current pay (Mcgee & Winters, 2013). On the other hand, some researchers have speculated that moving away from traditional DB pension systems would have a negative impact on teacher quality (Boivie, 2011; Weller, 2011).

One reason that proposals to shift teacher's pensions towards DC systems are controversial is that they shift the risk associated with investment returns onto individuals, leading to concerns about how such reforms would affect the retirement security of teachers. In addition to investment risk, retirement security could also be affected by the contribution levels chosen by teachers. Randi Weingarten, President of the American Federation of Teachers, has referenced these concerns in opposing any movement away from defined benefit pension systems (Institutional Investor, 2013).[2]

Few states have incorporated DC features into teacher pension systems and we know very little about how providing teachers with greater control over deferred compensation might affect their savings behavior. In this paper we report on the retirement savings behavior of Washington State teachers enrolled in the state's hybrid pension plan, which includes a DC component funded by employee contributions. Our research, which is the

[1] For more on issues of underfunding of public sector pensions, see Novy-Marx & Rauh (2011), Pew Center on the States (2012), and Zeehandelaar & Winkler (2013).

[2] The American Federation of Teachers has resolved to urge its affiliates to support policies that encourage the retention of DB pension plans (see http://www.aft.org/about/resolution_detail.cfm?articleid=1610), and the National Education Association has expressed similar sentiments (https://www.nea.org/home/10622.htm).

first quantitative analysis of teachers' choices of defined contribution rates, speaks to the debate around the structuring of teacher pension systems. Specifically, we address the following questions: 1) How are discretionary retirement savings rates influenced by individual characteristics and the ability to adjust contribution rates?; 2) What can we infer about teacher preferences for current compensation versus the present value of investment in retirement compensation?; and 3) How does the level of retirement savings compare under traditional defined benefit and hybrid pension systems? To answer these questions we use longitudinal pension plan data from Washington State, where public school teachers who enroll in the state's hybrid pension plan can choose from a menu of contribution rates.

We find that teachers' initial contribution rate choices appear to be age dependent, and are affected by their beliefs about the ability to adjust contribution rates after the initial rate selection. The preferences of teachers revealed through their choice of contribution-rate plans indicates that they value the opportunity to invest in retirement compensation far more than prior evidence has suggested. And, consequently, the total amount per teacher contributed to retirement savings is estimated to be higher under Washington's hybrid DB-DC pension system than it would be under the more traditional DB-only system.

2. Background

2.1 Teacher Retirement Systems in Washington State

Washington state currently administers three retirement systems that cover teachers: TRS1, TRS2, and TRS3.[3] TRS1 and TRS2 are traditional defined benefit (DB) systems in which retired teachers are paid an annuity, which is formulaically determined by years of service and average final compensation.[4] The third system, TRS3, is a hybrid system: it has a DB component funded by employers as well as a defined contribution (DC) component that places employee contributions into a tax-deferred 401(a) investment account (similar to a 401(k) account). Washington is among a select few states to include a DC component for retirement, and is one of only two states that provide teachers with a choice about the rate at which they contribute to the retirement system.[5]

TRS3 was created by legislation adopted in 1995, and enrollment was opened in July 1996. Employees who were enrolled in TRS2 when TRS3 opened had the opportunity to transfer to TRS3, and employees hired between July 1996 and July 2007 were mandated into TRS3.[6] Employees hired since July 2007 have been able to choose between TRS2

[3] For a more detailed accounting of the TRS plans, see Goldhaber et al. (2012).

[4] Under TRS1, average final compensation is defined as average salary during an employee's two highest-paid consecutive fiscal years of service. Under TRS2 and TRS3, it is an employee's average salary during his or her 60 highest-paid consecutive service credit months.

[5] A few other states offer pure DC pensions to teachers (AK, FL, MT, and OH) or a DB plan with DC components (IN, OH, and SC) (National Education Association, 2010). However, with the exception of Indiana, these plans do not offer contribution rate choice to members.

[6] Teachers enrolled in TRS1 were not eligible to transfer to TRS3. Employees in TRS2 who opted to transfer into TRS3 before January 1998 received a transfer bonus payment, and about three-quarters of

and TRS3, and are defaulted into TRS3 if a choice is not indicated within the first three months of employment. These various enrollment scenarios produce three district groups of TRS3 enrollees: those choosing to transfer into TRS3 (hired prior to July 1996), those mandated into TRS3 as new hires (hired between July 1996 and July 2007), and those choosing or defaulting into TRS3 as new hires (hired since July 2007).

TRS3's DB component is funded entirely by employer contributions and the value of the benefit upon retirement is determined by the formula: $Annual\ Benefit = 0.01 * Years\ of\ Service * Average\ Final\ Compensation$. The DC component is funded entirely by employee contributions. Its value is determined by both the amount of salary contributed to the DC account and the investment performance of the account. Upon enrollment, teachers choose from among the six different contribution plans described in **Table 1**, which determine the percentage of salary automatically diverted to a teacher's DC account each month. A teacher who does not indicate a contribution rate preference within 90 days is defaulted into Plan A, which requires the minimum contribution of five percent earnings. Those who transfer to TRS3 from TRS2 are required to indicate a contribution plan preference as part of the transfer process.

[TABLE 1 ABOUT HERE]

Initially, TRS3 members could change contribution rate plans only if changing employers. However, in 2000 the Department of Retirement Services (DRS) submitted TRS3 to the IRS for qualification and added a provision allowing members to change contribution-rate plans during an adjustment period in January of each year.[7] TRS3 was qualified by the IRS in 2002, and in 2003 state statutes were amended to include rate flexibility (Chapter 156, Laws of 2003). The first January adjustment period occurred in 2004. TRS3 members were informed of the opportunity to change contribution rates in a memo prepared by the DRS in December 2003. In 2009, TRS3 was submitted to the IRS for re-qualification and it was re-qualified in 2013 contingent on the removal of member rate flexibility.[8] That is, as of 2013, teachers in TRS3 must specify a contribution rate to the DC component of the plan that cannot be changed over their careers.

In addition to choosing contribution levels, TRS3 enrollees can choose from among three investment options. The default option is a retirement fund that automatically adjusts its asset mix as teachers approach retirement age. A second option is to invest DC assets in the Washington State Investment Board's (WSIB) Total Allocation Portfolio, a monthly valued fund with a diversified portfolio of stocks, bonds, private equity, and real estate

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those eligible to transfer did so during the transfer bonus period. For more on this choice, see Goldhaber and Grout (2013).

[7] If a retirement savings plan is not qualified by the IRS, its members may be required to pay taxes each year on income and investment earnings.

[8] A bill has been sponsored for the 2014 legislative session that will make January 2015 the final adjustment period. For background on rate flexibility in Washington Sate see http://www.leg.wa.gov/SCPP/Documents/2013/09-17/4.TRS3Members.pdf

investments. The third option is to select one's own mix of individual funds from a limited menu of options.[9]

Whether a teacher is enrolled in TRS3 or one of the traditional DB plans, the vehicles through which retirement savings can be accumulated are not limited to the features of TRS. For example, as Washington State employees, public school teachers can participate in the Washington State Deferred Compensation Program, which is a supplemental retirement savings plan (IRC Section 457).[10] Many school districts also offer their employees an alternative savings plan in the form of a 403(b), or Tax Sheltered Annuity Product. Additionally, retirement savings can be accumulated in Individual Retirement Accounts (IRAs) or in any unsheltered savings or investment vehicle (e.g., stocks or bonds). Unfortunately, the administrative data we utilize for this study do not allow us to account for savings behavior outside of the Teacher Retirement System.

2.2 Research on Retirement Savings Behavior

Two primary points of interest in the debate around teacher pension reform are: 1) whether DC pension systems are likely to provide adequate retirement income,[11] and 2) whether the proportion of teacher compensation allocated to retirement benefits by traditional DB pension systems is appropriate. What we know from the existing literature about the retirement savings behavior (i.e., contribution and asset allocation preferences) of public school teachers is quite limited, which is not surprising given that the great majority (95 percent) of participants in public-education related retirement plans are enrolled in traditional DB plans (National Education Association, 2010) where savings behavior is determined by the pension system rather than individual preferences. However, there are numerous studies of employees in private-sector DC pension systems.[12]

During the 1980s and 1990s, the private sector pension systems largely transitioned away from traditional DB plans and into DC plans (Buessing & Soto, 2006), spurring a literature motivated by concerns about whether DC plans are likely to provide adequate income in retirement. Because DC systems put retirement savings decisions in the hands of individuals, these studies tend to focus on how plan design and individual characteristics influence retirement savings behavior. Plan structures, including default

[9] As of 2010, these funds included Money Market, Washington State Bond, and Socially Responsible Balanced funds, as well as four index funds (U.S. Large Stock Index, U.S. Stock Market Index, U.S. Small Stock Index, and International Stock Index).

[10] Currently, only a small number, 4,900, of school district employees (about 4 percent) are participating in the state's Deferred Compensation Program. For more information on the Deferred Compensation Program, see https://washington.gwrs.com.

[11] There is no specific definition of what constitutes an adequate level of retirement savings. However, concerns about retirement savings levels in DC plans have been raised in the debate around public pension reform. For example, in opposing the push away from DB pension systems, Randi Weingarten (President of the American Federation of Teachers) noted that, "A lot of the defined contribution plans don't provide enough for retirement security" (Institutional Investor, 2013).

[12] A third point of interest, not directly addressed in this paper, is type of deferred compensation do teachers prefer. This topic has been examined in recent analyses of teachers' choices between traditional DB plans and DC or hybrid plans (see Chingos & West, 2013; Goldhaber & Grout, 2013).

settings (Choi, Laibson, Madrian, & Metrick, 2004), employer matching rates (Benartzi & Thaler, 2007; Holden & VanDerhei, 2001; Huberman, Iyengar, & Jiang, 2007), and the type of information provided to employees (Clark & Schieber, 1998), are found to have large effects on participation rates and the proportion of salary contributed by employees. Employee characteristics are also found to be related to contribution and participation rates. In particular, age and salary are associated with higher contribution rates (Choi et al., 2004; Clark & Schieber, 1998; Holden & VanDerhei, 2001; Huberman et al., 2007; Munnell, Sundén, & Taylor, 2002), suggesting that an employee's savings preferences are likely to change throughout his career.

The private sector literature provides little evidence on the adequacy of overall retirement wealth accumulation among DC plan participants.[13] Using data from the Employee Benefit Research Institute's Retirement Confidence Survey, Helman et al. (2013) report that among workers age 45 and older, 47 percent report total savings and investments (not including the value of defined benefit plans or real estate) of less than $25,000 and 19 percent report total assets of over $250,000. Choi et al. (2002) assess savings adequacy using a survey of 401(k) participants at a large U.S. firm, but do not report on the accrual of retirement wealth. They find that about two-thirds of survey respondents consider their savings rates to be too low. Among those respondents, about one third have contribution rates between 0 and 4 percent and another third fall between 5 and 8 percent. Among employees who consider their savings rates to be "about right," 73 percent contribute between 9 and 12 percent of salary. Other studies document observed savings rates in company-sponsored DC plans, and find average contribution rates between 5 and 7 percent (Holden & VanDerhei, 2001; Huberman et al., 2007; Munnell et al., 2002). Holden and VanDerhei (2001) find that among pension plans featuring an employer contribution, the average total contribution is 10 percent.

Within the realm of teacher pension systems, a few studies speak to the points of interest raised above. Two studies use data from states that offer teachers choices between traditional DB plans and plans with DC features and compare the potential accumulation of pension wealth in the two types of plans. Chingos and West (2013) consider the case of Florida, where teachers have been able to choose between DB and DC pension systems since 2003, while Goldhaber et al. (2012) consider the case of Washington State and the introduction of TRS3 in in 1996. Both studies model the accumulation of net pension wealth for a representative teacher given assumptions about investment returns, salary, contribution levels, retirement age, life expectancy, and inflation. The general finding is that the traditional DB plans are likely to be outperformed by the alternative plans when a teacher exits the profession well before reaching retirement age. However, among teachers who stay in the profession until retirement, the studies find that the traditional DB plans are likely to provide the greater net benefit. A limitation of these representations of pension wealth is that they do not speak directly to the concerns that

[13] Studies that do analyze retirement preparedness tend to look at the general American population, with concern focused on the large proportions of individuals who lack financial literacy and/or have not planned for retirement (e.g., Lusardi & Mitchell, 2007) - a group that does not include employees participating company-sponsored DC pension plans.

when given a choice, individuals in DC plans will make contribution and investment decisions that result in inadequate retirement savings.

One of the potential benefits of moving from a traditional DB system to a DC system is the provision of greater flexibility in determining how much to save for retirement (Hansen, 2010). The prevailing DB structure in public schools means that we know relatively little about teacher preferences for current versus future consumption, and therefore utility-optimizing savings rates. Fitzpatrick (2012) assesses teacher preferences for current versus future consumption by exploiting an instance in which Illinois public school teachers enrolled in the state's traditional DB pension system were given the opportunity to purchase an upgrade to future pension benefits. She finds that on average, teachers value a dollar increase in the present value of expected retirement benefits at approximately 19 cents. This suggests an inefficient allocation of compensation because, for instance, the state could save money by reducing a teacher's deferred compensation while increasing her current compensation by a smaller amount (thereby reducing costs), without making her any worse off. It's not clear whether this result can be applied to other types of deferred compensation, and would depend on whether it is driven by preferences for current versus deferred compensation, the relative salience of different types of retirement savings (e.g., investment accounts vs. annuity formulas), or beliefs about the security of future benefits in traditional DB systems. Along the lines of Fitzpatrick's findings, McGee and Winters (2013) argue that the teacher profession could be made more attractive by reforming pension plans, including the allocation of more compensation to current pay.

3. Data

3.1 Data Sources

To model teachers' savings behavior we rely on confidential teacher retirement system data that is maintained by the DRS. These data are merged with administrative records from the Washington State Office of Superintendent for Public Instruction (OSPI) S-275 personnel reporting system and the Professional Education Standards Board (PESB). The administrative records are supplemented with school- and district-level information from the National Center for Education Statistics' Common Core of Data (CCD).

The S-275 administrative data include information on teacher demographics, position assignment, salary, and experience. Data on teacher endorsement areas (e.g., English, math, science) and certifications, and the year in which they were obtained, are from PESB records. The DRS data provide a record of every transaction between a teacher and DRS between the beginning of his or her career and 2010, including contribution rate choices. The CCD provide school-level data on size, demographics, passage rates of standardized tests, Title I status, and the percentage of students receiving free lunch. District-level data include test-passage rates, size, and type of locale (e.g., rural or urban).

To study contribution rate choice, a panel of observations (with on observation per individual per year) is assembled for the school years ending between 1997 and 2010.

The panel only includes TRS3 members who are identified in S-275 records as classroom teachers during at least one year of employment. For these individuals, we retain all years with record of employment including years in which non-teaching positions were held. Years in which an individual is not employed (indicated by absence from S-275 records) are excluded from the panel because TRS3 contributions are not being made in those years.

As described in Section 2.1 above, three distinct groups of teachers have enrolled in TRS3 since its opening: 1) those who transferred from TRS2 to TRS3 during the period from January, 1997 to December 1997, 2) those mandated into TRS3 as new hires during January 1997 to July 2007, and 3) those hired since July 2007 who can choose between TRS3 and TRS2.[14] These groups of teachers will be referred to as the 1997 Choice, Mandated, and 2007 Choice cohorts, respectively. There are a number of important distinctions between the TRS3 cohorts. First, the dates on which they entered the retirement system as new hires do not overlap. Second, for two of the cohorts (the 1997 and 2007 Choice cohorts) enrollment in TRS3 was optional. Third, the default plan choice is different for the two Choice cohorts: if no choice is indicated to the DRS, teachers in the 1997 Choice cohort remain in TRS2 and teachers in the 2007 Choice cohort are defaulted into TRS3. Finally, the 1997 Choice cohort enrolled in TRS3 with whatever experience and contributions had been accumulated under TRS2, whereas those in the Mandated and 2007 Choice cohorts enrolled as new hires.[15] Overall, our data cover the period 1997 to 2009 and consist of 243,846 teacher-year observations, comprised of 47,577 individual teacher observations (19,014 who transferred into TRS, 26,779 who were mandated into TRS3, and 1,784 who chose TRS3 as new hires).[16]

3.2 Summary of Contribution Rate Choices

We begin by comparing average contribution rates for teachers enrolled in TRS2 and those enrolled in TRS3. Under both retirement plans the *employer* contributions (which fund half of the DB under TRS2 and all of the DB of TRS3) are equal.[17] Given this, any differential in the amount of compensation contributed to TRS2 and TRS3 is determined by *employee* contributions to the plans.

[14] Teachers were originally given choice of plans starting in July 1996, but choice only included three rate plans so we exclude the individuals enrolled in TRS3 between July 1996 and January 1997 from the sample.

[15] Teachers transferring from TRS2 to TRS3 moved accrued TRS2 contributions (which earn 5.5 percent interest) into the DC component of TRS3. Those transferring before January 1, 1998 received a transfer bonus payment equal to 65 percent of accrued TRS2 contributions as of January 1996 (Goldhaber & Grout, 2013).

[16] A "teacher-year observation" in our data is a year in which a teacher can make a contribution rate choice. More specifically, the year in which a teacher makes an initial contribution rate choice (during the first 90 days of enrollment), and each year a teacher is employed between 2004 and 2009 when TRS3 members can adjust their contribution rates during the month of January.

[17] TRS2 and TRS3 pay benefits out of the same pension fund and are treated as a single pension plan by the IRS.

Figure 1 shows average employee contribution levels under TRS2 and TRS3 for the 1998-2009 period. TRS2's employee contribution rates are determined by the state's actuarial assessment of the contributions necessary to adequately fund the defined benefit, but TRS3 teachers get to pick amongst six different contribution rate plans. As is apparent from the figure, during this period of time, except for the intitial year, the amount of compensation being allocated to the support of future retirement benefits is substantially lower under TRS2 than TRS3. This provides prima facia evidence that a shift from a strict DB system to a hybrid DB-DC system will not necessarily lead to a decrease in the amount set aside for teacher retirements, as has been suggested (e.g., Long, 2012); in fact, in these years the opposite is generally true.[18] But it is also the case that teachers moving into the hybrid system might be different from those who opted to stay in TRS2, and differences in teacher demographics, for instance, could help explain the differential observed in Figure 1.

[FIGURE 1 ABOUT HERE]

Table 2 presents selected sample statistics for teachers who choose different DC contribution rates in the 2008-09 school year. Lower proportions of older and higher-salary workers are in Plan A, and higher proportions of the same groups are in the highest contirubtion rate plans (Plans E or F). There is also evidence that Asian, white, and female teachers tend to prefer the higher contribution rate savings plans. These patterns are generally consistent with previous analyses of contribution rate choice (see Section 2.2).

[TABLE 2 ABOUT HERE]

Since 2004, TRS3 members have been able to change their contribution rates during an adjustment period each January. Transitions between between differenct plans are reported in **Table 3** in terms of initial contribution rate choice and last observed choice for teachers employed one or more years during 2004-2009. Teachers initially choosing (or defaulting into) Plan A were the least likely to be last observed in a different plan (82 percent stayed), while teachers in Plan E were the most likely to be last observed in a different plan (65 percent stayed).

Nearly three quarters (73 percent) of the teachers in our sample are not observed switching contribution rates during the study period, but there are a surprising number of significant rate changes as well. Among those teachers who change rate plans, 61 percent had a last observed rate that was higher than their initial rate selection and 39 percent had a lower last observed rate. And a significant number of changes are dramatic. Among teachers intially enrolled in Plans E and F, 13, and 15 percent were last observed in Plan A, respectively. To what extent might these changes, or initial contribution rate choices, be driven by individual teacher or work environment factors? In the next section we describe how we model contribution rate decisions.

[18] Recall that the minimum contribution rate plan is 5% under TRS3, so the DC component could not have been lower than the state mandated contribution under TRS2. However, the majority of teachers voluntarily contribute more than the minimum.

[TABLE 3 ABOUT HERE]

4. Modeling Teacher Contribution Rate Choices

The objective of the contribution rate choice analysis is twofold. First, we seek to gain insights into teacher preferences for current versus deferred compensation. Second, we are interested in whether the introduction of rate choice flexibility in 2004 influences both the initial choice of contribution rate and savings over a teacher's lifetime. Ultimately we wish to use the analysis to assess how incorporating a DC component into a teacher pension system – with and without rate flexibility - affects the level of compensation contributed to retirement.

4.1 Initial Rate Choice

We begin by estimating multinomial logit regressions of teachers' initial contribution rate choices. The models are estimated across all teachers, as well as separately for each of the cohorts, who enrolled in TRS3 under different contexts. We also consider the influence of rate choice flexibility on initial contribution rate choice by estimating models of initial rate choice before and after its introduction in 2004.

The dependent variable for each of the teachers in the sample indicates their selection of one of the six initial contribution rate plans, A-F. The multinomial logit model is specified as follows:

$$(1) \qquad p_{ij} = \frac{e^{(\mathbf{T}_i'\beta_{Tj} + \mathbf{S}_i'\beta_{Sj} + \mathbf{D}_i'\beta_{Dj})}}{\sum_{l=1}^{m} e^{(\mathbf{T}_i'\beta_{Tl} + \mathbf{S}_i'\beta_{Sl} + \mathbf{D}_i'\beta_{Dl})}} \quad , \qquad j = 1, \dots, m.$$

with the usual restriction that $\beta_1 = 0$, and where p_{ij} is the ratio of the probability choosing plan i and the probability of choosing plan j, $\mathbf{T}_i$ is a vector of teacher characteristics, $\mathbf{S}_i$ is a vector school-level characteristics, $\mathbf{D}_i$ is a vector of district-level characteristics, and the six different contribution plans are indexed by j.

We control for individual teacher characteristics, including a teacher's age category, gender, race, salary quartile, and having an endorsement in a particular subject area. We do not have strong priors as to whether these individual characteristics are likely to predict rate choice though there is, as discussed in Section 2.2 above, evidence from the private sector that contribution levels are positively related to age and salary level. This is consistent with the life-cycle framework of savings and consumption (Browning & Crossley, 2001), under which one would expect lower savings rates at younger ages, when wages are lower and expenses are higher (e.g., education, purchasing a home, raising children). Other individual characteristics, such as gender, ethnicity, and college degree type, may be related to contribution rate preferences if they are correlated with risk preferences, life expectancy, personal discount rates, or household-level characteristics including marital status and household wealth.

School-level controls include school level (elementary, middle, or high) and school demographic measures (e.g. the percentage of students in the school that are underrepresented minorities and the poverty level defined by the percentage of students receiving free or reduced price lunch), and district-level controls include locale type (city, suburb, town, or rural) and a cost-of-living index.[19] These controls are included in order to account for the possibility that the environment in which teachers are employed, which may be associated with their risk of attrition from the profession (e.g., Goldhaber, DeArmond, & DeBurgomaster, 2011; Hanushek, Kain, & Rivkin, 2004) and/or the cost of living, may influence retirement savings preferences. In some specifications we estimate the models with district fixed effects. Districts may provide different types of information to their employees and/or provide different types of supplemental retirement savings vehicles, but this type of heterogeneity is unobservable in our data.

Finally, we consider the influence of the introduction of contribution rate flexibility in 2004, when teachers were given the option to adjust their rate plan choices in January of each year. One could imagine that the introduction of rate choice flexibility affects initial rate choice in several ways. Rate flexibility allows individuals to make yearly adjustments as, for instance, their salaries change or they approach retirement. For individuals who seek to smooth consumption over the course of their lifetime, we would expect rate flexibility to lower initial contribution rate choices since that corresponds, for younger teachers, with periods in which salary is lower.[20] Hence we should see an increased likelihood of choosing a low contribution plan, e.g. Plan A, when rate flexibility is introduced. Rate flexibility may also encourage individuals to put off the work involved in determining an appropriate rate choice since they can easily adjust in subsequent years, increasing the probability that they default into a plan (Plan A is the default). On the other hand, the ability to adjust one's contribution rate may lessen the risk associated with, for instance, choosing a relatively high rate (e.g., Plans E or F) since this rate would not be locked in for the duration of a teacher's career.[21] The effect of rate flexibility on choices is especially interesting because it is slated to go away after January 2015 in order to satisfy IRS standards for the re-qualification TRS3 as an employer-sponsored pension system. The influence of rate flexibility on plan choice is accounted for with school-year indicator variables and with a rate flexibility indicator (pre- and post-2004). Additionally, we estimate the initial choice models for pre- and post-2004 hires separately and test the model specification.

4.2 Contribution Rate Choice over Time with Rate Flexibility

In Section 4.1 we consider the influence of contribution rate flexibility on an individual's initial contribution rate choice. Here, we consider the influence of rate flexibility on an individual's rate choices over time. Since 2004, TRS3 members have been able to adjust

[19] We use a regional comparable wage index indicating the earning power of individuals with similar levels of education outside of the teaching profession (Taylor, Glander, Fowler Jr., & Johnson, 2007). Higher comparable wages are indicative of a higher cost of living.

[20] This assumes that the desirable lifetime contribution rate is over 5 percent for some teachers, otherwise teachers would be expected to choose Plan A regardless of whether they had rate flexibility.

[21] Or at least a teacher's employment in a particular district; teachers are allowed to adjust their rates when switching employers (i.e. school districts).

their contribution rates during January of each year.[22] This rule change also applies to members hired prior to 2004, who likely thought at the time that their initial rate was locked in unless they changed employers. To better understand teacher savings behavior in the context of contribution rate flexibility we model the probability of choosing a contribution plan over time.

There are a number of reasons to expect teachers' savings preferences to change over time. Under the life-cycle framework of savings and consumption individuals are assumed to attempt to smooth Savings preferences may also shift due to changes in one's personal circumstances (e.g., marital status or financial situation), investment expectations, or changes in income tax rules or macro-economic conditions. Unfortunately, many of these individual time-varying variables are unobservable in our data.

To analyze how rate flexibility affects savings behavior of teachers, we consider two scenarios. First, given an existing pension plan without rate flexibility, how might adding a provision for flexibility affect teachers' savings during their careers. Second, in a newly implemented pension system how might the provision of contribution rate flexibility influence teachers' savings levels during their careers? These two scenarios reflect Washington State teachers' experiences under TRS3, depending on when they were hired. The first scenario applies to teachers who were hired before the 2003-2004 school year, and the second scenario applies to teachers hired between 2004 and 2009.

To model the probability of choosing a particular contribution rate plan in each year, we estimate model (2) over the panel of teacher-year observations between 2004-2009.

$$(2) \qquad p_{itj} = \frac{e^{(\mathbf{T}_{it}'\beta_{Tj} + \mathbf{S}_{it}'\beta_{Sj} + \mathbf{D}_{it}'\beta_{Dj} + \beta_p \mathrm{Plan}_0 + \beta_a \mathrm{Age}_0)}}{\sum_{l=1}^{m} e^{(\mathbf{T}_{it}'\beta_{Tl} + \mathbf{S}_{it}'\beta_{Sl} + \mathbf{D}_{it}'\beta_{Dl} + \beta_p \mathrm{Plan}_0 + \beta_a \mathrm{Age}_0)}} \quad , \qquad j = 1, \ldots, m.$$

In addition to the fact that model (2) utilizes a panel of data, the primary difference between model (2) and model (1) is that model (2) controls for each teacher's initial contribution rate choice and age when the initial choice was made. As discussed in Section 4.1, there are reasons to expect the initial rate choice decision to differ under rate flexibility.[23] Because model (2) conditions for initial rate choice, we estimate it separately for those hired before and after the introduction of rate flexibility in 2004, with clustered standard errors clustered at the individual level.[24]

[22] Previously, members could only change contribution rate plans when changing employers (i.e. school districts); a small percentage of our sample is observed to have done so. Of those employed prior to and after 2004 (31,071 individuals), 16 percent (4,830) are identified as having an opportunity to change rates prior to 2004 due to changing school districts, having a gap in the years in which they are reported in our administrative data, or being reported in DRS data as separating from employment and returning. Among these individuals, 2,031 changed contribution rate plans prior to 2004. While we do not report the result, as a robustness check, we estimate models described below, but utilize teachers' last observed contribution rate prior to 2004 rather than their contribution rate choice, and find our results are virtually unchanged from those reported.

[23] We test for this by estimating pooled and unrestricted models.

[24] To be clear, our model does not capture the full complexity of the process by which individuals choose contribution rates over time, which is likely dynamic and path-dependent. But the types of models that

Next we estimate the probability that a teacher will be in a contribution rate plan at a particular age because we are interested in the influence of rate flexibility on contribution rate choices over a teacher's career. We use estimates of the predicted probabilities of each teacher being in Plan_j given Age_i derived from models (1) and (2) above to obtain the probability of being in a particular plan at a particular age:

$$(3) \quad \text{pr}(\text{Plan}_{it} = j|\text{Age}_{it}) = \text{pr}(\text{Plan}_{it} = j|\mathbf{T}_{it}, \mathbf{S}_{it}, \mathbf{D}_{it}, \text{Plan}_{i0}, \text{Age}_{i0}) * \text{pr}(\text{Plan}_{io} = j|\text{Age}_{i0}, \mathbf{T}_{i0}, \mathbf{S}_{io}, \mathbf{D}_{io}) \ ,$$

The first term on the right-hand side of (3) is the predicted probability obtained from estimating model (2), and the second term is the predicted probability of estimating model (1). With equation three, we can consider what contribution rate choices might look like over a teacher's career under both of the scenarios described above: a teacher hired prior to the introduction of rate flexibility, and a teacher hired with provisions for rate flexibility in place. One limitation of our analysis is that we do not observe contribution rate transitions over every teacher's entire career; in other words our estimates suffer from right censoring.

5. Results

5.1 Findings on Initial Rate Choice

The results from the estimation of model (1) above for a pooled sample that includes both the 1997 Choice, Mandated, and 2007 Choice Cohorts, as well as a model that interacts each covariate with a cohort indicator, are presented in Appendix Table A1.[25] We also show the results estimated separately for each cohort, with and without district fixed effects since findings from research investigating the choice of TRS2 and TRS3 suggest that districts may play an important role in influencing teachers' pension choices (Goldhaber and Grout, 2013). While the district effects significantly improve the fit of the models, they do not appreciably change the other estimated coefficients.[26] Given this, we focus on the models that omit district effects; including the district effects is problematic because it requires us to exclude many districts in the 2007 Choice Cohort where there is very little variation within the districts in plan choice.

Prior to describing the determinants of teachers' contribution rate choices – our primary focus – a few other findings from the models reported in the Appendix are worth noting.

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would allow us to better control for individual fixed effects and choices in previous time periods (e.g., Egger, Pfaffermayr, & Weber, 2007) tend not to be able to produce the predicted probabilities we are most interested in given the context of this paper.

[25] Note that the coefficients in the Appendix tables are log-odds ratios, where Plan A is the reference category among the six discrete choices (Plans A-F). The odds ratio of a coefficient (its influence on the ratio: $\text{pr}(\text{Plan}_j = j)/\text{pr}(\text{Plan}_j = A)$) can be obtained by taking the exponent of the coefficient.

[26] Note that the coefficient estimates generated from these multinomial logit models are not straightforward to interpret because the coefficients predict the change in the log of the ratio of the two probabilities for a one-unit change in the predictor.

Female and Asian teachers are much more likely to select high contribution rate plans (E and F), while African-American and Hispanic teachers are significantly less likely to do so. And not surprisingly, teachers employed in higher-cost localities (identified by the coefficient on the comparable wage index) are more likely to select a low contribution rate plan (Plan A), while teachers earning higher salaries are more likely to select higher contribution rate plans. Finally, for teachers mandated into TRS3, the probability of selecting a low rate plan rises with the proportion of underrepresented minority students served by the schools in which they are employed and falls with salary level.

Next we turn our attention to the different choice cohort groups: 1997 Choice Cohort refers to those teachers who were previously enrolled in TRS2 but opted into TRS3, the Mandate Cohort refers to those teachers hired between 1997 and 2007 who were required to enroll in TRS3, and the 2007 Choice Cohort refers to those teachers hired after 2007 who had the choice to enroll either in TRS2 or TRS3. The coefficients on the indicators for each choice cohort group in the pooled regression (Table A1 in the appendix) show that savings behavior varies across these groups, though not in a terribly consistent way. In general, relative to teachers who were mandated into TRS3, the teachers who transferred into TRS3 in 1997 or chose TRS3 after 2007 tend to be more likely to select higher contribution rate plans. For instance, the odds of selecting Plan E (10 percent rate) versus Plan A (5 percent rate) for the 1997 and 2007 Choice Cohorts are approximately 1.6 (where $\exp(0.47) = 1.6$) relative to the baseline of the mandate cohort (even odds).

To assess the differences in the underlying propensities of the different choice groups to select different rate plans, we use the estimates from the pooled model to predict the probabilities of being in each contribution rate plan for each individual in the sample. We do this under three hypothetical situations: where all individuals are assumed to be members of the 1997 Choice Cohort, where all individuals are assumed to be in the group mandated into TRS3, and where all individuals are assumed to be in the 2007 Choice Cohort. This yields 18 probabilities for each individual in the sample: 3 cohorts times 6 rate contribution plans (reported in **Table 4**). We then use the predicted probabilities of enrollment in each plan to calculate the estimated overall contribution rates for each individual, under a given choice cohort assumption. This is done by aggregating across the contribution rates associated with each of the six plans, where each plan's rate is weighted by the predicted probability of being in that plan.[27] Finally, we obtain overall average contribution rates for a particular cohort by averaging the overall estimated individual contribution rates across all individuals in the sample under the assumption that they are members of a particular group.

[TABLE 4 ABOUT HERE]

Using the procedure described above, we estimate the mean contribution rate given that one is in the 1997 Choice Cohort to be 7.0 percent. It is estimated to be 6.8 percent for those mandated into TRS3, and 7.2 percent for the 2007 Choice Cohort. The finding of differences across the cohorts is not surprising given that the teachers from the three

[27] In cases where the plan has an age-adjusted contribution rate (Plans B and C), we use the contribution rate associated with each individual's age in this step.

cohorts faced very different investment climates. For instance, the Dow Jones Industrial Average increased by 26 percent in the year prior to the contribution rate decision made by the 1997 Choice Cohort; it increased on average by under 10 percent for the years covering the mandated group; and it increased by 6 percent (in 2007) and negative 34 percent (in 2008) in the years when the 2007 Choice Cohort was making rate contribution decisions.[28] Moreover, those opting into TRS3 may have done so because they sought to deviate from what would have been the required employee contribution toward overall savings under TRS2. The TRS2 contribution rate was consistently over 6 percent for most of the decade prior to the 1997 Choice Cohort making a transfer decision, but averaged about 3 percent in the decade prior to the 2007 Choice Cohort opting into TRS3.[29] Finally, the cohorts may be different from one another along unobservable dimensions. As discussed in Section 2.1, the three cohorts enrolled in TRS3 under different contexts: the 1997 and 2007 Choice cohorts opted in as opposed to being mandated into the plan, and the default settings were different in 1997 and 2007. Hence, we might expect heterogeneous savings preferences across cohorts.

Some specifications of the models reported in the appendix also include year indicators to account for changes in perceptions of the investment climate and the introduction of rate flexibility in 2004 (see tables A3.1 and A3.2). Many of these are statistically significant. In particular, the indicators for 2004 and later tend to show an increased likelihood of selecting the lowest rate plan relative to the other options. This suggests that rate flexibility, along with other factors that may be correlated with its introduction, may be associated with teachers opting for lower initial contribution rates.

To further assess the influence of rate flexibility on initial choice we focus on the group of teachers who are mandated into TRS3 because this is the only cohort where we observe initial choices both with and without rate flexibility (before and after 2004). **Figure 2** shows both the average proportion of teachers choosing each plan in each year (Panels A-F) as well as the predicted proportion choosing each plan given the marginal effect of the year (relative to 2003), estimated over the demographics in the workforce in each year.[30] The differential between the simple proportion choosing a specific contribution rate plan and the average probability of a teacher choosing that rate plan represents the estimated effect of the influence of non-year covariates. But while there are

[28] To the degree that individuals perceive future stock market returns as the opportunity cost associated with current consumption and believe that recent past returns are predictive of future returns, we would expect savings rates to rise when the anticipated returns rise. And, this perception about future returns may be correlated with past returns. If so, we would expect a correlation between contribution rate choices and past stock market returns.

[29] Note also that the default retirement plan was TRS2 for the 1997 Choice Cohort and TRS3 for the 2007 Choice Cohort so we might also expect differences in the average financial sophistication of the teachers who end up in TRS3 in the two different choice periods (see Goldhaber and Grout, 2013 for more on this issue).

[30] Model (1) is estimated on the Mandated Cohort (see Table A3.1, columns 1-5) with school year indicators and the 2002-03 school year as a reference. The marginal effect of each school year on the probability of choosing each plan is calculated, given that a teacher made an initial rate choice in that school year. The marginal effects are used to calculate the expected contribution rate for each teacher by taking the sum of each plan's contribution rate, weighted by the probability of choosing that contribution plan.

certainly deviations between many of the average contribution rates in a year and the coefficients on the year indicator variables, there is also significant overlap in the confidence intervals for many the year indicators for many of the plans. The exception is for Plan A, which shows teachers to be more likely to choose this plan in the years after the introduction of rate flexibility.

[FIGURE 2 ABOUT HERE]

Again, it is difficult to assess what the implications of rate flexibility or year-effects are based on the six different rate plans. To facilitate an assessment of the overall savings rate, we aggregate across rate plans using the same methodology described above, but assuming different years instead of different choice cohorts. These estimations are presented in **Figure 3**, which suggests that the introduction of rate flexibility has a negative impact on savings propensity. When the rate flexibility indicator is interacted with the covariates in Table A.3.2 to estimate an unrestricted model, a likelihood ratio test suggests the model should be estimated separately for those with and without rate flexibility. However, when the same test is performed as if rate flexibility were introduced in other years (i.e., other than 2004) we obtain similar results. In fact, the Chi-Squared test statistic is higher when interacting indicators for pre- and post-2001, 2002, and 2003.[31] This may be driven in part by the manner in which the provision for rate flexibility was established: it was added by the DRS in 2000, approved by the IRS in 2002, and adopted into state statutes in 2003 (see Section 2.1).

[FIGURE 3 ABOUT HERE]

While we find that the probability of choosing a lower contribution rate increases with the introduction of rate choice flexibility, two important caveats apply to this finding. The first is that we cannot rule out the possibility that other factors correlated with the introduction of rate flexibility are influencing the drop in contribution rates. And second, the introduction of rate flexibility may influence the initial contribution rate choice, but it also allows for later adjustments to contributions, meaning we cannot infer the total effect on a teacher's retirement savings without considering potential rate adjustments, a point we return to in Section 5.2.

One of our primary interests is estimating the relationship between a teacher's age and contribution rate decisions given that this provides evidence about the degree to which teachers value current versus future consumption and the extent to which per teacher retirement savings is affected by allowing them to save through defined contribution accounts. In the discussion that follows, we focus on the results from the model specifications that estimate plan choice separately for the three teacher cohorts, given the above findings that teachers from each group behave differently.

Across each cohort there is a clear association between teacher age and plan choice, but the relationship differs across the cohorts. All-else-equal probabilities of selecting each of

[31] These tests are conducted with and without a time trend variable and with lagged returns on Washington State Investment Board assets, and produce very similar results.

the contribution rate plan by age cohort are presented in **Figure 4**. There is a slight increase with age in the probability of selecting the lowest rate plan (Plan A) for the Mandated and 2007 Choice Cohorts, but not for the 1997 Choice Cohort; the probability of selecting Plans B and C (the age-adjusting rate plans) drops consistently with age across all three choice cohorts; there is little association between age and the probability of selecting Plan D for any of the choice cohorts, and the probability of selecting both Plans E and F (the highest rate plans) tends to rise with age, then drop off (in the case of Plan E).[32]

[FIGURE 4 ABOUT HERE]

Finally, to assess the relationship between age and the expected initial contribution rate, we aggregate across rate plans for individuals who fall into different age categories (using the same methodology described above to assess differences across cohorts and years). The results of this aggregation are reported in **Figure 5**, which shows that contribution rates across each choice cohort tend to rise with age, though average initial rate choices level off after age 50 for the Mandated Cohort. These findings consistent with empirical evidence on retirement savings patterns in the private sector (Clark & Schieber, 1998; Holden & VanDerhei, 2001).

[FIGURE 5 ABOUT HERE]

5.2 Contribution Rate Choices in the Context of Rate Flexibility

The coefficient estimates from the multinomial logit panel models are reported in Appendix Table A5. The results of the model estimated on teachers hired prior to the introduction of rate flexibility are presented in columns (1) – (5), and the results for those hired in the 2004 school year or later are in columns (6) – (10). Initial rate choice is highly predictive of individuals' subsequent rate choices. As we would expect, the odds of being in Plan j in year t are highest for those whose initial choice is Plan j. Initial age is not generally predictive of plan choice, though among the pre-2004 hires older initial age is associated with higher probabilities of being in Plan D. Older current age is predictive of being in higher contribution rate plans among the pre-2004 hires, but with the exception of being in Plan F, is not predictive of plan choice for post-2004 hires. In general, fewer covariates are predictive of contribution rate choice among the post-2004 hires, which may be due to the fact that relatively few of them have deviated from their initial choice because it was recently made.[33]

To simulate the probability of being in each particular plan during the range of one's career, we utilize the coefficients from the models in Appendix Tables A3.3 and A5, and the sample of teachers in the Mandated Cohort aged 25-30 (9,391 individuals). We assume that individuals enter the teacher labor market at age 25 and exit at age 65 and we calculate their predicted retirement plan probability $\mathrm{pr}(\mathrm{Plan}_{itj} = k|\mathrm{Age}_{it})$ for each age,

[32] Not all of these relationships are statistically significant, and, in some cases (especially for teachers in their 20s and 50s for Plans E and F), the estimates are based on relatively small samples.

[33] Note also that the magnitude of the coefficients on the initial plan choice indicators are largely in the post-2004 model.

conditional on individual characteristics (which are held constant), using equation (3). This is likely a conservative estimate of contribution rates given that younger teachers earn less and there is an increasing likelihood of selecting higher contribution rate plans as salaries rise.

We then calculate the average contribution for each age category, weighting by the predicted probability of choosing each plan and sample composition.[34] The calculations are carried out separately for those hired before and after rate flexibility. For those hired before rate flexibility, we use the initial choice estimates (columns 1-5 of Table A3.3) and the panel choice estimates (columns 1-5 of Table A5) of those hired before 2004. In the simulated panel, rate flexibility is introduced five years after hire, at age 35. For those hired after rate flexibility, we use the coefficients from the corresponding post-2004 coefficient estimates (in Tables A3.3 and A5). [35]

In **Table 5** we present the simulated probability of being in each contribution plan at age 65 given initial rate choice at age 25, using the estimated probabilities described above.[36] The results for those hired before 2004 are in Panel A, and the results for those hired after are in Panel B. Most teachers are predicted to end up in a plan that is the same as their initial choice plan – particularly those in Plans A and F (and B for the post-2004 hires) – as was the case for the transition from first to last observed plan (**Table 3**). One exception is those hired without rate flexibility who initially choose Plan C, the majority of whom end up in other plans. Finally, consistent with our finding in Section 5.1 that older teachers tend to choose higher initial contribution rates, our analysis of contribution rate choice over the course of a career generally shows that teachers are more likely to adjust contribution rates upwards than downwards.

[TABLE 5 ABOUT HERE]

To get additional insight on the net effect of rate choice flexibility on contribution rate choices during a teacher's career, we plot average simulated contribution rates by age (as calculated above) under three different scenarios in Figure 6.[37] The baseline scenario is "no rate flexibility," where an individual makes an initial choice at age 25 and stays at that contribution rate. In Figure 6, this average rate shifts upwards at ages 35 and 45

[34] To account for sample composition, "types" of individuals are defined across all combinations of the categorical variables. For example, one type would be female, Asian, second, salary quartile, with math endorsement, in a suburban middle school. The sample composition weight is based on the number of individuals belonging to that "type".

[35] The great majority of the teachers in the 25-30 age category are in the lowest salary quartile. When we instead utilize the entire panel of teachers mandated into TRS3, which has a balanced salary quartile distribution. The average predicted contribution rate is larger when using the entire panel and the difference increases with age, but the magnitude of the differences between average rates are small: between 0.0005 and 0.003. The shapes of the plots in Figure 6 using the two different samples are consistent with one another.

[36] We run the simulation assuming each initial rate plan for each person. The percentages off of the diagonal represent the predicted probability of being in that plan at age 65, given the initial plan choice.

[37] Note that while Figures 5 and 6 both consider contribution rate choice by age category, they are quite different. Figure 5 presents predictions about initial choice across all ages. Figure 6 predicts initial choice given initial age of 25-30, and simulates subsequent contribution rate plan choices up to age 65.

because plans B and C automatically adjust upwards at these ages. The first alternative scenario is "introduced rate flexibility," where an individual makes an initial without expectation of have rate flexibility (the same as the baseline) and then is able to adjust contribution rates each year starting after 5 years (age 30). The second alternative scenario is "rate flexibility at hire," where the individual is hired knowing that contribution rates can be adjusted in subsequent years. The results in Figure 6 suggest that on average, teachers will shift to higher contribution rate plans as they get older. Over most of the age range, teachers with rate flexibility are predicted to have higher average contribution rates than those without rate flexibility.

[FIGURE 6 ABOUT HERE]

6. Policy Implications and Conclusions

The recent focus on public sector pensions has occasioned a reexamination of the existing theory that a primary reason the public sector devotes a relatively high proportion of compensation to retirement benefits is because this compensation structure helps them retain effective employees (Dorsey, 1995).[38] An alternative theory developed by Glaeser and Ponzetto (2013) posits that part of the reason why public sector pensions are relatively generous is that compensation in the public sector is determined through a political process in which there is asymmetric information about compensation packages, with public sector employees having a better understanding of the implications of retirement packages than ordinary taxpayers. Under this scenario, with politicians competing for the votes of both public employees and taxpayers in general, it is possible for an equilibrium to occur in which compensation is inefficiently back-loaded with retirement compensation. One implication of this is that the welfare of public-sector employees could be enhanced without adding to total cost by shifting compensation forward from retirement into salaries.

The Glaeser and Ponzetto theory is supported empirically by the Fitzpatrick (2012) finding (discussed in Section 2.2) that at the margin, public school teachers appear to value their DB pension benefits at far less than the cost to employers of providing them (across the sample in her study the value was estimated to be only 19 cents on the dollar of cost).[39] The findings we present above also speak to preferences for current vs. deferred compensation, but in a different context: whereas Fitzpatrick (2012) analyzes an instance in which teachers could purchase an upgrade (at a heavy discount) to their future DB annuities, we model teacher contribution rate choices over time.

Because teachers in our study are making choices about current contribution rates we do not need to know anything about employee expectations about investment returns or individual discount rates to infer how they feel about current compensation versus

[38] Employees and employers may also prefer deferred (retirement) compensation in employer-sponsored plans because they receive favorable tax treatment, and there are economies of scale in the administrative costs of investment (Gustman, Mitchell, & Steinmeier, 1994).

[39] In other words, Fitzpatrick's estimates suggest that teachers would, on the margin, be indifferent between $1.90 in current salary vs. deferred compensation with a present value of $10.

deferred compensation. Many of the employees, though not all (as we describe below) reveal their preferences based on their contribution rate choices, since the tradeoff between the two are both expressed in current dollars. Specifically, the opportunity cost of investing an additional dollar into a DC retirement account is equivalent to the amount of money that could otherwise be taken home as current income. The complicating factor in making the calculation is that many contributions to retirement plans are not taxed until they are withdrawn in the form of retirement benefits,[40] meaning that the cost to the employee of an additional dollar contributed toward retirement savings is less than a dollar in terms of what is given up in current compensation. Taking taxes into account, the cost of contributing an additional dollar toward retirement is simply $(1 - t_{ic})$, where t_{ic} is the marginal tax rate for individual i given contribution rate c. The calculation of t_{ic} in Washington State is simplified by the fact that the state has no income tax, so the cost of contributions depends entirely on the federal taxes that teachers might face when they make their DC contribution rate choices.

Table 6 shows the estimated marginal tax rate (on gross adjusted income) associated with different rate plans and income quintiles.[41] This tax rate varies somewhat because teacher compensation varies across individuals and because teachers choose different contribution rates.[42] In reality the situation is more complex since the marginal tax rate will depend on household income and other retirement savings vehicles. Unfortunately we do not have information about household-level incomes or savings so we base the marginal tax rate estimates in Table 6 entirely on observed teacher earnings.

[TABLE 6 ABOUT HERE]

Were employees completely free to choose different contribution rates, we could directly infer the value of the marginal dollar set aside for retirement based on teachers' choices of contribution rates. However, teachers choose from amongst six discrete rate plans (see Table 1) and at the minimum are required to contribute 5 percent (Plan A). Given the constraints on teacher choices, we must make some assumptions about what different rate plan choices imply about the value of investing a dollar for retirement.

While we cannot be sure that the *marginal* dollar for teachers choosing a particular rate plan is valued at $(1 - t_{ic})$, we assume that for teachers choosing plans other than A, they value the *average marginal* contribution (i.e., the amount above the next lowest plan) at least as much as $(1 - t_{ic})$. For example, consider an age-30 teacher earning $50,000 with a marginal tax rate of 0.25 who chooses Plan D (7 percent contribution). We assume that the average marginal value of the additional one percent contribution of $500 toward retirement ($500 being the difference between choosing plan C and D) is worth at least

[40] One exception, for instance, is the Roth IRA.

[41] Marginal tax rates are a function of an individual's adjusted gross income (AGI). AGI is calculated by taking an individual's salary (S275 data collected by OSPI) and subtracting the defined contribution and the annual IRS (varies by year) standard deduction and personal exemption.

[42] Almost all school systems in Washington state utilize the state (single) salary schedule and virtually all employees on this schedule are estimated to pay a marginal tax rate between 15 and 28 percent. For instance, in 2009 no teacher in our sample faced a marginal tax rate of more than 28 percent, 85 percent faced a rate of 25 percent, and 11 percent faced a rate of 15 percent.

75 cents on the dollar to the teacher, where 75 cents represents the amount of current compensation that is foregone per dollar of retirement savings given the tax rate teachers are calculated to be in if they choose Plan D.

For those teachers choosing Plan A, the minimum rate plan, we do not know how much teachers actually value the retirement investment because it is required minimum contribution.[43] We therefore consider three different scenarios. First, we make the unrealistic assumption that Plan A members place zero value on the required minimum contribution, which represents a lower bound for this group. Second, we assume that they value retirement investments at 19 cents on the dollar, consistent with Fitzpatrick's estimates. Finally, we assume that they value contributions at one half of the rate $(1 - \mathrm{t_{ic}})$ associated with Plan A were teachers choosing that contribution rate freely.

Table 7 shows the estimated average marginal value of a dollar invested in retirement for teachers of varying ages given the aforementioned assumptions about individuals in Plan A and by aggregating across teachers in different rate plans. It is clear from this table that the value teachers place on retirement investment is far higher than that suggested by Fitzpatrick. For instance, the lower bound estimate (assuming Plan A members place zero value of retirement investments) suggests that on average, teachers value additional contributions to their DC accounts at more than 50 cents on the dollar. Assuming that Plan A members value their contributions at $0.5 * (1 - \mathrm{t_{ic}})$ suggests an average marginal valuation of at least 65 cents on the dollar.

[TABLE 7 ABOUT HERE]

What explains the differences between our findings and those of Fitzpatrick? There are at least three possibilities.[44] First, Fitzpatrick suggests that one reason why teachers may wish to forgo pension income for current income is because they are already relatively "oversaturated" with retirement income. In theory it is possible that the degree of retirement funding saturation differs between Illinois (the state in which Fitzpatrick's sample is drawn) and Washington. However, this does not look terribly plausible. The Illinois TRS annual benefit formula is $0.022 * \text{Average Final Copensation} * \text{Experience}$, which is not significantly more generous than TRS2 (which has a multiplier of 0.02), especially considering that Illinois TRS members do not participate in Social Security while Washington State TRS members do.[45]

Second, our study speaks to how much teachers are willing to sacrifice in compensation to invest in a defined contribution plan whereas Fitzpatrick is estimating how much they

[43] Almost 70 percent of teachers (in 2009) are found to be selecting a contribution rate plan other than Plan A. For these teachers, we can conservatively say that on the *margin*, at least some of the compensation deferred to retirement savings above the 5 percent minimum is valued at least 72 cents on the dollar.

[44] A fourth possibility is, of course, that the estimates of what teachers value are incorrect. In the case of our findings, the estimates are pretty straightforward given that they are derived based on teachers' revealed preferences, but Fitzpatrick's are based, in large part, on deriving the demand for pension enhancements, which is complicated by selection issues.

[45] Between 1990 and 2010, the tax rate paid to social security was 12.4 percent (6.2 percent by each employers and employees). Illinois TRS members do not pay this tax.

are willing to sacrifice to purchase a more generous defined benefit annuity. It is possible that teachers view these as very different options given, for instance, differing views about the fiscal sustainability of DB systems, or the nudges (or lack thereof) that they receive about retirement savings associated with the two systems.[46]

Finally, the contexts of Fitzpatrick's and our calculations are quite different. We calculate the tradeoff between current income and the *investment* in future income, where the opportunity cost of that investment is defined in terms of foregone current income. Fitzpatrick considers the tradeoff between current income and the present value of an annuity upgrade that generates a future stream of benefits, where the opportunity cost of the upgrade is the cost to the state of providing that benefit (assuming a 5.10 percent discount rate).[47] The opportunity cost of the upgrade from a teacher's perspective may be understated if her discount rate is higher than 5.10 percent. To illustrate this point, we make a back-of the-envelope calculation using a 5.10 percent discount rate and then an 8.5 percent discount rate, which is the discount rate assumed by the Illinois Teacher Retirement System (National Education Association, 2010). Consider a 50 year-old teacher with 20 years experience who purchases the annuity upgrade in 1998, retires at age 60, and expects to live to 80 years of age. The "price" of the upgrade in terms of the ratio $(\text{upgrade fee})/(\text{present value of benefit increase})$ is 21 cents per dollar under a 5.10 percent discount rate and 38 cents per dollar under an 8.5 percent discount rate. The annuity upgrade would have seemed like less of a bargain than Fitzpatrick suggests to teachers who might have invested that money with the expectation of a high rate of return.

Our analysis of Washington State teachers' contribution rate choices also speaks to the question of whether shifting from a traditional DB plan to a hybrid DB-DC plan affects the level of compensation contributed in support of future retirement benefits. Contribution levels in TRS2 – the baseline, traditional DB plan – depend on a number of factors, including investment performance, retirement timing, and longevity of its members. Since its inception in 1977 the TRS2 employee contribution rate has varied substantially, ranging between a high of 6.99 percent in 1989 and a low of 0.15 percent in 2002. The entry age normal cost of the plan was calculated to be 5.9 percent in 2009.[48] Yet, the average employee contribution rate during the plan's lifetime is approximately

[46] The argument about fiscal sustainability seems a bit tenuous given the context of Fitzpatrick's analysis, which was based on a sample of teachers in Illinois in the 1990s when the state was increasing retirement benefits because of unexpected surpluses in state budgets and pension funds. But, in the case of Washington, there are differences in the nudges that teachers receive about their pensions depending on whether they have a DB only or a DC account. For instance, while both TRS2 and TRS3 members can see monthly deductions from their paychecks, only the deductions for TRS3 have a direct relationship to the accumulation of retirement wealth (TRS3 members receive quarterly statements from the DRS reporting DC accounts contributions and balances).

[47] To calculate the present value of the cost of the annuity upgrades, Fitzpatrick assumes a discount rate of 5.10 percent, the true interest cost rate for Illinois state bonds sold during 1998.

[48] Entry age normal cost is an actuarial method under which the actuarial present value of the projected benefits for each individual is allocated on a level basis over the earnings or service of the individual between entry age and assumed exit age(s).

4.7 percent, perhaps because the pension fund's investments have exceeded expectations during that time period.[49]

If the long-term average employee contributions required to fund TRS2 are between 5 and 6 percent, how do contributions compare when teachers move to a hybrid plan and can choose at what level to contribute to the DC component? In general, we find that the majority of teachers contribute more than the minimum required by plan rules (5 percent), and since the plan's inception in July 1996, average teacher contribution rates are above 7 percent. In Section 5, we examine the contribution rate decision in more detail, accounting for the demographic composition of TRS3 members, and different rule structures. Again, we find that average contribution rates are likely to exceed what a teacher would be required to contribution in support of funding TRS2. In Figure 6, we predicted average teacher contribution rates over a teacher's career under three different scenarios. In each case, contributions well exceed 6 percent, both with and without contribution rate flexibility. Teachers who make a choice without expecting to be able to adjust rates in the future are predicted to shift to higher, not lower, contribution plans when given the option. In general, our findings suggest that the amount of compensation contributed in support of TRS3 retirement benefits is likely to be at least as high as the amount contributed in support of TRS2 benefits.

While our analysis speaks directly to the question of how the introduction of a hybrid DB-DC system might affect contribution levels, addressing the question of how this might affect teachers' retirement security is more complicated. The value of benefits that will ultimately be provided to each individual under TRS2 or TRS3 is uncertain: the benefits provided by the DB components of both plans depend on each teacher's average final compensation and amount of tenure at the time of retirement, and the benefits provided by TRS3's DC component depends on each teacher's tenure, contribution levels and investment returns.

A concern about individuals relying on their DC account investments for the provision of retirement income is that some individuals may not contribute enough and/or be able to earn a rate of return sufficient for retirement security. As a basic exploration of this issue we calculate the internal rate of return (IRR) on DC investments that a teacher would need to earn in order equate the present values of TRS2 and TRS3 (as of year-of-hire). These calculations follow the analysis of relative financial value in Goldhaber and Grout (2014); the primary difference is that here we compare the present values (rather than the net present values) of the two plans. The IRR is calculated for a representative female teacher who is hired at age 25, and for each potential year of exit from the profession (i.e., given exit at age 25, 26, 27,..,64).[50] Furthermore, we make the calculations assuming contribution rates that are low (5 percent), high (10 percent) and consistent with the

[49] Historical returns for the Washington State Investment Board can be found at: http://osa.leg.wa.gov/Actuarial_Services/Actuarial_Information/Historical_Returns.htm.

[50] The assumptions related to the calculation of the IRR that are detailed in Goldhaber and Grout (2014) are also applied to the calculations in this paper (http://cedr.us/papers/working/CEDR%20WP%202014-1.pdf). These assumptions include 3 percent inflation and salary growth, and the first withdrawal of retirement benefits at age 65. DC assets are assumed to continue earning up until age 65 when retirement begins. The IRR values presented here are nominal.

simulated expected contribution rates presented in **Figure 6** (between 6.1 and 7.9 percent).

The IRR calculations are presented in **Figure 7**. They exhibit a great deal of variation depending on the representative teacher's length of tenure. For example, if she separates at the end of the school year in which she is age 50 (with 26 years of experience), the IRR that equates the present values of TRS2 and TRS3 is between 1.1 and 3.7 percent depending on the contribution rate. But if separate age is instead assumed to be 64 (with 40 years of experience) the IRR is between 6.2 and 9.1 percent. There are large discontinuities in the IRR that occur with the accumulation of 5, 10, and 20 years of experience that are consistent with teachers becoming vested in TRS2 (after 5 years), becomes vested in TRS3 (after 10 years), and becomes eligible for a 3 percent annual increase in the value of TRS3 DB for each year between exit and age 65 (after 20 years).

[FIGURE 7 ABOUT HERE]

As Figure 7 shows, the level of retirement security that is likely to be provided by TRS3 relative that provided to TRS2 largely depends on how long a public school teacher expects to remain in the profession. The IRR is highest if a teacher exits with between 5 and 10 years of service as this corresponds to a period when she would be vested in TRS2 but not yet in TRS3, and when the teacher stays in the profession until she nears retirement age (i.e., beyond age 55). In general, however, the IRR is quite low. Campbell (2001), for instance, provides an estimate of long-term real equity returns averaging between 6.5 to 7 percent (the values in Figure 7 are nominal). And, since it's inception in 1926, the Washington State Investment Board has earned an average annual nominal return of 10.2 percent (see http://osa.leg.wa.gov/Actuarial_Services/Actuarial_Information/Historical_Returns.htm) and TRS3 members can invest their DC assets in funds managed by the Board.

That teachers' retirement security may be reduced by shifting to DC pension systems is a valid concern. In the context of comparing TRS2 and TRS3, however, we do not find evidence that teachers are likely to have less retirement security under the hybrid plan. In fact, reasonable assumptions about investment returns on DC assets suggest that Washington's hybrid plan is likely to provide a level of retirement security that is comparable or greater than that provided by the traditional plan (depending on an individual's career length and investment performance). Clearly, the retirement benefits provided by the hybrid system are subject to greater investment risk, but teachers appear to be willing to accommodate this risk; when given a choice between enrolling in TRS2 or TRS3, the majority of teachers choose the hybrid system.[51]

[51] One advantage of a DC plan relative to a traditional DB plan is that if an individual exits well before retirement age, the size of the benefit can still grow as it accrues investment returns. Under a traditional DB plan the size retirement annuity remains fixed, given the level of average final compensation and experience upon exiting. In addition to not growing, the real value of the annuity will depreciate with inflation.

In summary, our findings suggest that the debate around pension reform, which tends to be centered on the suitability of DB and DC pension systems for the teacher workforce, may be somewhat misguided. Our analysis demonstrates that a well-designed hybrid plan can create an environment under which teachers value the compensation being deferred to retirement savings, and are likely to save at least as much as would have been the case under a traditional DB system.

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Figure 1. Average Employee Contribution Rates by School Year

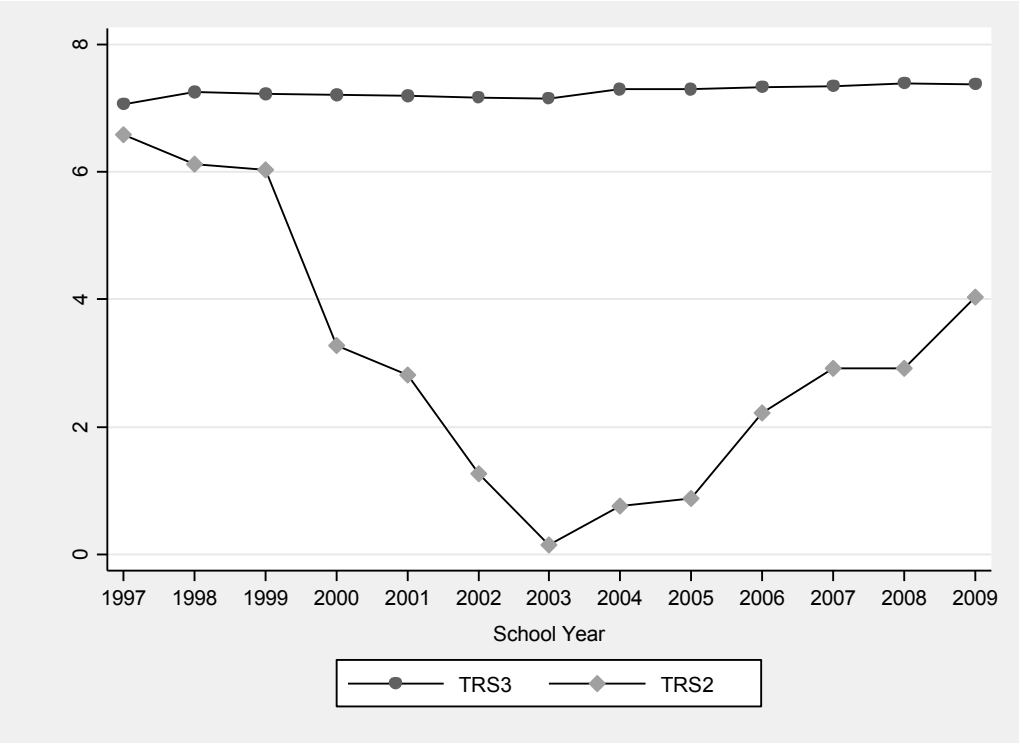


Figure 2. The Marginal Year-Effects on Probability of Initial Plan Choice (2003 is reference year)

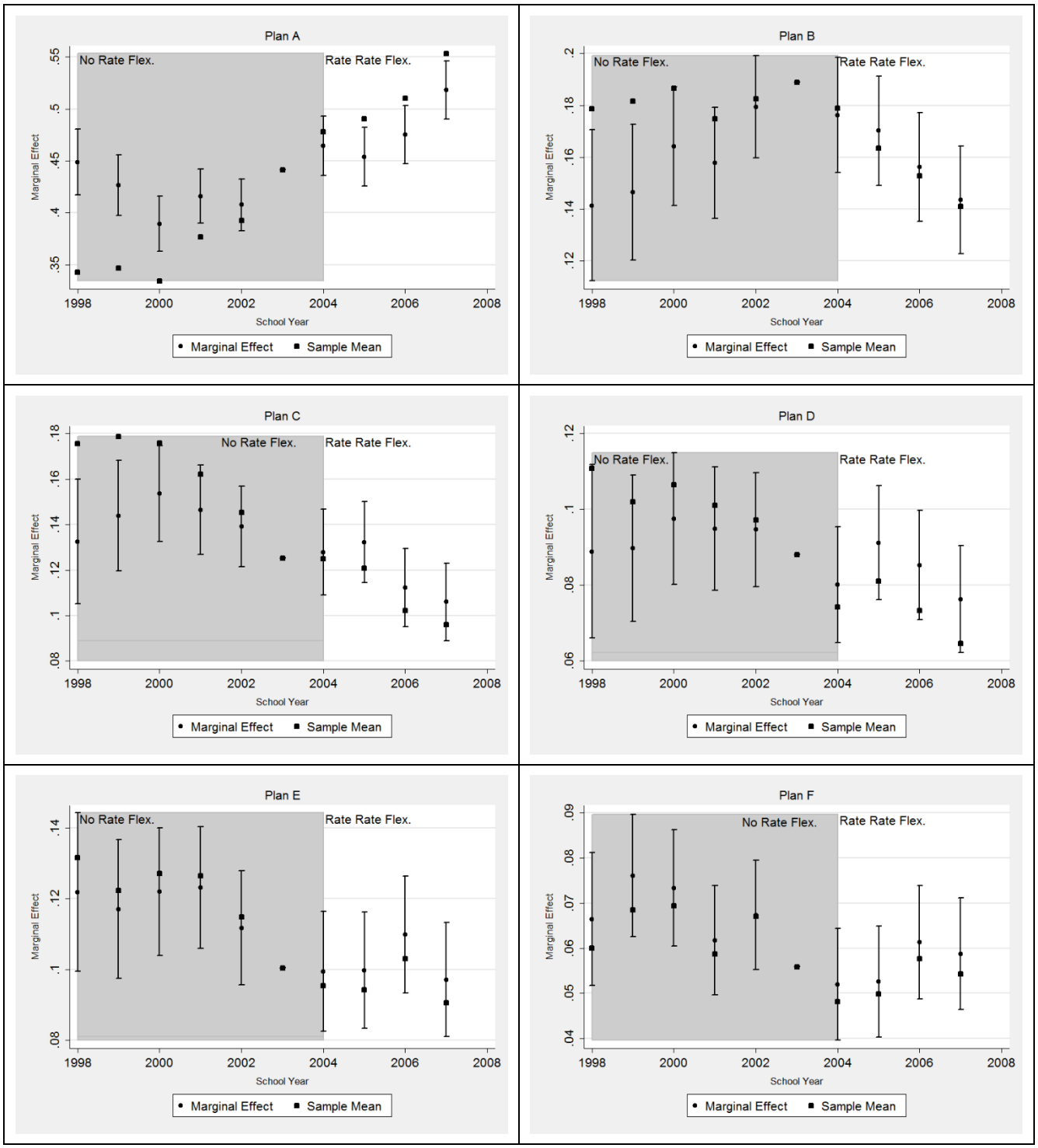


Figure 3. Marginal Effect of School Year on Weighted Contribution Rate (Initial Choice)

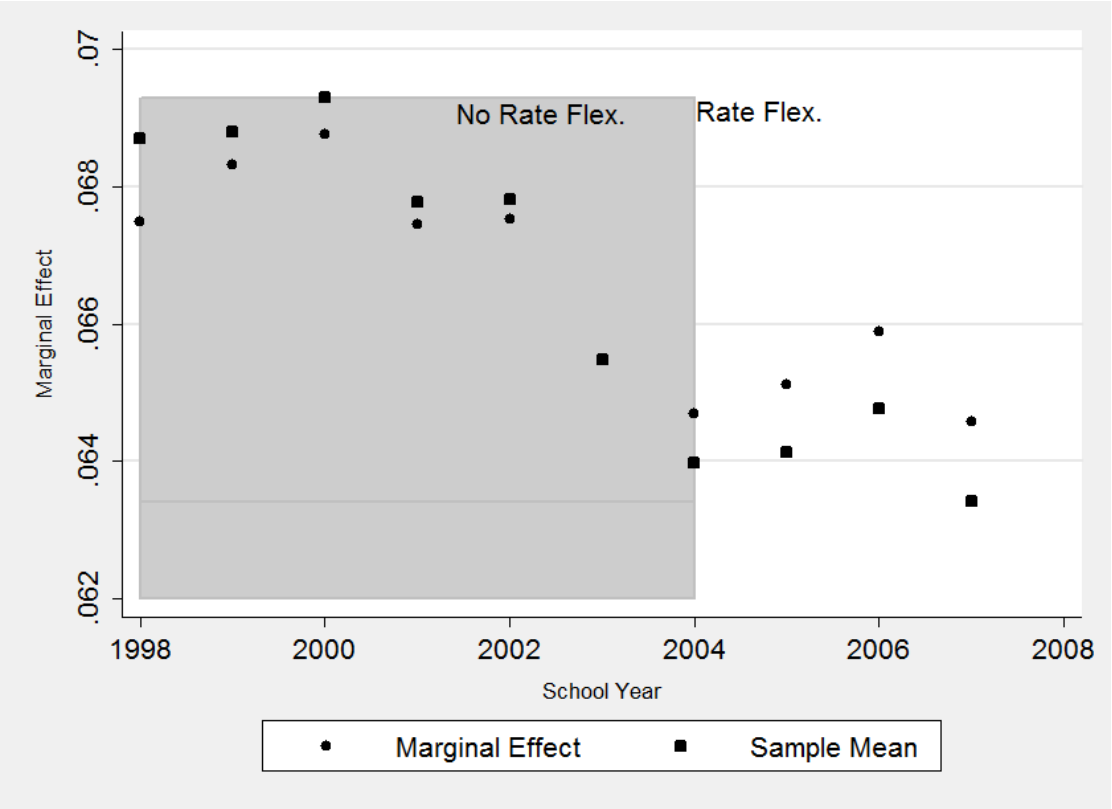


Figure 4. The Predicted Probability of Initial Plan Choice by Age and Cohort

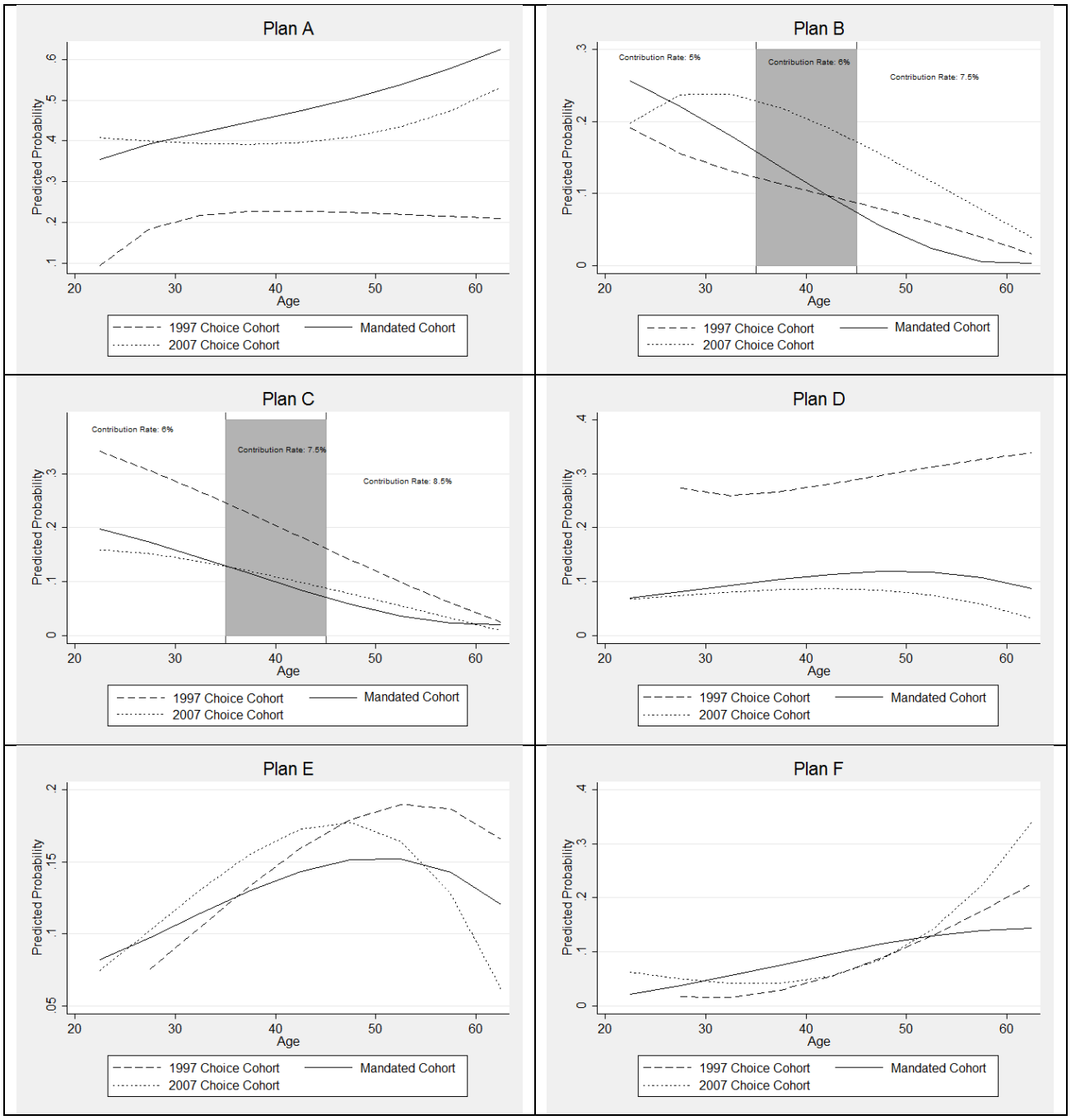


Figure 5. Average Predicted Contribution Rate by Age and Cohort (Initial Choice)

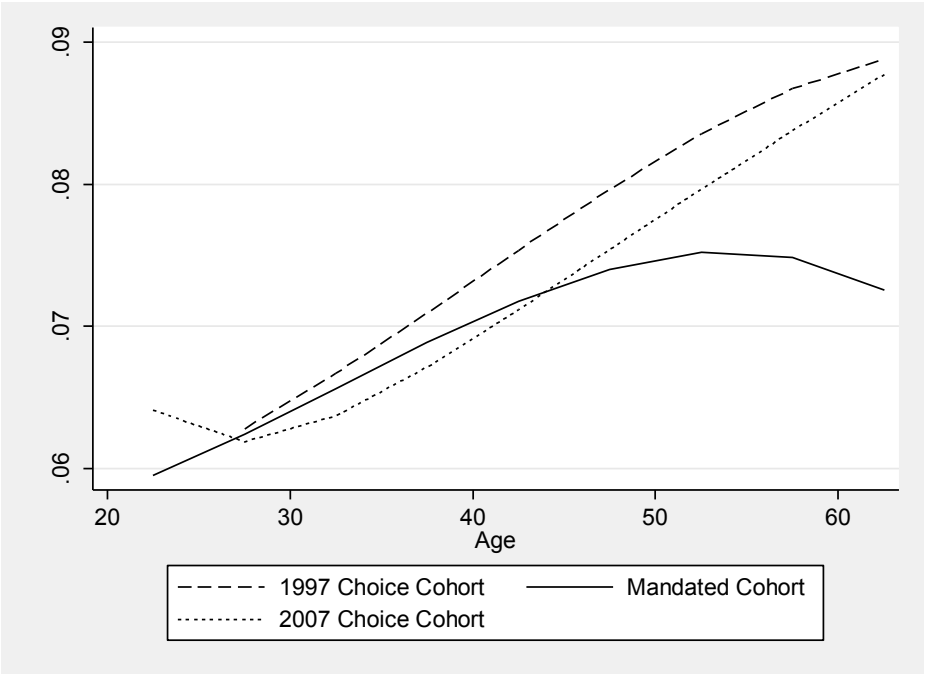


Figure 6. Simulated Effect of Rate Flexibility on Expected Contribution Rates during Employment (hired at age 25 and leave employment at age 65)

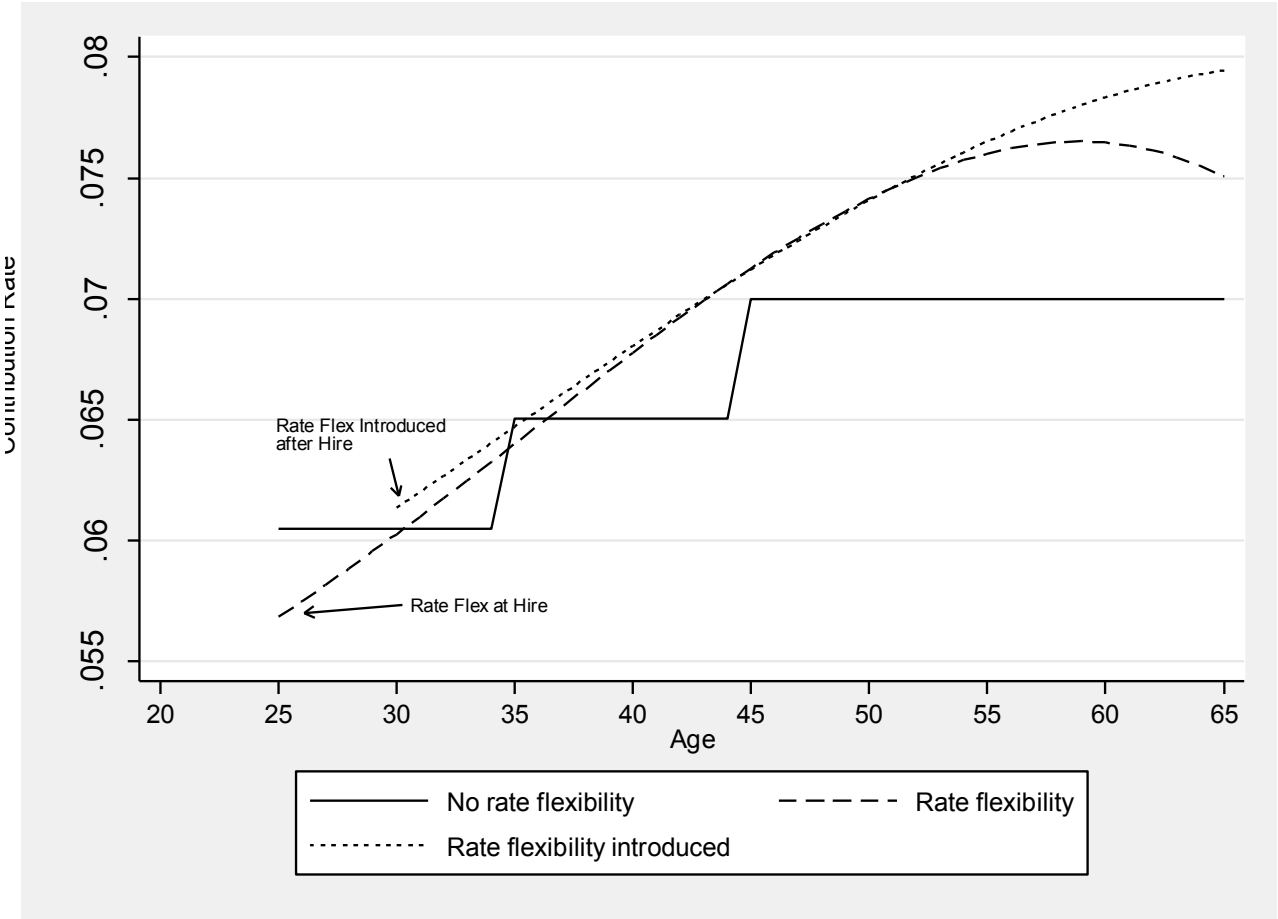
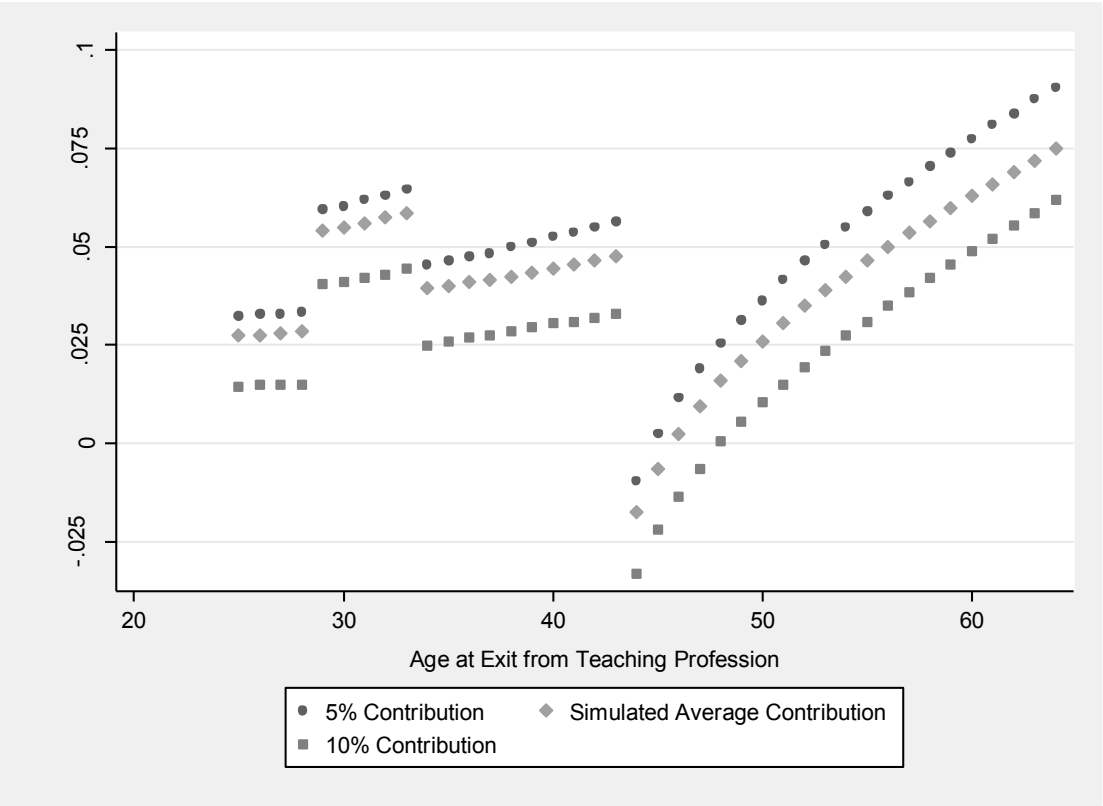


Figure 7. Internal Rate of Return Required to Equate the Present Values of Retirement Benefits under TRS2 and TRS3



Tables

Table 1. TRS3 Employee Contribution Rates by Plan and Age

	Contribution Plan Options					
Age Bracket	A	B	C	D	E	F
age < 35	5	5	6	7	10	15
$35 \leq$ age < 45	5	6	7.5	7	10	15
$45 \leq$ age	5	7.5	8.5	7	10	15

Table 2. Plan Choice Distribution and Teacher Characteristics (2008-09 School Year)

	A (5%)	B (5-7.5%)	C (6-8.5%)	D (7%)	E (10%)	F (15%)
Overall	0.33	0.13	0.16	0.14	0.14	0.09
Age: 20-35	0.40	0.20	0.16	0.10	0.10	0.04
Age: 35-45	0.33	0.16	0.21	0.11	0.13	0.06
Age: 45+	0.30	0.08	0.12	0.19	0.17	0.14
Female	0.33	0.13	0.15	0.14	0.14	0.10
Male	0.35	0.13	0.17	0.15	0.13	0.07
Race: Asian	0.37	0.14	0.14	0.11	0.14	0.09
Race: Black	0.46	0.15	0.11	0.13	0.10	0.06
Race: Hispanic	0.39	0.16	0.15	0.12	0.12	0.06
Race: Native	0.37	0.12	0.17	0.15	0.11	0.08
Race: White	0.33	0.13	0.16	0.15	0.14	0.09
Salary Quartile						
1	0.43	0.19	0.13	0.09	0.10	0.06
2	0.41	0.16	0.15	0.09	0.11	0.07
3	0.33	0.14	0.16	0.13	0.14	0.09
4	0.27	0.10	0.17	0.19	0.16	0.11
Math/Science Endorsement	0.34	0.12	0.15	0.14	0.14	0.11
Locale						
City	0.37	0.12	0.14	0.13	0.14	0.10
Suburb	0.33	0.13	0.16	0.14	0.14	0.09
Town	0.30	0.14	0.18	0.16	0.13	0.09
Rural	0.32	0.14	0.16	0.15	0.14	0.08
Cohort Group						
Choice	0.39	0.20	0.14	0.09	0.12	0.06
Mandate	0.40	0.16	0.15	0.09	0.12	0.08
Transfer	0.24	0.09	0.18	0.22	0.16	0.11
Observations	11,836	4,647	5,600	5,086	4,896	3,278

Table 3. Contribution Plan Transition Matrix

		Last Observed Choice						
		A	B	C	D	E	F	Observations
Initial Choice	A	82%	4%	4%	3%	4%	4%	14,310
	B	10%	71%	8%	3%	5%	3%	6,323
	C	10%	4%	70%	3%	9%	5%	7,050
	D	9%	2%	4%	69%	9%	7%	7,211
	E	13%	2%	3%	3%	65%	15%	5,198
	F	15%	2%	2%	2%	7%	73%	2,367
	Observations	14,743	5,551	6,441	5,994	5,728	4,002	42,459

Table 4. Average Predicted Probability of Initial Plan Choice by Cohort

	Contribution Rate Plan						Average Predicted Rate
	A	B	C	D	E	F	
1997 Choice Cohort	0.27	0.12	0.21	0.23	0.13	0.05	7.00
Mandate Cohort	0.39	0.17	0.14	0.11	0.12	0.07	6.79
2007 Choice Cohort	0.30	0.19	0.15	0.13	0.15	0.08	7.17

Table 5. Simulated Plan Transition Matrix

Panel A: Rate Flexibility Introduced after Employee is Hired (Age 30)							
		Predicted Final Rate Plan (Age 65)					
		A	B	C	D	E	F
Initial Rate Plan Choice (Age 25)	A	84%	2%	2%	1%	4%	7%
	B	18%	53%	7%	2%	9%	12%
	C	13%	2%	55%	1%	13%	16%
	D	16%	2%	4%	41%	16%	20%
	E	9%	1%	1%	1%	60%	28%
	F	7%	1%	1%	0%	4%	88%
Panel B: Employee Hired with Rate Flexibility in Place							
		Predicted Final Rate Plan (Age 65)					
		A	B	C	D	E	F
Initial Rate Plan Choice (Age 25)	A	85%	2%	0%	1%	3%	9%
	B	6%	84%	1%	1%	3%	5%
	C	13%	7%	37%	2%	15%	25%
	D	9%	2%	1%	61%	11%	17%
	E	6%	1%	0%	0%	77%	16%
	F	3%	0%	0%	0%	2%	95%

Table 6. Average Marginal Tax Rates on Gross Adjusted Income

	Contribution Rate Plan						
Age Category	A	B	C	D	E	F	Total
Age < 25	0.16	0.16	0.16	0.16	0.15	0.15	0.16
25 < age < 30	0.19	0.19	0.19	0.19	0.18	0.17	0.19
30 < age < 35	0.22	0.22	0.23	0.23	0.22	0.19	0.22
35 < age < 40	0.24	0.24	0.24	0.25	0.24	0.22	0.24
40 < age < 45	0.24	0.25	0.25	0.25	0.24	0.23	0.25
45 < age < 50	0.24	0.25	0.25	0.25	0.24	0.23	0.25
50 < age < 55	0.25	0.25	0.25	0.25	0.25	0.24	0.25
55 < age < 60	0.25	0.25	0.25	0.25	0.25	0.24	0.25
60 < age < 65	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salary Quintile							
1	0.15	0.15	0.15	0.15	0.15	0.15	0.15
2	0.25	0.25	0.25	0.25	0.23	0.18	0.24
3	0.26	0.26	0.26	0.26	0.26	0.26	0.26
4	0.26	0.26	0.26	0.26	0.26	0.26	0.26
5	0.26	0.26	0.26	0.26	0.26	0.25	0.26
Overall	0.23	0.23	0.23	0.25	0.23	0.23	0.23

Table 7. Average Value (per dollar of current income) of Marginal Retirement Contribution

	A = 0	A = 0.19	A = Half
Age Category	Mean	Mean	Mean
Age < 25	0.54	0.61	0.69
25 < age < 30	0.53	0.59	0.67
30 < age < 35	0.54	0.60	0.66
35 < age < 40	0.54	0.59	0.65
40 < age < 45	0.55	0.60	0.65
45 < age < 50	0.54	0.60	0.65
50 < age < 55	0.54	0.60	0.65
55 < age < 60	0.55	0.60	0.65
60 < age < 65	0.55	0.60	0.65
Overall	0.54	0.60	0.65

Table 8. Internal Rate of Return by Age at Hire and Tenure Length (Representative Teacher)

Separate and Retire at Age 65				Separate with 15 SCY and Retire at Age 65			
Age at Hire	Tenure Length	Rate Plan	IRR	Age at Hire	Tenure Length	Rate Plan	IRR
25	40	A	9.1%	25	15	A	5.1%
25	40	B	7.7%	25	15	B	4.9%
25	40	C	7.2%	25	15	C	4.3%
25	40	D	7.7%	25	15	D	4.1%
25	40	E	6.2%	25	15	E	3.0%
25	40	F	4.4%	25	15	F	1.7%
30	35	A	10.0%	30	15	A	6.1%
30	35	B	8.3%	30	15	B	5.6%
30	35	C	7.7%	30	15	C	4.8%
30	35	D	8.4%	30	15	D	4.8%
30	35	E	6.7%	30	15	E	3.5%
30	35	F	4.6%	30	15	F	2.0%
35	30	A	11.1%	35	15	A	7.4%
35	30	B	9.1%	35	15	B	6.1%
35	30	C	8.3%	35	15	C	5.3%
35	30	D	9.3%	35	15	D	5.9%
35	30	E	7.3%	35	15	E	4.2%
35	30	F	4.8%	35	15	F	2.4%

Table A1. Pooled Regression (Three Cohorts Combined)

	(1) B	(2) C	(3) D	(4) E	(5) F
Cohort					
Transfer 1997	0.409***	0.382***	0.439***	0.486***	0.549***
	(0.072)	(0.078)	(0.095)	(0.084)	(0.108)
Mandate	-	-	-	-	-
	-	-	-	-	-
Choice 2007	0.030	0.812***	1.163***	0.447***	0.164*
	(0.060)	(0.054)	(0.056)	(0.060)	(0.082)
Age Category					
Age: < 25	0.262***	0.229***	0.290***	0.058	0.041
	(0.046)	(0.050)	(0.063)	(0.063)	(0.094)
Age: 25-30	-	-	-	-	-
	-	-	-	-	-
Age: 30-35	-0.105*	-0.0564	-0.153**	-0.027	0.155
	(0.044)	(0.0434)	(0.052)	(0.054)	(0.080)
Age: 35-40	-0.402***	-0.455***	-0.158**	0.085	0.291***
	(0.050)	(0.050)	(0.054)	(0.056)	(0.082)
Age: 40-45	-0.829***	-0.735***	-0.027	0.214***	0.711***
	(0.057)	(0.054)	(0.054)	(0.055)	(0.076)
Age: 45-50	-1.470***	-1.343***	0.092	0.310***	0.954***
	(0.071)	(0.064)	(0.055)	(0.057)	(0.075)
Age: 50-55	-1.898***	-1.505***	0.031	0.385***	1.196***
	(0.107)	(0.085)	(0.065)	(0.067)	(0.084)
Age: 55-60	-1.938***	-1.695***	-0.027	0.287**	1.625***
	(0.190)	(0.159)	(0.104)	(0.110)	(0.112)
Age: 60-65	-3.934***	-2.927***	-0.360	-0.192	1.145***
	(1.007)	(0.592)	(0.234)	(0.254)	(0.236)
Female	0.071*	0.011	0.088**	0.215***	0.363***
	(0.034)	(0.033)	(0.034)	(0.037)	(0.051)
Race					
White	-	-	-	-	-
	-	-	-	-	-
Asian	-0.047	-0.084	-0.171	-0.124	0.213
	(0.088)	(0.090)	(0.100)	(0.102)	(0.123)
Black	0.079	-0.252*	-0.267*	-0.504***	-0.635**
	(0.112)	(0.124)	(0.120)	(0.139)	(0.198)
Hispanic	0.127	-0.023	-0.083	-0.245*	-0.268
	(0.086)	(0.091)	(0.096)	(0.107)	(0.149)
Native American	-0.276	-0.180	-0.177	-0.093	-0.283
	(0.188)	(0.175)	(0.173)	(0.183)	(0.270)
Salary Quartile					
1	-	-	-	-	-
(Lowest)	-	-	-	-	-
2	0.055	0.061	0.157***	0.058	-0.014
	(0.041)	(0.040)	(0.043)	(0.045)	(0.065)
3	0.094*	0.121**	0.302***	0.178***	0.282***
	(0.044)	(0.043)	(0.046)	(0.047)	(0.064)
4	0.034	0.116*	0.372***	0.157**	0.237***
	(0.050)	(0.050)	(0.051)	(0.052)	(0.068)

Table A1 continued

	(1) B	(2) C	(3) D	(4) E	(5) F
Math/Sci. Endorsement	-0.147***	-0.067	0.044	0.013	0.167**
	(0.044)	(0.043)	(0.042)	(0.046)	(0.061)
Elementary Endorsement	-0.009	0.141***	0.132***	0.116**	0.309***
	(0.040)	(0.039)	(0.038)	(0.041)	(0.055)
Spec. Ed. Endorsement	-0.011	-0.046	-0.052	-0.043	-0.021
	(0.043)	(0.041)	(0.041)	(0.044)	(0.058)
School Level					
Elementary	-	-	-	-	-
	-	-	-	-	-
Middle	-0.005	-0.071	-0.030	-0.081	-0.004
	(0.042)	(0.041)	(0.041)	(0.044)	(0.059)
High	0.027	-0.021	-0.025	-0.039	0.086
	(0.048)	(0.046)	(0.046)	(0.050)	(0.066)
Other	0.039	-0.034	-0.103	0.052	0.095
	(0.074)	(0.072)	(0.072)	(0.075)	(0.100)
School: Pct. Minority	-0.002*	-0.005***	-0.004***	-0.005***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Transfer Wealth	0.004**	-0.000	0.001	-0.003**	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Locale					
Urban	-0.289***	-0.134**	-0.015	0.016	0.052
	(0.043)	(0.042)	(0.042)	(0.045)	(0.061)
Suburban	-0.001	0.172***	0.139***	0.130**	0.215***
	(0.037)	(0.037)	(0.037)	(0.040)	(0.055)
Town/Rural	-	-	-	-	-
	-	-	-	-	-
Comparable Wage Index	-1.872***	-2.603***	-2.838***	-2.003***	-1.499***
	(0.129)	(0.135)	(0.149)	(0.146)	(0.193)
Constant	1.531***	2.068***	1.451***	0.688***	-1.210***
	(0.148)	(0.153)	(0.170)	(0.168)	(0.226)
Observations	47,577	47,577	47,577	47,577	47,577
Pseudo R^2	0.062	0.062	0.062	0.062	0.062

Standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

Table A2. 1997 Transfer Cohort.

	Transfers					Transfers with Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	B	C	D	E	F	B	C	D	E	F
Age Category (Ref: 25-30)										
Age: < 25	1.426	1.156	1.206	-12.490	-11.838	1.381	0.962	0.904	-16.570	-16.221
	(1.157)	(1.098)	(1.121)	(714.9)	(1132.1)	(1.186)	(1.122)	(1.147)	(5526.5)	(8193.8)
Age: 30-35	-0.039	0.020	-0.129	0.130	0.414	-0.093	0.001	-0.156	0.097	0.390
	(0.106)	(0.086)	(0.091)	(0.114)	(0.215)	(0.111)	(0.091)	(0.095)	(0.119)	(0.220)
Age: 35-40	0.113	-0.217*	-0.124	0.366**	0.794***	0.084	-0.230*	-0.126	0.365**	0.809***
	(0.108)	(0.091)	(0.092)	(0.114)	(0.208)	(0.114)	(0.096)	(0.096)	(0.119)	(0.214)
Age: 40-45	-0.219	-0.45***	-0.006	0.468***	1.364***	-0.233	-0.50***	-0.012	0.447***	1.353***
	(0.114)	(0.095)	(0.093)	(0.115)	(0.200)	(0.120)	(0.101)	(0.097)	(0.120)	(0.207)
Age: 45-50	-0.65***	-0.95***	0.140	0.659***	1.652***	-0.71***	-1.01***	0.145	0.617***	1.639***
	(0.124)	(0.103)	(0.095)	(0.116)	(0.200)	(0.130)	(0.109)	(0.099)	(0.122)	(0.207)
Age: 50-55	-0.92***	-1.01***	0.134	0.854***	2.205***	-0.99***	-1.08***	0.138	0.8239***	2.226***
	(0.157)	(0.125)	(0.108)	(0.129)	(0.209)	(0.164)	(0.132)	(0.113)	(0.136)	(0.217)
Age: 55-60	-1.01***	-1.22***	0.095	0.907***	2.731***	-1.26***	-1.28***	0.173	0.911***	2.755***
	(0.269)	(0.215)	(0.158)	(0.183)	(0.244)	(0.296)	(0.223)	(0.165)	(0.191)	(0.255)
Age: 60-65	-2.122*	-2.910**	0.102	0.430	2.611***	-2.206*	-3.017**	0.139	0.521	2.6415***
	(1.042)	(1.040)	(0.355)	(0.451)	(0.452)	(1.050)	(1.048)	(0.373)	(0.475)	(0.482)
Female	0.060	0.163**	0.202***	0.308***	0.729***	0.092	0.182***	0.217***	0.3135***	0.7568***
	(0.063)	(0.053)	(0.048)	(0.059)	(0.087)	(0.066)	(0.055)	(0.050)	(0.061)	(0.093)
Race (Ref: White)										
Asian	0.219	-0.057	-0.078	0.092	0.109	0.091	-0.127	-0.119	0.042	0.061
	(0.201)	(0.177)	(0.166)	(0.192)	(0.266)	(0.205)	(0.183)	(0.170)	(0.197)	(0.273)
Black	0.602**	0.317	0.026	-0.031	-0.532	0.420	0.154	-0.103	-0.130	-0.701
	(0.218)	(0.198)	(0.186)	(0.225)	(0.353)	(0.223)	(0.205)	(0.190)	(0.232)	(0.362)
Hispanic	0.106	0.096	-0.017	-0.156	-0.009	0.160	0.164	-0.011	-0.112	0.062
	(0.193)	(0.160)	(0.150)	(0.188)	(0.244)	(0.198)	(0.168)	(0.155)	(0.194)	(0.251)
Native American	-0.318	-0.030	-0.008	0.037	0.034	-0.264	-0.050	-0.034	-0.002	0.098
	(0.367)	(0.271)	(0.241)	(0.285)	(0.387)	-0.374	(0.286)	(0.251)	(0.301)	(0.399)
Salary Quartile										
Referent (1=lowest)										
2	-0.064	-0.0355	0.114	-0.086	-0.295**	-0.063	-0.034	0.103	-0.098	-0.304**
	(0.080)	(0.0664)	(0.065)	(0.076)	(0.111)	(0.083)	(0.071)	(0.068)	(0.079)	(0.115)
3	-0.052	0.0135	0.230**	-0.028	-0.045	-0.067	-0.007	0.207**	-0.072	-0.077
	(0.095)	(0.0785)	(0.073)	(0.086)	(0.118)	(0.099)	(0.083)	(0.077)	(0.090)	(0.122)
4	0.044	0.0426	0.230**	-0.129	-0.061	-0.002	0.019	0.171	-0.200	-0.163
	(0.114)	(0.0954)	(0.086)	(0.102)	(0.137)	(0.120)	(0.102)	(0.091)	(0.107)	(0.144)

Table A2 continued

	(1) B	(2) C	(3) D	(4) E	(5) F	(6) B	(7) C	(8) D	(9) E	(10) F
Math/Sci. Endorsement	-0.232**	-0.0390	0.022	-0.114	0.120	-0.266**	-0.037	0.004	-0.108	0.129
	(0.080)	(0.0646)	(0.059)	(0.074)	(0.103)	(0.084)	(0.068)	(0.062)	(0.077)	(0.107)
Elementary Endorsement	-0.154*	0.0610	0.070	-0.013	0.036	-0.115	0.065	0.059	-0.024	0.011
	(0.073)	(0.0606)	(0.054)	(0.065)	(0.089)	(0.076)	(0.064)	(0.057)	(0.068)	(0.093)
Spec. Ed. Endorsement	0.060	-0.0249	-0.003	0.088	0.069	0.060	-0.010	0.017	0.092	0.070
	(0.075)	(0.0629)	(0.057)	(0.067)	(0.093)	(0.078)	(0.066)	(0.060)	(0.070)	(0.097)
School Level										
Referent (Elementary)										
Middle	-0.060	-0.0147	0.005	-0.025	0.068	-0.040	-0.015	0.002	-0.044	0.071
	(0.080)	(0.0663)	(0.060)	(0.073)	(0.100)	(0.084)	(0.071)	(0.063)	(0.077)	(0.106)
High	-0.101	0.0212	0.022	0.087	0.173	-0.031	0.050	0.074	0.114	0.192
	(0.086)	(0.0721)	(0.064)	(0.077)	(0.107)	(0.092)	(0.078)	(0.068)	(0.082)	(0.113)
Other	-0.071	-0.0709	-0.090	0.102	0.112	0.046	-0.083	-0.033	0.188	0.178
	(0.130)	(0.1096)	(0.097)	(0.113)	(0.159)	(0.155)	(0.132)	(0.116)	(0.132)	(0.182)
School: Pct. Minority	-0.001	-0.0016	-0.004**	-0.004**	-0.000	0.006	0.002	0.007*	0.010**	0.015**
	(0.002)	(0.0013)	(0.001)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.004)	(0.005)
Transfer Wealth	-0.003*	-0.0025	0.002	-0.003*	-0.01***	-0.001	-0.001	0.002	-0.002	-0.006**
	(0.002)	(0.0014)	(0.001)	(0.001)	(0.002)	(0.0017)	(0.001)	(0.001)	(0.001)	(0.002)
Locale										
Referent (Town/Rural)										
Urban	-0.260**	-0.221**	0.046	-0.010	-0.111	—	—	—	—	—
	(0.086)	(0.071)	(0.062)	(0.075)	(0.106)	—	—	—	—	—
Suburban	0.089	0.198**	0.206***	0.114	0.066	—	—	—	—	—
	(0.075)	(0.062)	(0.057)	(0.069)	(0.097)	—	—	—	—	—
Comparable Wage Index	-1.440**	-0.812*	-2.71***	-1.234**	0.091	—	—	—	—	—
	(0.486)	(0.405)	(0.366)	(0.441)	(0.623)	—	—	—	—	—
Constant	1.080*	0.980**	2.358***	0.240	-3.02***	-1.143*	-0.655	-1.45***	-2.49***	-5.15***
	(0.449)	(0.375)	(0.339)	(0.411)	(0.596)	(0.515)	(0.451)	(0.419)	(0.538)	(0.848)
Observations	19,014	19,014	19,014	19,014	19,014	18,627	18,627	18,627	18,627	18,627
Pseudo R^2	0.0302	0.0302	0.0302	0.0302	0.0302	0.0845	0.0845	0.0845	0.0845	0.0845

Standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05. Referent category: "-". Not applicable: "—".

Table A3.1 Mandated Cohort with Year Indicators

	Mandates					Mandates with District Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	B	C	D	E	F	B	C	D	E	F
Age Category										
Age: < 25	0.238***	0.230***	0.344***	0.070	-0.018	0.227***	0.231***	0.329***	0.069	-0.036
	(0.049)	(0.054)	(0.069)	(0.067)	(0.102)	(0.051)	(0.055)	(0.071)	(0.068)	(0.103)
Age: 25-30	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Age: 30-35	0.000	-0.008	-0.283***	-0.027	0.217*	0.005	0.009	-0.276***	-0.012	0.217*
	(0.051)	(0.055)	(0.079)	(0.068)	(0.092)	(0.052)	(0.057)	(0.080)	(0.069)	(0.093)
Age: 35-40	-0.526***	-0.455***	-0.064	0.057	0.352***	-0.537***	-0.470***	-0.084	0.052	0.354***
	(0.067)	(0.071)	(0.083)	(0.075)	(0.100)	(0.069)	(0.073)	(0.085)	(0.077)	(0.102)
Age: 40-45	-1.066***	-0.832***	0.077	0.246***	0.657***	-1.114***	-0.847***	0.054	0.249***	0.631***
	(0.082)	(0.083)	(0.082)	(0.073)	(0.094)	(0.084)	(0.084)	(0.084)	(0.075)	(0.096)
Age: 45-50	-2.193***	-1.741***	0.229**	0.231**	0.851***	-2.268***	-1.760***	0.201*	0.281***	0.845***
	(0.137)	(0.123)	(0.082)	(0.076)	(0.092)	(0.141)	(0.125)	(0.084)	(0.078)	(0.095)
Age: 50-55	-2.825***	-2.025***	0.208*	0.192*	0.815***	-2.907***	-2.057***	0.173	0.172	0.768***
	(0.230)	(0.176)	(0.099)	(0.093)	(0.111)	(0.237)	(0.178)	(0.102)	(0.097)	(0.115)
Age: 55-60	-2.554***	-1.935***	0.141	-0.052	1.269***	-2.561***	-1.962***	0.167	-0.045	1.270***
	(0.343)	(0.289)	(0.160)	(0.164)	(0.149)	(0.344)	(0.291)	(0.164)	(0.170)	(0.153)
Age: 60-65	-16.653	-2.577***	-0.691	-0.258	0.631	-18.003	-2.697***	-0.872*	-0.404	0.592
	(709.6)	(0.720)	(0.402)	(0.318)	(0.323)	(1345.0)	(0.724)	(0.436)	(0.335)	(0.330)
Female	0.073	-0.093*	-0.001	0.189***	0.1503*	0.082	-0.088	-0.002	0.186***	0.151*
	(0.042)	(0.045)	(0.053)	(0.050)	(0.065)	(0.044)	(0.046)	(0.054)	(0.051)	(0.066)
Race										
White	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Asian	-0.135	-0.093	-0.189	-0.258*	0.238	-0.072	-0.018	-0.120	-0.209	0.296*
	(0.104)	(0.111)	(0.142)	(0.130)	(0.144)	(0.106)	(0.113)	(0.144)	(0.133)	(0.146)
Black	-0.105	-0.674***	-0.324	-0.789***	-0.649**	0.056	-0.472*	-0.172	-0.648**	-0.523*
	(0.138)	(0.185)	(0.180)	(0.196)	(0.243)	(0.142)	(0.188)	(0.184)	(0.199)	(0.246)
Hispanic	0.157	-0.021	0.012	-0.266	-0.460*	0.070	-0.136	-0.046	-0.324*	-0.510*
	(0.101)	(0.118)	(0.138)	(0.139)	(0.208)	(0.104)	(0.121)	(0.140)	(0.142)	(0.210)
Native Amer.	-0.380	-0.275	-0.285	-0.151	-0.507	-0.422	-0.366	-0.260	-0.116	-0.473
	(0.234)	(0.241)	(0.292)	(0.251)	(0.397)	(0.242)	(0.250)	(0.296)	(0.256)	(0.401)
Salary Quartile										
1	-	-	-	-	-	-	-	-	-	-
(lowest)	-	-	-	-	-	-	-	-	-	-
2	0.040	0.087	0.125	0.069	0.068	0.053	0.102	0.145*	0.069	0.063
	(0.050)	(0.054)	(0.067)	(0.061)	(0.086)	(0.052)	(0.056)	(0.070)	(0.063)	(0.088)
3	0.080	0.149**	0.288***	0.215***	0.404***	0.095	0.164**	0.310***	0.204**	0.408***
	(0.053)	(0.057)	(0.068)	(0.062)	(0.082)	(0.055)	(0.059)	(0.071)	(0.064)	(0.084)
4	0.003	0.141*	0.449***	0.260***	0.364***	0.031	0.157*	0.479***	0.228***	0.347***
	(0.059)	(0.063)	(0.071)	(0.065)	(0.084)	(0.063)	(0.067)	(0.074)	(0.068)	(0.087)
Endorsements										
Math/Sci	-0.081	-0.089	0.033	0.1255*	0.213**	-0.066	-0.053	0.064	0.1405*	0.248**
	(0.055)	(0.060)	(0.068)	(0.062)	(0.079)	(0.057)	(0.062)	(0.070)	(0.064)	(0.081)
Elementary	0.052	0.176**	0.127*	0.169**	0.489***	0.041	0.156**	0.125*	0.189**	0.531***
	(0.050)	(0.054)	(0.062)	(0.057)	(0.075)	(0.051)	(0.056)	(0.064)	(0.059)	(0.077)
Spec. Ed.	-0.051	-0.044	-0.081	-0.1421*	-0.079	-0.027	-0.020	-0.034	-0.116	-0.061
	(0.054)	(0.057)	(0.065)	(0.061)	(0.077)	(0.056)	(0.058)	(0.067)	(0.062)	(0.079)

Table A3.1 continued

	(1) B	(2) C	(3) D	(4) E	(5) F	(6) B	(7) C	(8) D	(9) E	(10) F
School Level										
Elementary	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Middle	0.014	-0.111*	-0.049	-0.124*	-0.038	-0.006	-0.141*	-0.077	-0.123*	-0.041
	(0.051)	(0.055)	(0.063)	(0.058)	(0.075)	(0.053)	(0.057)	(0.065)	(0.061)	(0.077)
High	0.116	-0.012	-0.060	-0.117	0.095	0.062	-0.064	-0.088	-0.084	0.154
	(0.060)	(0.065)	(0.075)	(0.069)	(0.089)	(0.063)	(0.068)	(0.079)	(0.073)	(0.094)
Other	0.153	0.071	-0.097	0.055	0.121	0.057	-0.081	-0.093	-0.020	0.229
	(0.096)	(0.102)	(0.121)	(0.106)	(0.138)	(0.112)	(0.119)	(0.138)	(0.124)	(0.153)
% Minority	-0.001	-0.005***	-0.004***	-0.005***	-0.01***	-0.004	-0.007**	-0.004	-0.002	-0.005
(School)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Locale										
Urban	-0.428***	-0.296***	-0.215**	-0.1047	-0.062	—	—	—	—	—
	(0.056)	(0.060)	(0.070)	(0.064)	(0.086)	—	—	—	—	—
Suburban	-0.119*	-0.0779	-0.0202	0.0097	0.0994	—	—	—	—	—
	(0.051)	(0.055)	(0.064)	(0.060)	(0.079)	—	—	—	—	—
Town/Rural	-	-	-	-	-	—	—	—	—	—
	-	-	-	-	-	—	—	—	—	—
Comparable						—	—	—	—	—
Wage Index	-1.721***	-2.185***	-2.181***	-1.457***	-0.783*					
	(0.237)	(0.255)	(0.300)	(0.276)	(0.363)	—	—	—	—	—
School Year										
1998	-0.280**	0.003	-0.009	0.162	0.194	0.238**	0.645***	0.613***	0.549***	0.402**
	(0.103)	(0.110)	(0.128)	(0.120)	(0.159)	(0.087)	(0.093)	(0.107)	(0.101)	(0.133)
1999	-0.182*	0.138	0.060	0.199	0.406**	0.2626**	0.692***	0.608***	0.545***	0.619***
	(0.093)	(0.100)	(0.117)	(0.109)	(0.141)	(0.084)	(0.091)	(0.105)	(0.099)	(0.126)
2000	0.017	0.318***	0.244*	0.335***	0.445***	0.297***	0.693***	0.591***	0.567***	0.579***
	(0.084)	(0.091)	(0.105)	(0.099)	(0.127)	(0.081)	(0.088)	(0.101)	(0.095)	(0.121)
2001	-0.108	0.1925*	0.140	0.264**	0.178	0.083	0.449***	0.378***	0.406***	0.288*
	(0.080)	(0.088)	(0.101)	(0.094)	(0.125)	(0.081)	(0.088)	(0.101)	(0.094)	(0.124)
2002	0.034	0.179*	0.156	0.185*	0.275*	0.126	0.307***	0.276**	0.252**	0.327**
	(0.075)	(0.084)	(0.096)	(0.091)	(0.116)	(0.077)	(0.086)	(0.098)	(0.092)	(0.117)
2003	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
2004	-0.120	-0.034	-0.147	-0.062	-0.128	-0.194*	-0.123	-0.247*	-0.161	-0.203
	(0.084)	(0.096)	(0.114)	(0.105)	(0.139)	(0.086)	(0.098)	(0.116)	(0.107)	(0.141)
2005	-0.139	0.028	0.012	-0.033	-0.088	-0.302***	-0.167	-0.183	-0.200	-0.206
	(0.084)	(0.095)	(0.109)	(0.103)	(0.135)	(0.084)	(0.095)	(0.109)	(0.103)	(0.134)
2006	-0.275**	-0.200*	-0.108	0.028	0.042	-0.410***	-0.375***	-0.318**	-0.166	-0.085
	(0.084)	(0.097)	(0.111)	(0.100)	(0.130)	(0.084)	(0.097)	(0.111)	(0.100)	(0.129)
2007	-0.451***	-0.356***	-0.322**	-0.189	-0.086	-0.580***	-0.527***	-0.506***	-0.34***	-0.204
	(0.085)	(0.098)	(0.114)	(0.103)	(0.132)	(0.085)	(0.098)	(0.113)	(0.102)	(0.130)
Constant	1.57***	1.79***	0.82*	0.05	-2.03***	-0.35	-0.59	-2.36***	-1.61***	-2.78***
	(0.283)	(0.305)	(0.358)	(0.331)	(0.440)	(0.289)	(0.323)	(0.485)	(0.350)	(0.485)
Observations	26,779	26,779	26,779	26,779	26,779	26,382	26,382	26,382	26,382	26,382
Pseudo R^2	0.0470	0.0470	0.0470	0.0470	0.0470	0.0701	0.0701	0.0701	0.0701	0.0701

Standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05. Referent category: "-". Not applicable: "—".

Table A3.2 Mandated Cohort with Rate Flexibility Indicator

	Mandates with Rate Flexibility Indicator					Mandates with Rate Flexibility Indicator & District Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	B	C	D	E	F	B	C	D	E	F
Age Category										
Age: < 25	0.255***	0.239***	0.336***	0.0686	-0.0283	0.213***	0.191***	0.294***	0.0392	-0.0651
	(0.049)	(0.054)	(0.069)	(0.067)	(0.102)	(0.051)	(0.055)	(0.070)	(0.068)	(0.103)
Age: 25-30	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Age: 30-35	0.0053	-0.0034	-0.283***	-0.0345	0.209*	0.0057	0.008	-0.277***	-0.0114	0.218*
	(0.051)	(0.056)	(0.079)	(0.068)	(0.092)	(0.052)	(0.057)	(0.080)	(0.069)	(0.093)
Age: 35-40	-0.517***	-0.446***	-0.0675	0.0509	0.330**	-0.527***	-0.451***	-0.0665	0.0666	0.366***
	(0.067)	(0.072)	(0.084)	(0.075)	(0.101)	(0.069)	(0.073)	(0.085)	(0.077)	(0.102)
Age: 40-45	-1.060***	-0.808***	0.0746	0.235**	0.636***	-1.110***	-0.841***	0.059	0.255***	0.632***
	(0.083)	(0.083)	(0.083)	(0.074)	(0.094)	(0.084)	(0.084)	(0.084)	(0.075)	(0.096)
Age: 45-50	-2.190***	-1.709***	0.220**	0.251***	0.847***	-2.262***	-1.740***	0.220**	0.296***	0.853***
	(0.139)	(0.123)	(0.082)	(0.076)	(0.093)	(0.141)	(0.124)	(0.084)	(0.078)	(0.095)
Age: 50-55	-2.829***	-1.984***	0.205*	0.1793	0.793***	-2.904***	-2.051***	0.1774	0.1767	0.771***
	(0.236)	(0.176)	(0.100)	(0.095)	(0.112)	(0.237)	(0.177)	(0.102)	(0.097)	(0.114)
Age: 55-60	-2.513***	-1.913***	0.1527	-0.0827	1.253***	-2.570***	-1.995***	0.1387	-0.0707	1.242***
	(0.343)	(0.289)	(0.160)	(0.167)	(0.149)	(0.344)	(0.291)	(0.164)	(0.170)	(0.153)
Age: 60-65	-16.2766	-2.531***	-0.8082	-0.3041	0.657*	-18.0127	-2.725***	-0.875*	-0.4102	0.609
	(606.6)	(0.721)	(0.431)	(0.331)	(0.323)	(1345.4)	(0.724)	(0.436)	(0.335)	(0.329)
Female	0.0721	-0.092*	-0.0041	0.190***	0.156*	0.0796	-0.100*	-0.0114	0.179***	0.145*
	(0.043)	(0.045)	(0.053)	(0.050)	(0.065)	(0.044)	(0.046)	(0.054)	(0.051)	(0.066)
Race										
White	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Asian	-0.1517	-0.0994	-0.2057	-0.2635*	0.2505	-0.0741	-0.0214	-0.1233	-0.2129	0.292*
	(0.104)	(0.111)	(0.143)	(0.131)	(0.144)	(0.106)	(0.113)	(0.144)	(0.132)	(0.146)
Black	-0.1307	-0.672***	-0.3233	-0.776***	-0.630**	0.0705	-0.445*	-0.1404	-0.623**	-0.500*
	(0.139)	(0.185)	(0.180)	(0.196)	(0.242)	(0.142)	(0.188)	(0.183)	(0.198)	(0.246)
Hispanic	0.1587	-0.0277	0.0069	-0.2665	-0.453*	0.0729	-0.124	-0.0355	-0.316*	-0.505*
	(0.101)	(0.118)	(0.139)	(0.140)	(0.208)	(0.104)	(0.121)	(0.140)	(0.142)	(0.210)
Native American	-0.354	-0.2446	-0.2328	-0.1016	-0.4701	-0.4118	-0.3317	-0.2319	-0.1027	-0.4703
	(0.234)	(0.242)	(0.292)	(0.252)	(0.398)	(0.242)	(0.249)	(0.296)	(0.256)	(0.401)
Salary Quartile										
1	-	-	-	-	-	-	-	-	-	-
(lowest)	-	-	-	-	-	-	-	-	-	-
2	0.0481	0.0932	0.1271	0.0549	0.0539	0.0281	0.0287	0.0788	0.0113	0.0128
	(0.050)	(0.054)	(0.068)	(0.062)	(0.087)	(0.051)	(0.055)	(0.069)	(0.062)	(0.087)
3	0.0923	0.160**	0.289***	0.197**	0.391***	0.0635	0.0714	0.229**	0.1340*	0.344***
	(0.053)	(0.057)	(0.069)	(0.062)	(0.082)	(0.054)	(0.058)	(0.070)	(0.063)	(0.083)
4	0.0254	0.137*	0.444***	0.232***	0.352***	-0.0145	0.021	0.360***	0.1217	0.252**
	(0.059)	(0.063)	(0.071)	(0.065)	(0.084)	(0.061)	(0.064)	(0.072)	(0.066)	(0.085)
Endorsements										
Math/Sci	-0.1052	-0.0905	0.0206	0.1086	0.212**	-0.0672	-0.0479	0.0679	0.145*	0.257**
	(0.056)	(0.060)	(0.069)	(0.063)	(0.080)	(0.057)	(0.061)	(0.070)	(0.064)	(0.081)
Elementary	0.0628	0.178**	0.144*	0.188**	0.506***	0.0393	0.155**	0.1227	0.190**	0.530***
	(0.050)	(0.054)	(0.062)	(0.058)	(0.075)	(0.051)	(0.055)	(0.063)	(0.059)	(0.077)
Spec. Ed.	-0.0585	-0.0507	-0.0665	-0.143*	-0.0877	-0.0186	0.0085	-0.0106	-0.0963	-0.043
	(0.054)	(0.057)	(0.066)	(0.061)	(0.078)	(0.055)	(0.058)	(0.067)	(0.062)	(0.079)
School Level										
Elementary	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Middle	0.0273	-0.110*	-0.0381	-0.103	-0.034	-0.0028	-0.136*	-0.0749	-0.121*	-0.0429
	(0.051)	(0.055)	(0.063)	(0.059)	(0.075)	(0.053)	(0.057)	(0.065)	(0.061)	(0.077)
High	0.138*	-0.0043	-0.0471	-0.0927	0.108	0.0614	-0.0601	-0.0876	-0.08	0.1549
	(0.061)	(0.065)	(0.075)	(0.070)	(0.090)	(0.063)	(0.068)	(0.079)	(0.073)	(0.093)
Other	0.14	0.0863	-0.0401	0.0401	0.1946	0.0592	-0.0597	-0.0747	0.0068	0.256
	(0.101)	(0.106)	(0.126)	(0.112)	(0.141)	(0.111)	(0.119)	(0.137)	(0.123)	(0.152)

Table A3.2 continued

	(1) B	(2) C	(3) D	(4) E	(5) F	(6) B	(7) C	(8) D	(9) E	(10) F
% Minority	-0.0007	-0.005***	-0.004***	-0.005***	-0.008***	-0.005*	-0.010***	-0.006*	-0.0038	-0.006*
(School)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Locale										
Urban	-0.440***	-0.307***	-0.219**	-0.0932	-0.0478	—	—	—	—	—
	(0.055)	(0.059)	(0.069)	(0.063)	(0.084)	—	—	—	—	—
Suburban	-0.1360**	-0.0824	-0.0252	0.0185	0.118	—	—	—	—	—
	(0.049)	(0.052)	(0.062)	(0.058)	(0.076)	—	—	—	—	—
Town/Rural	-	-	-	-	-	—	—	—	—	—
	-	-	-	-	-	—	—	—	—	—
Comparable Wage Index	-1.337***	-2.213***	-2.094***	-1.594***	-1.146***	—	—	—	—	—
	(0.182)	(0.193)	(0.225)	(0.208)	(0.271)	—	—	—	—	—
Rate Flexibility (2004+)	-0.256***	-0.289***	-0.263***	-0.234***	-0.254***	-0.528***	-0.731***	-0.690***	-0.578***	-0.520***
	(0.051)	(0.055)	(0.065)	(0.059)	(0.077)	(0.041)	(0.045)	(0.053)	(0.048)	(0.062)
Constant	1.052***	1.963***	0.835***	0.3906	-1.380***	-0.0515	0.145	-1.750***	-1.063**	-2.302***
	(0.196)	(0.207)	(0.243)	(0.226)	(0.297)	(0.279)	(0.312)	(0.476)	(0.340)	(0.474)
Observations	26,368	26,368	26,368	26,368	26,368	26,382	26,382	26,382	26,382	26,382
Pseudo R2	0.0454	0.0454	0.0454	0.0454	0.0454	0.0678	0.0678	0.0678	0.0678	0.0678

Standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05. Referent category: "-". Not applicable: "—".

Table A3.3 Mandated Cohort Estimated Separately Before and After Rate Flexibility

	Before Rate Flexibility (School Year < 2004)					After Rate Flexibility (School Year > 2004)				
	(1)	(2)	(3)	(4)	(4)	(6)	(7)	(8)	(9)	(10)
	B	C	D	E	F	B	C	D	E	F
Age Category										
Age: <25	-0.225***	-0.196**	-0.320***	-0.050	0.069	-0.277***	-0.295**	-0.352**	-0.100	-0.048
	(0.062)	(0.066)	(0.085)	(0.083)	(0.127)	(0.082)	(0.096)	(0.119)	(0.114)	(0.173)
Age: 25-30	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Age: 30-35	-0.255***	-0.201*	-0.629***	-0.022	0.407**	-0.205*	-0.293*	-0.575***	-0.247	-0.112
	(0.075)	(0.079)	(0.110)	(0.099)	(0.141)	(0.098)	(0.117)	(0.152)	(0.141)	(0.205)
Age: 35-40	-0.810***	-0.784***	-0.406***	-0.039	0.492***	-0.689***	-0.463***	-0.386*	0.025	0.069
	(0.092)	(0.097)	(0.114)	(0.107)	(0.146)	(0.123)	(0.134)	(0.163)	(0.147)	(0.221)
Age: 40-45	-1.340***	-1.156***	-0.208	0.134	0.601***	-1.257***	-0.825***	-0.480**	0.250	0.820***
	(0.107)	(0.107)	(0.109)	(0.104)	(0.143)	(0.156)	(0.160)	(0.178)	(0.148)	(0.200)
Age: 45-50	-2.657***	-2.303***	-0.125	0.074	0.783***	-1.945***	-1.206***	-0.107	0.357*	1.083***
	(0.176)	(0.162)	(0.107)	(0.106)	(0.141)	(0.232)	(0.207)	(0.176)	(0.157)	(0.201)
Age: 50-55	-3.354***	-2.554***	-0.189	0.015	0.828***	-2.550***	-1.628***	0.022	0.340	0.845***
	(0.312)	(0.233)	(0.130)	(0.128)	(0.159)	(0.349)	(0.285)	(0.190)	(0.177)	(0.236)
Age: 55-60	-2.722***	-2.267***	-0.090	-0.022	1.195***	-2.870***	-1.935***	-0.403	-0.355	1.414***
	(0.425)	(0.375)	(0.200)	(0.209)	(0.216)	(0.590)	(0.478)	(0.312)	(0.303)	(0.262)
Age: 60-65	-16.504***	-3.118**	-1.473*	-0.725	0.307	-15.328***	-2.502*	-0.603	0.035	0.910*
	(0.190)	(1.018)	(0.607)	(0.484)	(0.507)	(0.190)	(1.013)	(0.530)	(0.435)	(0.439)
Female	-0.090	0.091	0.049	-0.231***	-0.208**	-0.061	0.068	-0.095	-0.103	-0.060
	(0.052)	(0.055)	(0.064)	(0.061)	(0.080)	(0.070)	(0.081)	(0.095)	(0.087)	(0.112)
Race										
White	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Asian	-0.016	0.021	-0.111	-0.283	0.427*	-0.354*	-0.309	-0.316	-0.172	-0.089
	(0.130)	(0.134)	(0.173)	(0.167)	(0.172)	(0.180)	(0.205)	(0.250)	(0.208)	(0.267)
Black	-0.140	-0.653**	-0.416	-0.850***	-0.740*	-0.100	-0.759*	-0.110	-0.603	-0.390
	(0.169)	(0.216)	(0.216)	(0.235)	(0.307)	(0.251)	(0.378)	(0.325)	(0.352)	(0.404)
Hispanic	0.203	0.119	0.078	-0.051	-0.252	0.140	-0.253	-0.083	-0.679*	-0.882*
	(0.131)	(0.142)	(0.171)	(0.166)	(0.243)	(0.163)	(0.220)	(0.248)	(0.275)	(0.424)
Native American	-0.334	-0.315	-0.259	-0.077	-0.786	-0.505	-0.113	-0.341	-0.334	0.053
	(0.275)	(0.284)	(0.337)	(0.290)	(0.515)	(0.458)	(0.452)	(0.618)	(0.533)	(0.622)
Salary Quartile										
1	-	-	-	-	-	-	-	-	-	-
(Lowest)	-	-	-	-	-	-	-	-	-	-
2	0.020	0.040	0.036	0.040	0.054	0.119	0.247*	0.403**	0.107	0.069
	(0.059)	(0.062)	(0.078)	(0.071)	(0.099)	(0.093)	(0.111)	(0.141)	(0.121)	(0.179)
3	0.093	0.137*	0.263***	0.185*	0.353***	0.111	0.255*	0.411**	0.283*	0.510**
	(0.064)	(0.067)	(0.079)	(0.073)	(0.097)	(0.093)	(0.111)	(0.141)	(0.116)	(0.163)
4	-0.061	0.095	0.388***	0.202*	0.294**	0.131	0.248*	0.594***	0.323**	0.468**
	(0.076)	(0.079)	(0.083)	(0.079)	(0.101)	(0.097)	(0.115)	(0.139)	(0.116)	(0.162)
Endorsements										
Math/Sci	-0.093	-0.094	0.029	0.068	0.216*	-0.100	-0.099	0.000	0.241*	0.205
	(0.068)	(0.072)	(0.082)	(0.077)	(0.098)	(0.094)	(0.108)	(0.124)	(0.107)	(0.137)
Elementary	0.031	0.151*	0.086	0.162*	0.505***	0.098	0.220*	0.240*	0.149	0.420**
	(0.063)	(0.066)	(0.074)	(0.070)	(0.091)	(0.081)	(0.096)	(0.108)	(0.099)	(0.129)
Spec. Ed.	-0.063	-0.022	-0.037	-0.123	-0.054	-0.028	-0.096	-0.195	-0.186	-0.149
	(0.063)	(0.065)	(0.075)	(0.070)	(0.088)	(0.105)	(0.120)	(0.140)	(0.126)	(0.159)
% Minority	-0.000	-0.004***	-0.003*	-0.005***	-0.008***	-0.002	-0.007***	-0.005*	-0.004*	-0.008**
(School)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
Locale										
Urban	-0.507***	-0.363***	-0.272***	-0.028	-0.229*	-0.361***	-0.194	-0.109	-0.296**	0.363*
	(0.069)	(0.072)	(0.082)	(0.076)	(0.101)	(0.094)	(0.105)	(0.127)	(0.111)	(0.160)
Suburban	-0.208***	-0.134*	-0.114	0.022	-0.021	-0.043	0.008	0.173	-0.050	0.450**

Table A3.3 Continued

	(0.060)	(0.062)	(0.073)	(0.069)	(0.088)	(0.087)	(0.099)	(0.118)	(0.101)	(0.154)
Town/Rural	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Comparable Wage Index	-1.054***	-2.132***	-1.972***	-1.695***	-1.024***	-2.084***	-2.191***	-2.460***	-1.256**	-1.206*
	(0.213)	(0.219)	(0.259)	(0.240)	(0.306)	(0.347)	(0.395)	(0.467)	(0.414)	(0.597)
School Level										
Elementary	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Middle	0.020	-0.162*	-0.061	-0.145*	-0.076	-0.015	0.001	-0.015	-0.085	0.011
	(0.063)	(0.067)	(0.076)	(0.071)	(0.092)	(0.088)	(0.099)	(0.115)	(0.103)	(0.132)
High	0.076	-0.067	-0.101	-0.107	0.140	0.201*	0.089	0.051	-0.195	-0.040
	(0.076)	(0.080)	(0.090)	(0.085)	(0.108)	(0.098)	(0.115)	(0.132)	(0.121)	(0.160)
Other	0.140	-0.005	-0.144	0.114	0.077	0.165	0.192	0.032	-0.169	0.247
	(0.119)	(0.125)	(0.147)	(0.125)	(0.170)	(0.157)	(0.180)	(0.219)	(0.204)	(0.241)
Constant	1.184***	2.108***	1.139***	0.794**	-1.279***	1.932***	1.582**	1.092	-0.010	-1.672*
	(0.236)	(0.242)	(0.287)	(0.268)	(0.349)	(0.430)	(0.490)	(0.578)	(0.522)	(0.743)
Observations	17,175	17,175	17,175	17,175	17,175	9,586	9,586	9,586	9,586	9,586
Pseudo R2	0.0452	0.0452	0.0452	0.0452	0.0452	0.0359	0.0359	0.0359	0.0359	0.0359

Standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05. Referent category: "-". Not applicable: "—".

Table A4. Choice Cohort

	2007 Choice Cohort					2007 Choice Cohort with Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	B	C	D	E	F	B	C	D	E	F
Age Category										
Age: < 25	-0.020	0.216	0.265	0.026	0.524	-0.103	0.103	0.179	-0.041	0.597
	(0.178)	(0.198)	(0.229)	(0.227)	(0.305)	(0.210)	(0.234)	(0.274)	(0.257)	(0.347)
Age: 25-30	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Age: 30-35	0.020	0.071	-0.515	-0.208	0.174	-0.030	0.141	-0.424	-0.172	0.098
	(0.191)	(0.216)	(0.301)	(0.251)	(0.358)	(0.228)	(0.249)	(0.328)	(0.281)	(0.407)
Age: 35-40	0.036	-0.267	-2.113**	0.087	0.580	0.075	-0.294	-2.624*	0.103	0.601
	(0.234)	(0.288)	(0.735)	(0.281)	(0.376)	(0.275)	(0.334)	(1.034)	(0.330)	(0.421)
Age: 40-45	-0.035	-0.347	-0.037	0.251	0.9955*	-0.067	-0.395	0.215	0.455	1.1927*
	(0.299)	(0.371)	(0.406)	(0.335)	(0.414)	(0.365)	(0.432)	(0.450)	(0.386)	(0.468)
Age: 45-50	-0.896*	-0.816	0.491	0.150	1.480***	—	—	—	—	—
	(0.412)	(0.466)	(0.369)	(0.362)	(0.378)	—	—	—	—	—
Age: 50-55	-0.985	-0.942	-0.417	0.618	1.258**	—	—	—	—	—
	(0.560)	(0.635)	(0.642)	(0.395)	(0.481)	—	—	—	—	—
Age: 55-60	-0.281	-1.045	0.154	0.565	1.109	—	—	—	—	—
	(0.709)	(1.086)	(0.831)	(0.655)	(0.745)	—	—	—	—	—
Age: 60-65	-22.206	-22.313	-22.369	-22.210	2.196*	—	—	—	—	—
	(52421.1)	(64448.8)	(77458.1)	(69474.6)	(0.989)	—	—	—	—	—
Age: 45+	—	—	—	—	—	-1.19**	-1.031*	0.166	0.430	1.507***
	—	—	—	—	—	(0.398)	(0.425)	(0.366)	(0.307)	(0.372)
Female	0.108	-0.043	0.019	-0.220	0.077	0.078	-0.113	-0.113	-0.371	-0.059
	(0.164)	(0.184)	(0.229)	(0.190)	(0.249)	(0.201)	(0.217)	(0.267)	(0.218)	(0.281)
Race										
White	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Asian	0.013	-0.170	-0.174	-0.166	-0.070	-0.045	-0.165	-0.488	-0.314	0.342
	(0.348)	(0.404)	(0.507)	(0.422)	(0.519)	(0.377)	(0.449)	(0.599)	(0.467)	(0.550)
Black	-0.099	-0.335	-0.412	-0.115	-13.458	-0.095	-0.325	-0.424	0.158	-17.187
	(0.644)	(0.820)	(1.097)	(0.825)	(688.291)	(0.708)	(0.883)	(1.179)	(0.884)	(4705.8)
Hispanic	-0.428	-1.109*	-1.708*	-0.565	-0.466	-0.433	-0.967	-1.584*	-0.515	-0.522
	(0.329)	(0.490)	(0.745)	(0.432)	(0.559)	(0.379)	(0.563)	(0.764)	(0.460)	(0.671)
Salary Quartile										
1	-	-	-	-	-	-	-	-	-	-
(lowest)	-	-	-	-	-	-	-	-	-	-
2	0.014	0.065	0.169	0.5681*	0.115	0.038	0.078	0.013	0.507	0.065
	(0.184)	(0.218)	(0.261)	(0.250)	(0.314)	(0.233)	(0.270)	(0.324)	(0.293)	(0.382)
3	-0.057	0.079	0.176	0.5875*	-0.152	-0.066	0.194	0.293	0.528	-0.090
	(0.193)	(0.225)	(0.272)	(0.255)	(0.329)	(0.238)	(0.272)	(0.324)	(0.294)	(0.386)
4	-0.044	0.384	0.262	0.822**	0.287	-0.006	0.431	0.265	0.739*	0.352
	(0.215)	(0.243)	(0.302)	(0.269)	(0.322)	(0.262)	(0.297)	(0.362)	(0.315)	(0.397)
Endorsement										
Math/Science	-0.338	-0.242	-0.105	0.153	0.209	-0.146	-0.053	0.073	0.196	0.225
	(0.215)	(0.234)	(0.286)	(0.233)	(0.278)	(0.254)	(0.271)	(0.332)	(0.269)	(0.312)
Elementary	0.070	0.225	-0.266	0.147	0.097	0.081	0.180	-0.315	0.195	0.128
	(0.169)	(0.198)	(0.236)	(0.210)	(0.268)	(0.202)	(0.232)	(0.275)	(0.243)	(0.312)
Spec. Ed.	0.299	-0.084	-0.270	-0.142	0.619*	0.402	-0.155	-0.121	-0.120	0.793*
	(0.225)	(0.284)	(0.352)	(0.305)	(0.310)	(0.265)	(0.333)	(0.387)	(0.337)	(0.362)

Table A4 continued

	(1) B	(2) C	(3) D	(4) E	(5) F	(6) B	(7) C	(8) D	(9) E	(10) F
School Level										
Elementary	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Middle	0.208	0.289	-0.231	0.038	0.541	0.236	0.428	-0.169	0.195	0.931**
	(0.190)	(0.219)	(0.276)	(0.233)	(0.304)	(0.233)	(0.259)	(0.319)	(0.272)	(0.351)
High	0.116	0.287	-0.348	-0.109	0.510	0.024	0.212	-0.548	-0.191	0.632
	(0.214)	(0.247)	(0.298)	(0.266)	(0.331)	(0.260)	(0.298)	(0.357)	(0.314)	(0.389)
Other	-0.154	0.044	-0.639	-0.477	0.824	-0.381	0.591	-1.373	-0.052	1.081
	(0.333)	(0.386)	(0.520)	(0.456)	(0.456)	(0.583)	(0.555)	(0.869)	(0.591)	(0.630)
% Minority	-0.002	-0.002	0.001	-0.002	-0.007	0.004	0.010	0.010	-0.001	0.000
(School)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.007)	(0.008)	(0.009)	(0.008)	(0.011)
Locale										
Urban	0.250	0.337	0.743**	0.354	0.702*	—	—	—	—	—
	(0.196)	(0.238)	(0.285)	(0.246)	(0.324)	—	—	—	—	—
Suburban	0.079	0.508*	0.743**	0.369	0.543	—	—	—	—	—
	(0.187)	(0.220)	(0.274)	(0.233)	(0.307)	—	—	—	—	—
Town/Rural	-	-	-	-	-	—	—	—	—	—
	-	-	-	-	-	—	—	—	—	—
Comparable										
Wage Index	-1.047	-0.684	-2.406*	-0.293	1.218	—	—	—	—	—
	(0.775)	(0.907)	(1.074)	(0.965)	(1.282)	—	—	—	—	—
2009 Schl Yr	0.297*	0.147	0.089	0.039	0.416	0.419*	0.113	0.134	0.096	0.414
	(0.137)	(0.157)	(0.191)	(0.167)	(0.212)	(0.165)	(0.187)	(0.227)	(0.192)	(0.245)
Constant	0.486	-0.682	1.297	-1.410	-4.822	-1.075	-19.655	-1.022	-1.042	-20.624
	(0.964)	(1.134)	(1.321)	(1.213)	(1.634)	(1.006)	(4750.0)	(1.240)	(1.156)	(6069.0)
Observations	1,784	1,784	1,784	1,784	1,784	1,486	1,486	1,486	1,486	1,486
Pseudo R^2	0.0373	0.0373	0.0373	0.0373	0.0373	0.115	0.115	0.115	0.115	0.115

Standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05. Referent category: "-". Not applicable: "—".
Note: Fixed effects regressions including the three highest age categories failed to converge; the highest age category is therefore 45+.

Table A5. Multinomial Logit Panel Models

	Hired before 2004					Hired 2004 or Later				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	B	C	D	E	F	B	C	D	E	F
Initial Plan Choice										
A	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
B	4.979***	2.688***	2.085***	2.310***	2.017***	6.322***	3.379***	2.592***	2.620***	2.006***
	(0.071)	(0.083)	(0.105)	(0.088)	(0.108)	(0.146)	(0.188)	(0.241)	(0.236)	(0.308)
C	2.075***	5.094***	1.971***	2.979***	2.614***	3.101***	6.582***	2.985***	3.442***	2.891***
	(0.095)	(0.067)	(0.102)	(0.076)	(0.091)	(0.225)	(0.159)	(0.251)	(0.217)	(0.270)
D	1.556***	2.320***	5.422***	2.970***	2.669***	2.092***	2.978***	6.618***	3.415***	2.817***
	(0.114)	(0.089)	(0.072)	(0.075)	(0.086)	(0.307)	(0.276)	(0.190)	(0.229)	(0.282)
E	1.223***	1.603***	1.648***	4.881***	3.598***	1.508***	1.906***	2.154***	5.812***	3.168***
	(0.134)	(0.114)	(0.119)	(0.068)	(0.081)	(0.314)	(0.297)	(0.263)	(0.141)	(0.201)
F	1.527***	1.073***	1.358***	2.357***	5.031***	1.738***	1.713***	2.187***	2.767***	5.858***
	(0.166)	(0.186)	(0.170)	(0.118)	(0.089)	(0.379)	(0.397)	(0.331)	(0.267)	(0.181)
Initial Age Category										
Age: < 25	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Age: 25-30	0.104	-0.099	-0.045	-0.149	-0.069	-0.054	-0.188	-0.133	-0.239	-0.171
	(0.111)	(0.110)	(0.142)	(0.115)	(0.155)	(0.175)	(0.171)	(0.201)	(0.181)	(0.244)
Age: 30-35	0.103	0.059	-0.028	-0.178	-0.157	0.013	-0.217	-0.351	-0.484	-0.156
	(0.138)	(0.133)	(0.170)	(0.141)	(0.184)	(0.252)	(0.248)	(0.315)	(0.270)	(0.342)
Age: 35-40	0.200	0.023	0.331	-0.069	0.046	0.074	-0.225	-0.778	-1.008**	-0.421
	(0.158)	(0.150)	(0.186)	(0.156)	(0.204)	(0.356)	(0.362)	(0.466)	(0.360)	(0.428)
Age: 40-45	0.182	-0.043	0.454*	0.002	0.038	0.142	-0.207	-0.663	-1.361**	-1.158*
	(0.174)	(0.162)	(0.196)	(0.168)	(0.216)	(0.460)	(0.498)	(0.587)	(0.455)	(0.502)
Age: 45-50	0.029	-0.023	0.748***	0.012	0.044	-0.316	-0.342	-1.247	-1.236*	-1.222*
	(0.196)	(0.182)	(0.208)	(0.181)	(0.227)	(0.639)	(0.595)	(0.677)	(0.538)	(0.584)
Age: 50-55	0.241	-0.128	0.769***	-0.089	0.034	-0.185	-0.808	-1.363	-0.927	-1.660*
	(0.237)	(0.214)	(0.228)	(0.200)	(0.241)	(0.864)	(0.724)	(0.822)	(0.626)	(0.686)
Age: 55-60	0.325	-0.385	1.079***	-0.002	0.037	0.444	0.850	0.069	-1.308	-1.407
	(0.429)	(0.325)	(0.296)	(0.276)	(0.305)	(1.146)	(0.954)	(0.985)	(0.788)	(0.796)
Age: 60-65	-18.120***	-18.000***	1.586*	-0.747	0.715	-14.351***	-13.301***	-0.379	-0.530	-0.608
Age: < 25	(0.494)	(0.487)	(0.659)	(0.939)	(0.992)	(1.187)	(1.034)	(1.324)	(0.990)	(1.040)
1997 Transfer Cohort	0.219**	0.143*	0.346***	-0.091	-0.164*	-	-	-	-	-
	(0.075)	(0.066)	(0.071)	(0.062)	(0.070)	-	-	-	-	-
2007 Choice Cohort						-0.059	-0.033	0.136	-0.080	-0.428*
						(0.152)	(0.135)	(0.181)	(0.147)	(0.179)
Current Age Cat.										
Age: <25	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Age: 25-30	-0.522**	0.052	-0.003	0.424	0.306	-0.148	0.139	0.370	-0.180	0.296
	(0.184)	(0.192)	(0.299)	(0.273)	(0.399)	(0.181)	(0.187)	(0.254)	(0.210)	(0.276)
Age: 30-35	-0.630**	-0.057	0.107	0.547	0.523	-0.285	-0.036	0.356	-0.056	0.593
	(0.203)	(0.211)	(0.325)	(0.288)	(0.418)	(0.229)	(0.236)	(0.310)	(0.267)	(0.336)
Age: 35-40	-0.917***	-0.221	-0.303	0.601*	0.836	-0.265	0.130	0.281	0.723*	1.067*
	(0.218)	(0.222)	(0.337)	(0.298)	(0.427)	(0.313)	(0.331)	(0.430)	(0.350)	(0.424)
Age: 40-45	-1.022***	-0.298	-0.295	0.658*	1.051*	-0.593	0.242	0.460	1.236**	1.960***
	(0.233)	(0.234)	(0.347)	(0.308)	(0.438)	(0.423)	(0.431)	(0.585)	(0.444)	(0.505)
Age: 45-50	-1.267***	-0.526*	-0.506	0.713*	1.193**	-0.894	-0.023	0.675	1.326*	2.140***
	(0.248)	(0.245)	(0.357)	(0.317)	(0.446)	(0.575)	(0.559)	(0.665)	(0.525)	(0.589)
Age: 50-55	-1.400***	-0.722**	-0.674	0.784*	1.539***	-0.242	-0.111	0.688	1.220*	2.544***
	(0.262)	(0.256)	(0.365)	(0.324)	(0.453)	(0.744)	(0.653)	(0.795)	(0.595)	(0.668)
Age: 55-60	-1.495***	-0.776**	-0.891*	0.889**	1.982***	-1.004	-0.701	0.730	0.735	2.846***
	(0.279)	(0.269)	(0.373)	(0.332)	(0.459)	(0.923)	(0.877)	(0.915)	(0.702)	(0.768)
Age: 60-65	-1.843***	-0.860**	-1.174**	0.851*	2.145***	-0.337	-1.548	-0.527	0.594	2.531**
	(0.312)	(0.292)	(0.383)	(0.345)	(0.468)	(1.178)	(1.009)	(1.088)	(0.892)	(0.883)
Female	-0.022	-0.050	-0.072	-0.180***	-0.502***	-0.011	-0.096	0.012	-0.112	-0.015
	(0.059)	(0.053)	(0.056)	(0.052)	(0.061)	(0.133)	(0.133)	(0.148)	(0.125)	(0.147)

Table A5 Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	B	C	D	E	F	B	C	D	E	F
Race										
White	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Asian	0.106	0.052	0.251	0.129	0.166	0.249	-0.156	-0.454	0.368	0.519
	(0.166)	(0.155)	(0.181)	(0.144)	(0.171)	(0.350)	(0.377)	(0.375)	(0.267)	(0.348)
Black	-0.085	0.059	-0.075	-0.411*	-0.636**	-0.222	-0.807*	-0.879*	-0.450	-1.185**
	(0.205)	(0.193)	(0.201)	(0.196)	(0.246)	(0.517)	(0.329)	(0.403)	(0.421)	(0.403)
Hispanic	0.212	-0.015	0.038	0.015	-0.156	-0.175	-0.335	-0.620*	0.358	-0.529
	(0.170)	(0.150)	(0.168)	(0.155)	(0.182)	(0.263)	(0.295)	(0.287)	(0.274)	(0.389)
Native American	0.286	0.223	0.254	-0.336	-0.370	0.164	0.857*	-0.240	0.679	0.911
	(0.314)	(0.288)	(0.284)	(0.240)	(0.329)	(0.690)	(0.425)	(0.468)	(0.627)	(0.683)
Salary Quartile										
1	-	-	-	-	-	-	-	-	-	-
(lowest)	-	-	-	-	-	-	-	-	-	-
2	0.042	0.144**	0.136*	0.249***	0.117	-0.114	0.135	0.057	0.058	0.142
	(0.054)	(0.053)	(0.063)	(0.051)	(0.061)	(0.093)	(0.098)	(0.112)	(0.091)	(0.109)
3	0.033	0.215**	0.189*	0.319***	0.234**	0.049	0.346	0.228	0.371*	0.251
	(0.071)	(0.067)	(0.077)	(0.065)	(0.075)	(0.181)	(0.183)	(0.189)	(0.160)	(0.178)
4	-0.066	0.259***	0.099	0.412***	0.322***	-0.092	0.087	-0.317	0.671**	-0.166
	(0.085)	(0.077)	(0.086)	(0.073)	(0.084)	(0.317)	(0.380)	(0.405)	(0.257)	(0.351)
Endorsements										
Math/Science	-0.090	-0.089	-0.077	0.028	0.169*	0.073	-0.217	-0.233	-0.194	0.211
	(0.077)	(0.068)	(0.070)	(0.064)	(0.072)	(0.173)	(0.185)	(0.201)	(0.160)	(0.177)
Elementary	-0.076	-0.007	-0.083	0.070	0.085	0.093	0.031	0.132	-0.169	0.045
	(0.068)	(0.060)	(0.062)	(0.056)	(0.063)	(0.165)	(0.165)	(0.193)	(0.149)	(0.187)
Special Education	-0.096	-0.118	-0.108	-0.138*	-0.234***	-0.037	0.213	-0.076	-0.292	-0.310
	(0.074)	(0.065)	(0.069)	(0.061)	(0.070)	(0.175)	(0.190)	(0.222)	(0.159)	(0.203)
% Minority (School)	0.001	-0.003**	-0.001	-0.003**	-0.003*	0.002	0.006**	0.001	-0.004	-0.004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Locale										
Urban	-0.064	-0.116	-0.147*	0.051	0.025	0.129	-0.120	0.227	-0.019	0.293
	(0.074)	(0.064)	(0.066)	(0.061)	(0.069)	(0.158)	(0.153)	(0.176)	(0.149)	(0.178)
Suburban	0.139*	0.059	0.069	0.106	0.069	0.469**	0.059	0.171	-0.050	0.063
	(0.064)	(0.057)	(0.060)	(0.055)	(0.062)	(0.143)	(0.143)	(0.173)	(0.138)	(0.163)
Town/Rural	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Comparable Wage Index	-1.083***	-1.302***	-1.324***	-0.837***	-0.024	-2.238***	-0.867	-1.374	-0.966	0.444
	(0.278)	(0.248)	(0.257)	(0.237)	(0.271)	(0.638)	(0.636)	(0.707)	(0.582)	(0.709)
School Level										
Elementary										
Middle	-0.073	-0.066	0.051	-0.047	0.060	0.022	0.408**	0.276	0.168	0.100
	(0.069)	(0.062)	(0.066)	(0.060)	(0.069)	(0.159)	(0.155)	(0.180)	(0.149)	(0.178)
High	-0.134	-0.057	-0.087	-0.072	0.019	0.129	-0.050	0.027	0.065	0.027
	(0.080)	(0.071)	(0.074)	(0.066)	(0.075)	(0.194)	(0.199)	(0.221)	(0.172)	(0.217)
Other	-0.153	-0.190*	-0.026	-0.166*	0.112	0.484*	0.446	0.239	0.366	0.373
	(0.100)	(0.088)	(0.091)	(0.081)	(0.090)	(0.241)	(0.233)	(0.318)	(0.215)	(0.301)
Constant	-0.717	-0.891*	-1.478***	-2.551***	-4.392***	-0.886	-2.931***	-2.548**	-2.209**	-5.294***
	(0.389)	(0.362)	(0.440)	(0.402)	(0.522)	(0.822)	(0.831)	(0.940)	(0.772)	(0.947)
Observations	167,648	167,648	167,648	167,648	167,648	28,513	28,513	28,513	28,513	28,513
Psuedo R2	0.476	0.476	0.476	0.476	0.476	0.618	0.618	0.618	0.618	0.618

Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05