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*Teacher Pensions
and Retirement
Behavior*

*How Teacher Pension Rules
Affect Behavior, Mobility,
and Retirement*

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Teacher Pensions and Retirement Behavior: How Teacher Pension Rules Affect Behavior, Mobility, and Retirement

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Abstract

This paper examines late career mobility and retirement decisions for a cohort of mid-career Missouri public school teachers. Specifically, the paper follows a cohort of teachers whose combined age and experience totaled 45 or more years in fall 1991 through the 2005-06 school year. Like many public employee pensions, Missouri has a system that permits teachers to receive full benefits if the sum of their age and experience is at least 80 (“rule of 80”). Thus, the sum of age and experience for most of the teachers in this cohort will hit 80—full retirement eligibility—in the 16-year window studied. Traditional benefit (DB) pension systems provide teachers with a large annuity value on retirement. The accrual of this annuity value occurs over the teacher’s entire work life; however, the rate of accrual is highly nonlinear and back-loaded with most of the gain occurring in the final years prior to retirement. In addition, these pension systems have various rules that introduce kinks or discontinuities in the rate of accrual after 30 years. This paper explores the effect of these pension rules on retirement patterns, as well as general descriptive data on retirement patterns. Like many states, Missouri permits teachers to continue teaching part-time while collecting benefits (e.g., DROP plans). Teachers can also retire from one pension system and begin teaching in another. The paper examines both types of behavior. The primary source of data for this study is administrative teacher records maintained by the Missouri Department of Elementary and Secondary Education. These records include data on teacher experience, demographics, teaching field, compensation, retirement, and workforce exit, as well as the employing school and district. The paper also compares teacher retirement data from the Missouri administrative records with data from the 2000-01 Teacher Follow-up Survey.

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Teacher pensions and retiree health insurance represent a large and growing cost for public school districts. A recent study estimated the unfunded liabilities of state and local employee pension systems (including teachers) to be as large as \$1.4 trillion in the aggregate (Edwards and Gokhale 2006). Much of these unfunded liabilities arise from pay-as-you-go retiree health insurance benefits about which researchers have limited data. However, even the teacher pension systems, which are expected to be fully funded, have large unfunded liabilities in many states. Examples include California (\$20.3 billion), Ohio (\$19.4 billion), Missouri (\$5.2 billion), and West Virginia (\$5.0 billion).¹

Aside from their fiscal impacts, teacher pensions potentially have important labor supply effects. Substantial literature in labor economics has identified the effect of incentives in pension systems on the timing of retirement decisions, labor turnover, and workforce quality (Asch, Haider, and Aissimopoulos 2005; Friedburg and Webb 2005; Ippolito 1997; Stock and Wise 1990). Unfortunately, little of this literature pertains to teachers. While there have been many studies of the effect of current compensation on teacher turnover (e.g., Hanushek, Kain, and Rivkin 2004; Murnane and Olsen 1990; Podgursky, Monroe, and Watson 2004; Stinebrickner 2001), the econometric literature on teacher pensions is very slender. The only published econometric study to date of which the authors are aware is Furgeson et al. (2006), who found that Pennsylvania teachers' retirement decisions were highly responsive to changes in administrative rules on changes in experience levels for full retirement benefits.²

In spite of the growing visibility of the problems faced by states and districts in the area of pensions and retiree benefits, even simple descriptive data are lacking. This paper focuses on teacher pension data, briefly reviewing the character of teacher pension plans and noting the key parameters used in determining contributions and benefits. The paper also analyzes data from a unique administrative data file for Missouri public school teachers that tracks a cohort of mid- to late-career teachers from 1990-91 through 2005-06, and it compares the findings from the Missouri data with the 2001 and 2005 Schools and Staffing Teacher Follow-up Surveys (TFS).

Review of Literature: Basic Features of Teacher Pensions**SECTION II**

Public school teachers are almost universally covered by traditional "defined benefit" (DB) pension systems.³ "Traditional" types of plans were the norm in both the public and private sector until recent decades. However, this is no longer the case in the private sector, which has largely shifted to defined contribution (DC) systems. In a DB system, the employer has an obligation to provide a regular retirement check to employees upon their retirement. The plans are collective in the sense that employee and employer contributions go into a fund that is supposed to be actuarially sound.

Typically, a DB teacher pension plan requires that both teachers and employers make a contribution each year. For example, Maryland is a state in which public school teachers are covered by Social Security. During the 2005-06 school year, employees contributed 2 percent of their gross salary and school districts paid 9.35

¹ From National Association of State Retirement Systems annual survey. Retrieved from <http://www.publicfundsurvey.org/publicfundsurvey/actuarialfundinglevels.asp>.

² See also Brown (2006), who examines the effect of an early retirement incentive program in California.

³ Data collected by the U.S. Department of Labor show that, unlike the public sector, defined contribution (DC) plans now predominate in the private sector (Employee Benefits Research Institute 2006). DC plans are particularly attractive for professionals who tend to exhibit high rates of mobility between employers (or who go into self employment and back). Two states (Ohio and Florida) have introduced limited defined contribution options for new teachers.

percent for a combined total of 11.35 percent. This is in addition to the 12.4 percent combined employer and employee contribution to the Social Security system. In Ohio, teachers are not part of the Social Security system; they contribute 10 percent, and their employers contribute 13.5 percent for a combined total of 23.5 percent. In the Missouri state plan, also outside of the Social Security system, teachers and districts both contribute 11.5 percent.

Teachers become eligible for a full pension based on a combination of age or service. In both Maryland and Pennsylvania, teachers are eligible for full pension if they reach the age of 62 or have 35 years of service at any age. In Missouri, qualification for full benefits is based on a “rule of 80”—the sum of age plus experience must total at least 80. This is an important difference between state teacher pension systems and the Social Security system. In the latter, employees face reduced payments if they retire before age 65, regardless of years of covered employment. However, under nearly all state teacher pension systems, teachers can retire at much younger ages—many in their mid-fifties—if they have put in the requisite years of service (usually 30 to 35).

Benefits at retirement are usually determined by a formula of the following sort:

$$\text{Annual Benefit} = (\text{years of service}) \times (\text{final average salary}) \times M$$

where final average salary is the average of the last (or highest) several years of salary and M is a proportion. In Missouri, teachers earn 2.5 percent for each year of teaching service up to 30 years.⁴ Thus, a teacher with 30 years experience and a final average salary (average of last three years) of \$60,000 would receive

$$\text{Annual Benefit} = .025 \times 30 \times \$60,000 = \$45,000$$

The traditional DB system described above may be contrasted with a defined contribution (DC) plan. In a DC plan, the employer merely agrees to contribute a fixed amount annually to a retirement account for an employee. For example, a common arrangement in the private sector is for the employer to contribute 5 percent of an employee’s salary and match employee contributions up to an additional 5 percent. These contributions go into a retirement account associated with that employee. If the employee quits, the fund goes with him or her. The employer is under no obligation to provide a given payment to the employee at the time of retirement.

Sources of Data on Teacher Pension Plans

SECTION III

Even simple descriptive data on state and district teacher pension plans and teacher retirement behavior are limited. The National Compensation Survey (NCS) is the flagship Bureau of Labor Statistics survey on pay and benefit comparability. It is the foundation for detailed reports on the cost and nature of employee fringe benefits, including pensions. Unfortunately, due to sample size restrictions, the data released on public school teachers are very limited. In fact, tabulations for public school teachers do not break out pension costs separately from other benefits. In addition, use of these data is complicated because many public school teachers are not covered by Social Security.⁵

⁴ Currently, the multiplier for teachers with 31 or more years of service is 2.55. Thus, teachers who are near 30 years of experience have a strong incentive to wait until 31 years. However, this was only introduced in 2001 and is scheduled to be phased out in 2008.

⁵ Whether or not teachers in a given state or district are covered by Social Security is important in assessing the adequacy of their retirement income systems. State and local employees were originally excluded from the Social Security system when it was set up in 1935. Congress amended the Act in 1950 to permit states to arrange voluntary entry of some or all state and local employees to enroll in the system. Some states and districts chose to do so and some did not. (Mitchell et al. 2001). The result is a complicated mosaic: there are 14 states in which most or all of the public school teachers are not covered by the federal Social Security system. For example, in Missouri, the teachers in the Kansas City and St. Louis school districts are in the Social Security system and have their own separate pension funds. Teachers in the remaining

Every 2 years, the National Education Association (NEA 2004) releases a report on large public education pension plans that provides a detailed table on the various features of the pension plans (e.g., employer and employee contribution rates, benefit multiplier, COL adjustments, years to vesting, etc.). Similar data are also collected annually by the National Association of State Retirement Administrators (2006) although on fewer teacher pension funds. Both of these studies provide useful data on the “parts” of the retirement pension system; however, they do not provide an overall assessment of the generosity of the benefits nor the labor market effects. A recent study by Loeb and Miller (2006) takes a useful step in this direction. This is a comprehensive paper that attempts to catalog a wide range of state policies concerning teacher labor markets. They provide a set of summary tables on pension plan parameters similar to those described above. In addition, they provide summary estimates of the overall replacement rates of these pension systems for teachers with various years of seniority for states in and out of the Social Security system.

For the next section, a more disaggregated microeconomic analysis of the retirement incentives built into the Missouri system is examined. Unfortunately, such an analysis cannot be taken “off the shelf,” so instead the authors have built one for a representative teacher.

The Structure of Missouri Pension Benefits

SECTION IV

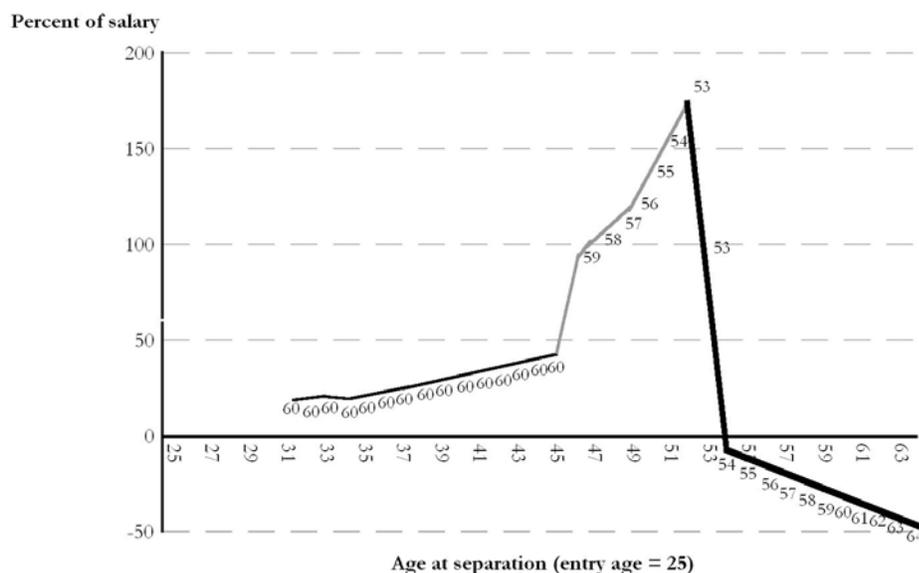
Data on the parameters of teacher pension plans can be used to generate estimates of the magnitude of pension benefits using the concept of present value. When an individual retires under a DB plan, he or she is entitled to a stream of payments that has a lump sum value that can be readily determined using standard actuarial methods. Indeed, such methods form the basis for the pricing of annuities that are regularly bought and sold in the marketplace.

Figure 1 illustrates the accumulation of pension wealth for a Missouri teacher entering the workforce at age 25 and working continuously until leaving service.⁶ After the individual is vested (5 years in Missouri), he or she is entitled to a pension of a certain size at a certain age, determined by the type of formulas discussed in Section II. If the individual leaves teaching with sufficient years of service to qualify for the pension but is too young to receive it, the value of the future stream of benefits is discounted back to the time of exit. By the time he or she is approximately 50-years-old, however, he or she is entitled to collect a full pension immediately due to the “rule of 80.”

520 school districts, roughly 90 percent of public school teachers in the state, are in a state pension fund and are not covered by Social Security. Obviously, as compared to teachers who are not in the Social Security system, teachers in the federal Social Security system do not require as large a payment from a state or district pension plan to attain a given level of income upon retirement.

⁶ Similar diagrams can be drawn for individuals entering service at different ages above or below 25. The diagram assumes a 5 percent interest rate, uses a typical teacher salary grid with 2.5 percent growth within cells, and 2.5 percent inflation for retiree benefits COLA. The mortality table is unisex for 2003, drawn from IRS Revenue Ruling 2002-62 Appendix B (see Costrell and Podgursky 2007).

Figure 1. Annual deferred income: Missouri (age of first pension draw indicated)



SOURCE: Costrell and Podgursky (2007)

For the first years of one’s career, pension wealth grows slowly as the accumulation of years of service raises the annual payment that one will eventually be eligible to receive. By the authors’ estimate, annual pension wealth accrual during this period is worth about 15 to 35 percent of the annual salary (or 5 to 15 percent, net of the employee contribution). When a teacher reaches the mid 40s, however, the eligibility formulas come into play and gradually reduce the age at which one is eligible for full pension, from 60 to 53. This has a dramatic effect on the individual’s pension wealth, and that wealth accrues annually at rates that actually exceed the salary for several years. Clearly, an individual would have a great incentive to stay on the job during this period. The “rule of 80” formula produces a very sharp spike at age 54. At age 54 and beyond, each year of work requires the teacher to forgo a year of pension benefits, and that loss outweighs the growth of annual benefits.⁷ Thus, the pension system creates a powerful incentive to retire when age plus experience total 80.

Late-career Labor Market Behavior of Missouri Teachers SECTION V

In order to examine late-career teacher labor supply decisions, a file of all full-time teachers whose combination of age and experience totaled at least 45 years in 1990-91 has been constructed from state administrative records. These teachers have been tracked through the 2005-06 school year. However, the teacher pension system in Missouri is not uniform. Teachers in the two largest school districts—St. Louis and Kansas City—are covered by the federal Social Security system, and each district has its own pension system. Teachers in all of the other 522 school districts in the state, comprising roughly 90 percent of the public school teachers, are not covered by Social Security and are in a state teacher pension plan (Public School Retirement System, PSRS). In a cooperative agreement with the Missouri Department of Elementary and Secondary Education, the authors arranged a match between the records in the mature teacher file described above and PSRS retirement records. From this it was determined whether or not a teacher had formally retired and, in those cases, the year of retirement.

⁷ Costrell and Podgursky (2007) examine in some detail the reasons for these sharp spikes and nonlinearities and compare their structure in several states. The spikes produced by DB pension systems are well recognized in the economics literature on retirement behavior (e.g., Friedberg and Webb 2005).

Figure 2 shows the frequency distribution of the sum of experience and age for teachers who retired over this period. The “rule of 80” effect is quite visible. Figures 3 and 4 report the distributions for age and experience respectively. Neither of these variables display the distinctive spike exhibited by their sum. The median age at retirement was 57 for Missouri teachers and the median years of experience was 29.

Figure 2. Frequency distribution of age + Missouri experience, "rule of 80"

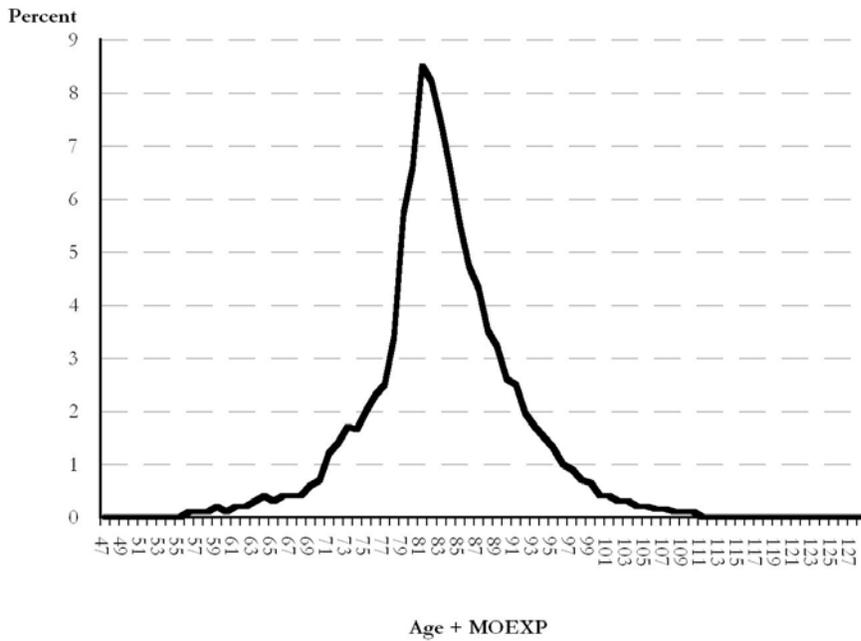


Figure 3. Age distribution for Missouri retired teachers

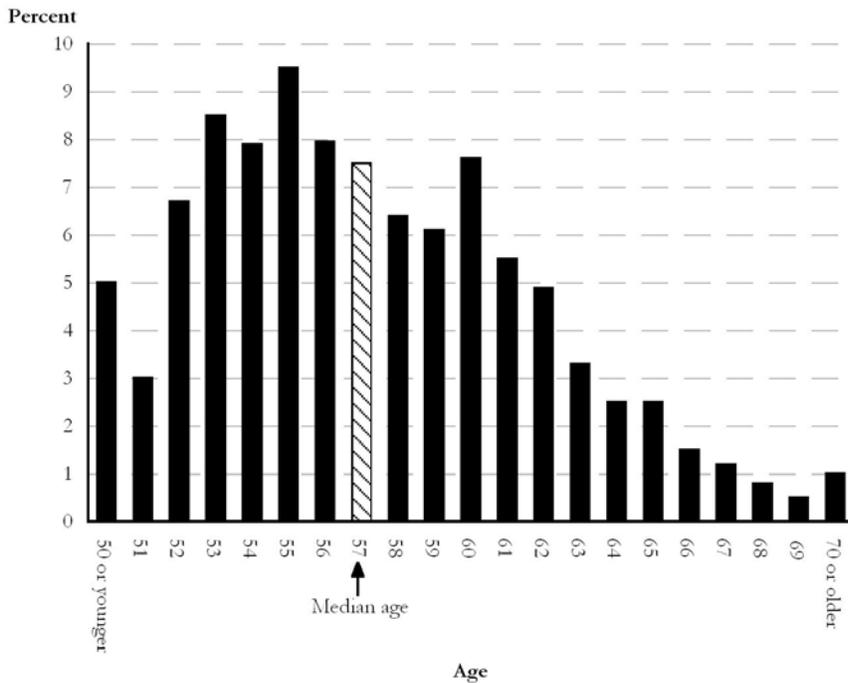


Figure 4. Experience distribution of Missouri retired teachers

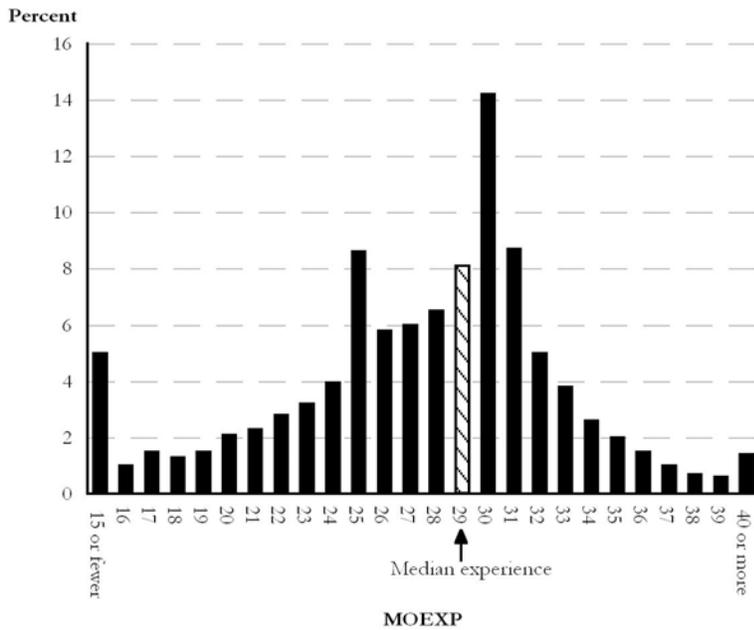
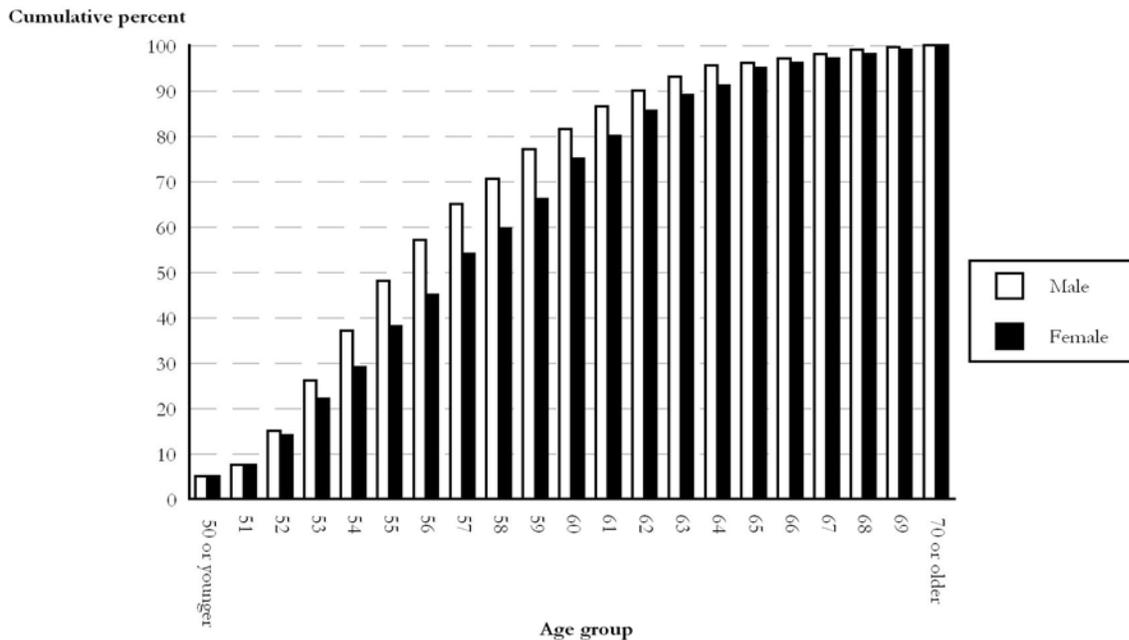


Figure 5 reports the cumulative density function (CDF) of age for male and female teachers. Men tend to retire at an earlier age than women. For example, 47 percent of women as compared to 56 percent of men had retired by age 56. At age 59, 78 percent of men but only 65 percent of women had retired. The explanation for this gender discrepancy comes from the fact that, for any given age over this retirement interval, women on average have fewer years of experience and hence are further away from the “rule of 80” threshold. This is probably due to interrupted spells or delayed workforce entry for childbearing, although this is a topic for further empirical exploration.

Figure 5. Cumulative age distributions for Missouri retired teachers, by gender



SOURCE: Schools and Staffing Surveys: 2001 and 2005 Teacher Follow-up Surveys

Figure 6 reports a similar CDF by the race of the teacher, specifically white and black (teachers of “other” races are excluded). At every age level, the CDF of white teachers is above that of black teachers. For example, roughly 58 percent of white teachers but only 46 percent of black teachers had retired by age 57. At age 60, the rates are 81 and 71 percent, respectively. There is no explanation for this disparity; it is a topic for future research.

Figure 6. Cumulative age distribution for rural and urban districts

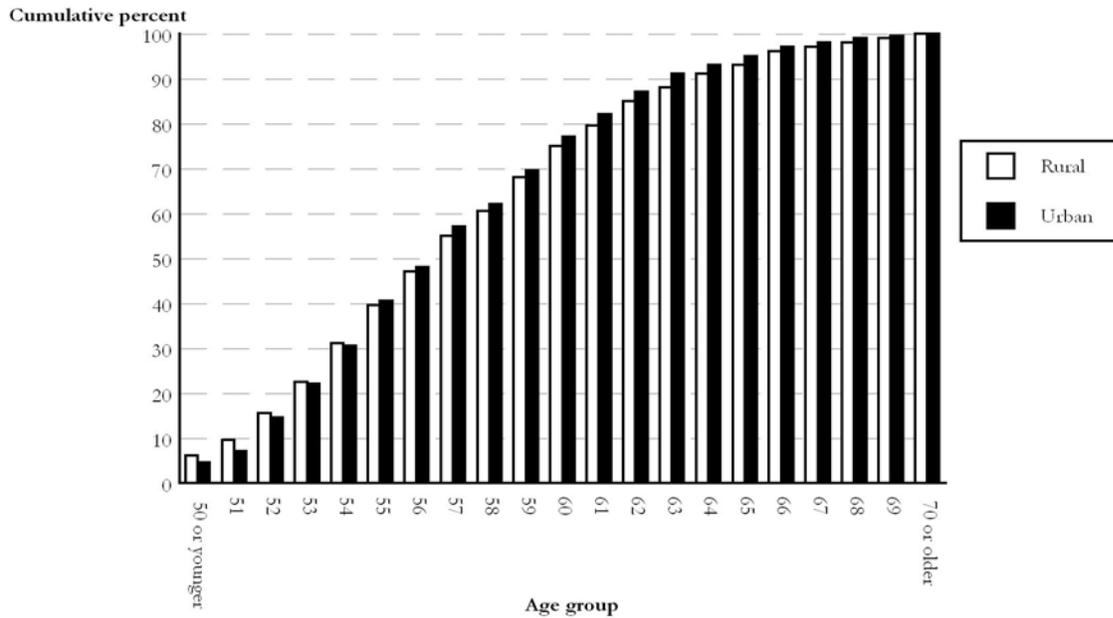


Figure 7 reports a CDF for rural versus urban teachers. There seems to be little difference between the two groups. Figure 8 reports the CDF for elementary and secondary teachers. The retirement rates for secondary teachers are slightly higher than for elementary teachers. However, since the vast majority of male teachers are in secondary schools, these gaps are largely a reflection of the earlier retirement rates of males seen in figure 5.

Figure 7. Cumulative age distribution, by race of teacher

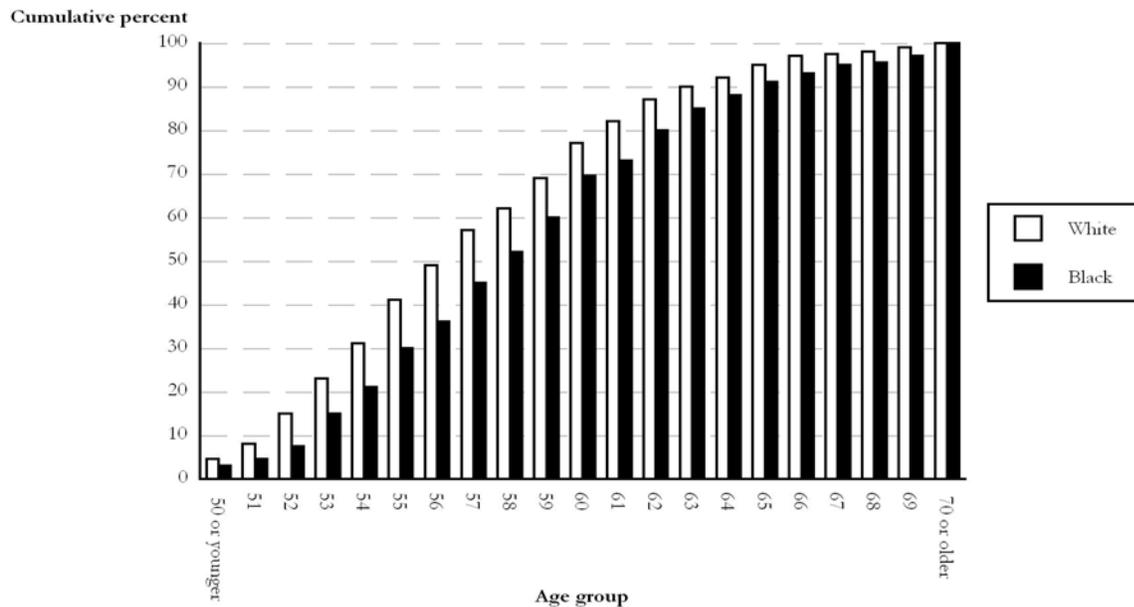
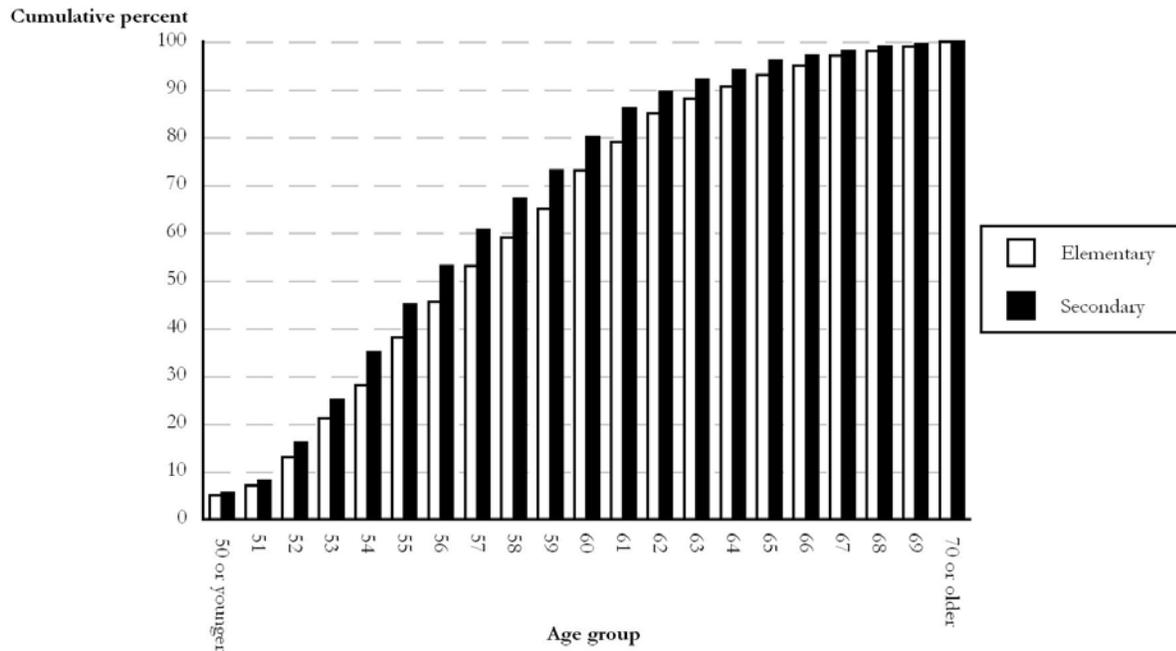


Figure 8. Cumulative age distribution, by school level of teacher



Comparisons to SASS Teacher Follow-up Survey Data

SECTION VI

Is the Missouri experience typical of teachers in other states? In order to shed light on this, data from the Schools and Staffing Survey (SASS) TFS was used for the years 2001 and 2005. TFS surveys a subsample of the roughly 51,000 teachers who were surveyed in the base years of SASS—1999-2000 and 2003-04—about their activities the following year. Teachers who left teaching are administered a Former Teacher Survey which asks questions about their current occupational activities and reasons why they left teaching (see figure 9).⁸ For this study, the records of all former teachers who reported that they were collecting a teacher retirement pension (roughly 700 per survey) were selected to plot their age and experience at the time of the TFS survey.⁹ These results are presented in figures 10 through 13. The CDFs for teacher age are rather dispersed; however, examination of the CDF in figure 12 shows a median age of 58 in both of the surveys, with broadly similar patterns. The results for experience are less consistent between the two surveys. Partly as a result of a spike at 20 years, the 2005 TFS has considerably greater mass at lower levels of experience; however, the median experience at retirement is 31 years in both surveys.

⁸ Teachers who quit teaching (leavers) and teachers who changed schools (movers) were oversampled relative to stayers (see U.S. Department of Education 2007).

⁹ Age is estimated at the time of the TFS survey, which is between January and March of the first year of their retirement, assuming they retired at the beginning of the subsequent school year. Thus, the age of the teachers is roughly 4 to 6 months past the beginning of their retirement. This would add, at most, one-half year to the mean retirement age as compared to the Missouri administrative data, which measured age at the beginning of retirement.

Figure 9. Structure of 2000-01 SASS Teacher Follow-up Survey

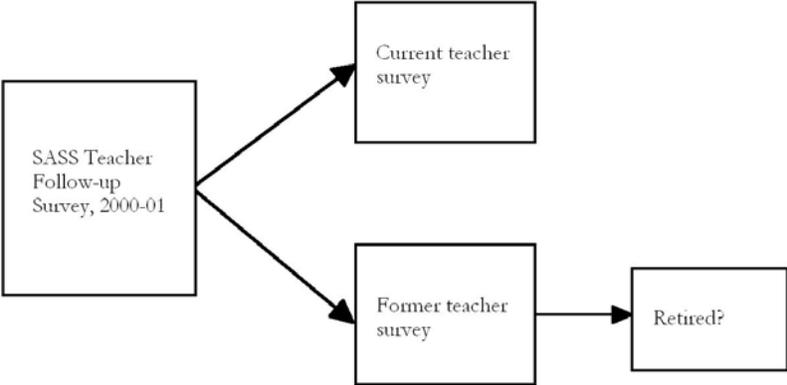
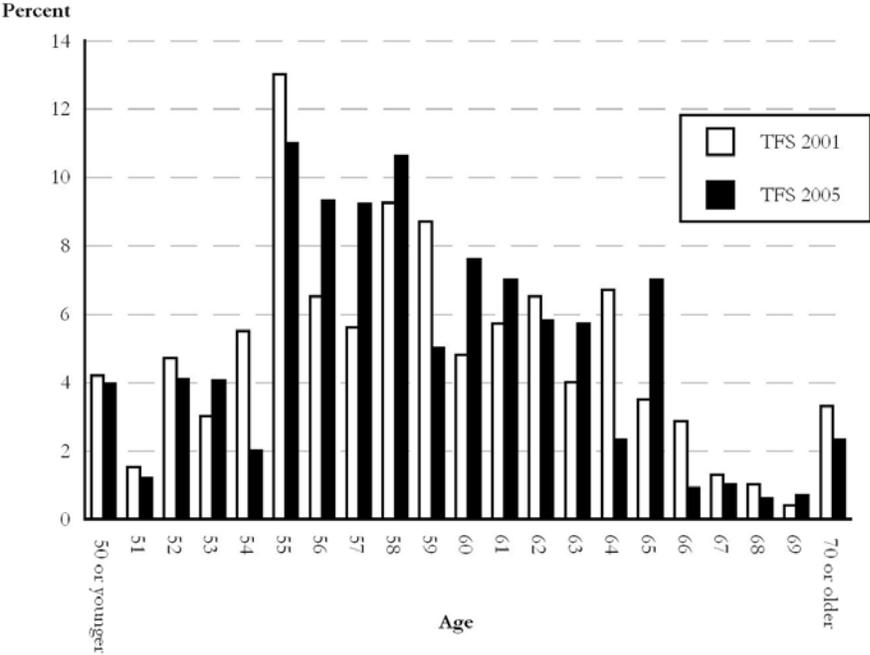
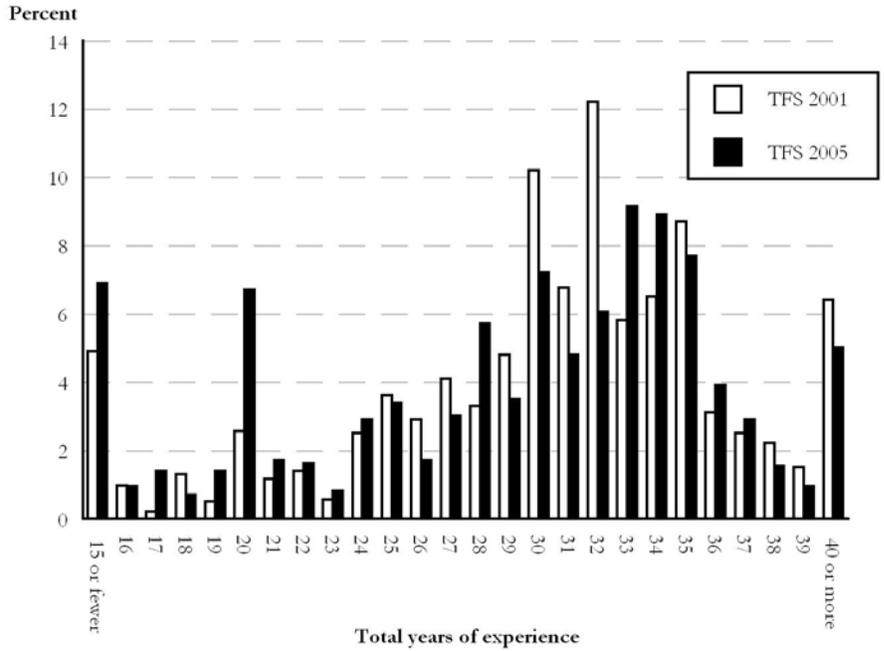


Figure 10. Age at retirement: SASS Teacher Follow-up Survey: 2001 and 2005



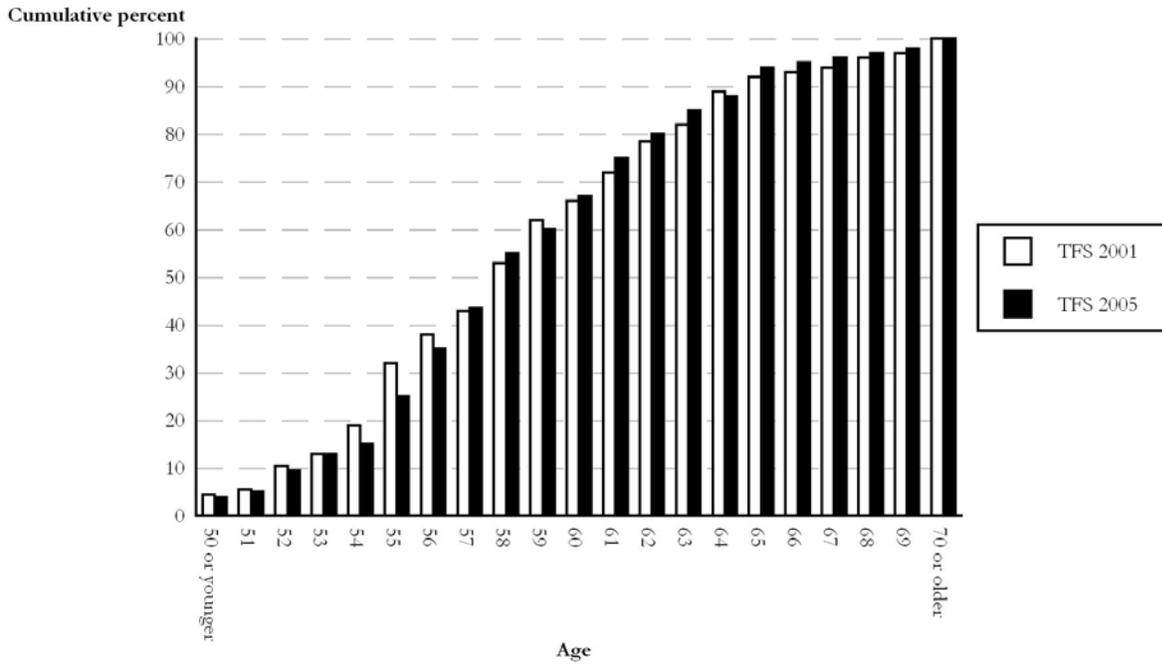
SOURCE: Schools and Staffing Surveys: 2001 and 2005 Teacher Follow-up Surveys

Figure 11. Teacher experience at retirement, SASS Teacher Follow-up Survey: 2001 and 2005



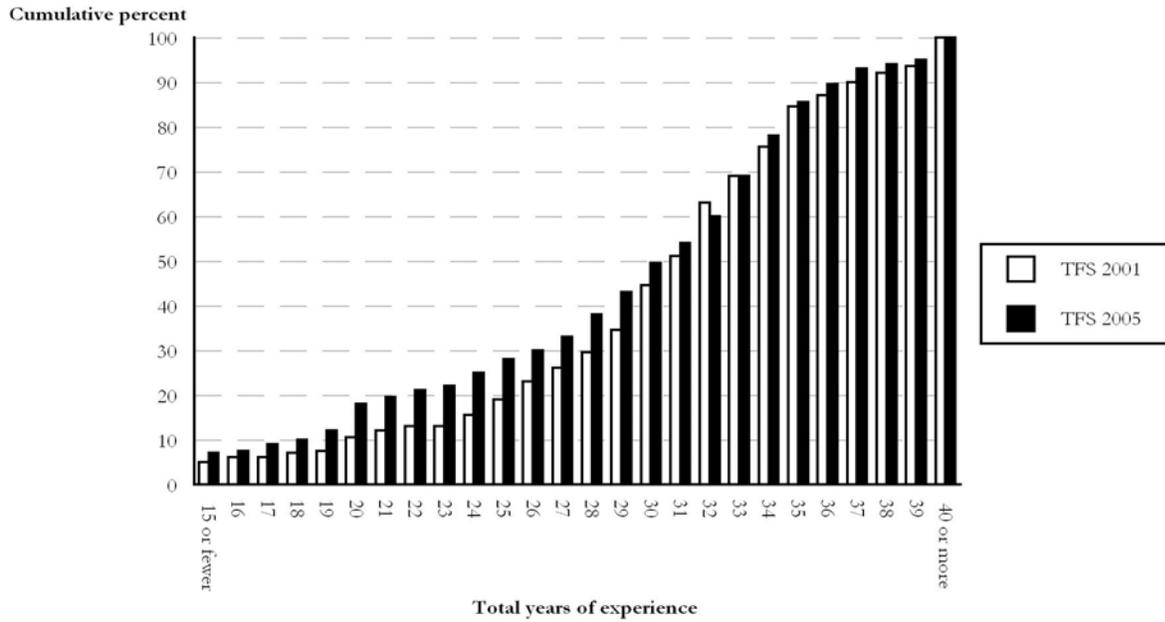
SOURCE: Schools and Staffing Surveys: 2001 and 2005 Teacher Follow-up Surveys

Figure 12. Cumulative distribution of teacher retirement ages, SASS Teacher Follow-up Survey: 2001 and 2005



SOURCE: Schools and Staffing Surveys: 2001 and 2005 Teacher Follow-up Surveys

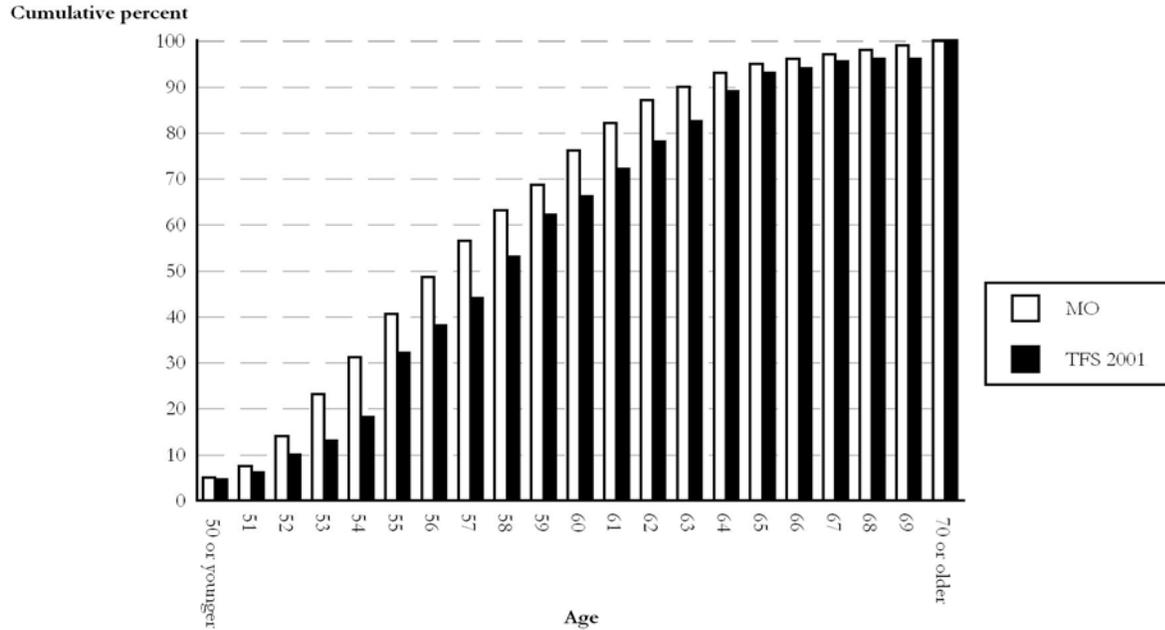
Figure 13. Cumulative distribution of teacher experience at retirement, SASS Teacher Follow-up Survey: 2001 and 2005



SOURCE: Schools and Staffing Surveys: 2001 and 2005 Teacher Follow-up Surveys

Figure 14 compares the Missouri and 2001 TFS CDFs for age. The CDF for Missouri is consistently above that of the TFS. For example, at age 55, 41 percent of Missouri teachers retired as compared to just 32 percent in the TFS—a gap of 9 percentage points. At age 60, the gap is 10 percentage points—76 percent of Missouri teachers retired versus 66 percent in the TFS.

Figure 14. Retirement age in Missouri and the United States, Missouri and SASS Teacher Follow-up Survey: 2001



SOURCE: Schools and Staffing Surveys: 2001 and 2005 Teacher Follow-up Surveys

What explains this large discrepancy? Do the provisions of the Missouri teacher pension system encourage earlier retirement than other states? The authors are aware of no study that has systematically modeled the “spikes” of the 50 state pension systems, as per figure 1. However, reviews of the underlying parameters of the pension systems by Loeb and Miller (2007) and the NEA (2004) do not find Missouri notably out of line.

Also, an important factor to consider relates to postretirement teaching employment by educators. In the Missouri data, teacher *retirement* is being measured, in particular, based on the state teacher pension fund concerning when teachers begin collecting their pension check. However, in Missouri, as well as many other states, teachers can collect pension checks and continue teaching in a public school. In Missouri, there are several ways that this can occur:

1. **Switch pension systems.** The authors focused on teachers in the core teacher fund (PSRS), covering all teachers except those in Kansas City and St. Louis. Teachers retiring from PSRS can work full time in either Kansas City or St. Louis.¹⁰
2. **Part-Time Work.** Teachers retired from PSRS can work up to 550 hours per year in PSRS-covered districts.
3. **“Critical Shortage” Fields.** Teachers can work full time for up to 2 years if the district designates their positions as being in “critical shortage” areas.

The authors are not aware of any systematic compilation of these postretirement employment rules. Their character seems to vary from state to state. Their examination of rules in a sample of states does not suggest that Missouri’s are excessively permissive.¹¹

Effect of Postretirement Employment on Missouri-TFS Comparison

Recall the structure of TFS, as described in figure 11. Information on retirement is only collected for educators who no longer teach. In the Missouri data, teachers are defined as retired if they formally elect to retire, even if they continue teaching. For example, suppose a teacher chooses to retire at age 55 but continues to teach part-time for 2 more years (while collecting pension). In the Missouri data, the age of retirement would be recorded as 55, whereas in TFS, the teacher would be recorded as retiring 2 years later at age 57.

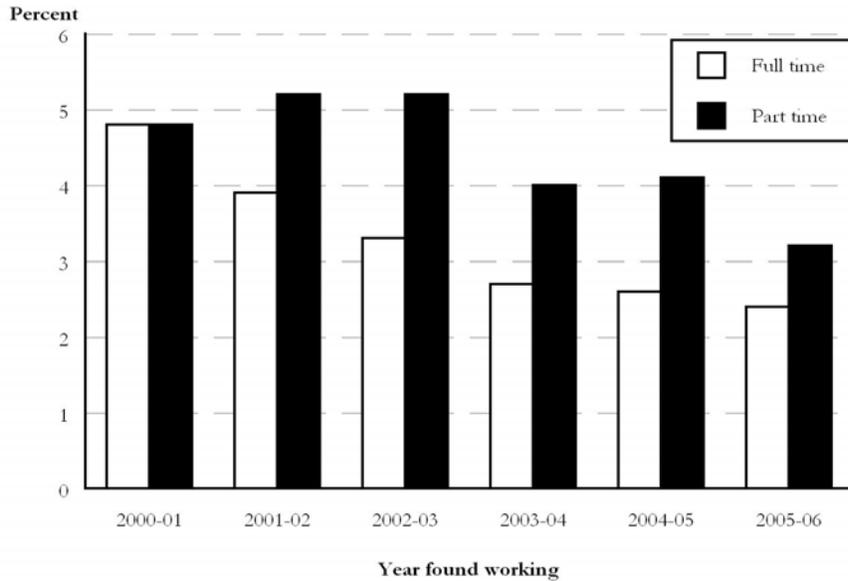
How prevalent is this postretirement teaching phenomenon? By its very design, the 2001 TFS could not answer this question.¹² However, when the Missouri administrative data is examined, one finds that a substantial proportion of educators continue to teach in Missouri public school after retirement. For the entire sample of 21,240 retirees, 12 percent taught in a Missouri public school at least one year after retiring. In order to facilitate comparison with the 2001 TFS, however, Missouri teachers who retired at the end of the 1999-2000 school year were tracked, similar to the 1999-00 SASS base survey. Then the percent of these teachers who were observed teaching one or more years after retirement were examined. The results are shown in figure 15. One year after retirement, roughly 10 percent of teachers were employed in a Missouri public school, split evenly between full- and part-time status (4.8 percent each). This is the most comparable statistic to the one year TFS. In the second year (2001-02), the full-time and part-time percentages are 3.8 and 5.3 percent, respectively. By the sixth year, these percentages have fallen to 2.4 and 3.2 percent. (Note that these are not necessarily continuous spells. For example, educators teaching in year six may not have been teaching in year one.)

¹⁰ They can also teach in public schools in another state. The Missouri-Kansas border bisects the Kansas City metropolitan area and anecdotal evidence suggests some postretirement teacher and administrator movement. In future work, this Missouri-Kansas mobility will be examined as well.

¹¹ A number of states (not Missouri) permit teachers to work for a limited number of years during retirement with the proviso that their pension checks be placed into an IRA. These are called Deferred Retirement Option Plans (see Bragg 2003).

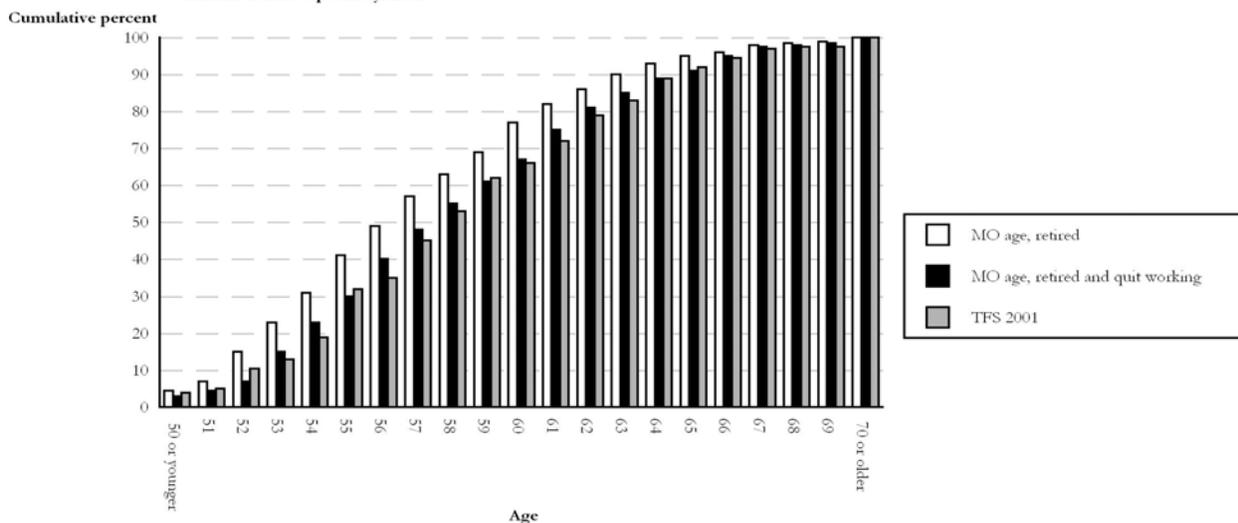
¹² In the 2005 TFS continuing teachers were asked whether they were collecting a teacher pension. Five percent of public school teachers indicated that they were.

Figure 15. Labor market experience for teachers who retired in 2000: Percent of teachers working full time and part time in Missouri public schools in subsequent years



In order to assess the effect of this postretirement teaching on the gap in retirement rates between the Missouri administrative data and TFS, the definition of “retirement” is changed to mean retired from the teacher pension system *and* not teaching in a Missouri public school, and the results are shown in figure 16. The first and third bars are identical to those in figure 15. The difference is the middle bar, which represents the cumulative percent of Missouri teachers retired *and* not working in a public school the year following retirement. Visual inspection finds that most of the gap between the two rates disappears if postretirement teaching employment is controlled. For example, by age 58, 63 percent of teachers had formally retired in Missouri, 55 percent had formally retired and were not working in the year following retirement, as compared to 53 percent of TFS teachers. Thus, of a 10 percentage point discrepancy, 8 percentage points are explained by postretirement employment.

Figure 16. Retirement age in Missouri and the United States, Missouri and SASS Teacher Follow-up Survey: 2001



SOURCE: Schools and Staffing Surveys: 2001 and 2005 Teacher Follow-up Surveys

Policy discussions about teacher recruitment, retention, and quality often focus on young teachers; however, the timing of retirements and workforce retention policies are receiving increasing attention. So, too, have the large unfunded liabilities of teacher retiree benefits. Teachers are retiring at ages well below those in the private sector or in the Social Security system. Teachers who retire in their mid-fifties not only create vacancies that must be filled, but they also draw pension benefits for spells that are likely to exceed their years of service employment. A teacher retiring at age 55 with a \$50,000 annual pension (typically indexed) has received an annuity worth over \$1 million. In order to better understand patterns of retirement and workforce withdrawal induced by these retiree benefit systems, a large longitudinal dataset for mid-career Missouri public school teachers has been constructed, showing that the incentives in the retirement system affect the timing of retirement. In addition, “retirement” and workforce withdrawal are not necessarily the same thing: many educators continue to teach in public schools even after formally retiring. For example, when the Missouri findings were compared to national data from the 2001 and 2005 SASS TFS, they showed that the Missouri retirement rates are higher than the TFS rates, largely explained by the fact that many Missouri teachers continue to teach after retirement. This important artifact of state teacher pension systems deserves more careful study.

Table 1. Mean and median teacher retirement age

| | Mean | Median | Sample Size |
|-----------------------------------|---------------|---------------|-------------|
| Missouri retired | 57.2 | 57.0 | 21,240 |
| Missouri retired and not teaching | 58.4 | 58.0 | 19,001 |
| 2001 TFS ¹ | 58.2 (.48) | 58.0 (.34) | 738 |
| 2005 TFS ¹ | 58.1 (.53) | 58.0 (.33) | 798 |

¹ Standard errors in parentheses.

SOURCE: Missouri Longitudinal Teacher Data File, Schools and Staffing Surveys, 2001 and 2005 Teacher Follow-up Surveys

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