Pension Reform and Return to Work Policies *

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Abstract
For many people, working after beginning retirement benefit collection is a way to enhance financial security by increasing income. Existing research has shown that retirees are sensitive to the Social Security earnings test, which restricts the amount of earnings some beneficiaries can receive (e.g., Friedberg 1998, Friedberg 2000, Gelber et al. 2013, Gelber et al. 2017). However, little is known about the effects of other types of policies on post-retirement employment. Instead of restricting earnings, many public pension plans restrict the number of hours beneficiaries can work. I use return-to-work rules limiting the number of hours of employment in a state's public pension plan and administrative data on employment and retirement to determine the rules' effects on retirement decisions and post-retirement labor supply. I find that the increases in the maximum number of hours of post-retirement employment lead to increases in retirement benefit collection and increases in part-time work among retirees. As such, these policies appear to be binding on the labor supply decisions of some employees. Policymakers should take this into account when designing policies aimed at extending work-lives or improving the health of pension systems.

KEYWORDS: Retirement, Return to Work, Public Pensions
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I. Introduction

Rules regarding post-retirement work (defined as work after beginning benefit collection) have the potential to greatly affect decisions about benefit collection and post-retirement labor supply. This is because when people make decisions about retirement they must consider how they will replace their wage income and continued work is one way to supplement retirement benefit income. In turn, these decisions will affect the health of pension systems, like public employee pensions and Social Security, by determining the number of years of benefit collection and, sometimes, the annual amount of benefits collected.

Existing research has shown that retirees are sensitive to the Social Security earnings test, which restricts the amount of earnings some beneficiaries can receive (e.g., Friedberg 1998, Friedberg 2000, Gelber et al. 2013, Gelber et al. 2017). However, little is known about the effects of other types of policies on post-retirement employment. Instead of restricting earnings, many public pension plans restrict the number of hours beneficiaries can work. In 2018, for example, while 28 states placed restrictions on the time worked by retirees, just 21 placed restrictions on earnings. Many of the 21 place restrictions on both, but just 11 have only earnings restrictions. In Illinois (the setting of this study), the rules regarding limitations on hours for those returning to work after retirement have changed 4 times in the past twenty years. This is evidence that the rules are binding enough for policymakers to change them over time as they face different conditions. The most recent rule change increased the maximum number of hours allowed to 600 in 2018, which is evidence for how timely this issue is and how important it is that we understand these policies' effects.

In this study, I aim to provide some of the first evidence on how restrictions on the number of hours worked after retirement affect labor supply decisions. First, I document the

post-retirement work patterns of public sector retirees. Using data covering employees in the Illinois school system over a period of over 20 years, I describe the patterns of post-retirement work and how they have changed over time for this population. In doing so, I pay particular attention to how the patterns of post-retirement work vary by employee gender, race, age, occupation, and earnings level.

Several patterns emerge from this descriptive analysis. First, the annuitants with the highest levels of service at retirement are the most likely to return to work after retirement. These are probably the employees with the highest labor market attachment. They are also the youngest annuitants and post-retirement employment decreases with age. Although there is little difference in post-retirement employment patterns by race or earnings, there are marked differences by gender and occupation (position last held). Instructional staff (teachers) are much less likely to return to work after retirement than administrative (principals, superintendents) and support (librarians, counselors) staff. At the same time, men are more likely to return to work after beginning benefit collection than are women. The differences in employment by gender are partly related to differences in the occupations across genders (men are much more likely to be in non-instructional positions) and partly related to differences in labor supply within occupation (female retirees are much less likely to be employed than their male counterparts). Finally, there is clear variation over time in patterns of labor supply among annuitants. Post-retirement work rises sharply for annuitants after an early retirement incentive program in the 1990s; this is likely driven by the compositional shift in retirees towards those who had been less likely to want to retire than retirees in previous cohorts. Employment of annuitants rises again in 2000 and declines thereafter, but what drives these later patterns is unclear.

Second, I analyze how rules restricting the number of hours that beneficiaries can work affect retirement decisions and post-retirement employment. To accomplish this, I make use of two sources of variation: (i) changes to the rules regarding post-retirement work and (ii) the fact that these rules applied to some employees and not others. Although the rules regarding the maximum number of hours of post-retirement employment in Illinois Public Schools have changed multiple times, I use the variation driven by the policy change in 2001.[1]

To identify how rules restricting the number of hours employees can work post-retirement affect retirement decisions, I use difference-in-difference techniques. This methodology makes use of the fact that, although most employees are restricted in the number of hours they can work in IPS schools after collecting their retirement benefit, employees in certified subject shortage areas in a given district are not. As such, the retirement decisions of those in certified subject shortage areas in a district should not be affected by rules limiting the number of hours that can be worked post-retirement. Therefore, I compare the retirement decisions of employees likely to be affected by the rules (those not in certified subject shortage areas within a district) to those unlikely to be affected by the rules (those in certified subject shortage areas within a district) before and after the state alters the hours restrictions. Doing so will allow me to identify the effects of the hours restrictions under the assumption that there was nothing else that changed concurrently to the rules changes that also differed across these groups. As described in more detail later, I also make use of the fact that it is only the labor supply of those closest to retirement that should be affected. This further allows me to control for potential confounding factors differentially affecting the labor supply of those nearing retirement.

[1] I focus on the change in 2001 because it was the only policy change for which I have enough pre- and post-treatment data to identify the effect.

I find that the increase in the maximum number of allowable hours of post-retirement work served to increased retirement annuitant benefit collection. It also increased the probability of working part-time, even when I am careful to control for the increased benefit collection. As such, these policies appear to be binding on the labor supply decisions of some employees. Policymakers should take this into account when designing policies aimed at extending work-lives or improving the health of pension systems.

II. Background on Illinois Teacher Retirement System

Employees of Illinois Public Schools (IPS) participate in one of two retirement systems, either the Teachers Retirement System (TRS) or the Chicago Teachers Pension Fund. The focus of this study is the former.[2] In this section, I first provide an overview on the general parameters of the TRS and then describe the specifics about rules regarding work after retirement. There were significant changes to the rules regarding membership in 2011. In what follows, I describe the rules for members employed as of January 1, 2011. Where relevant, I also describe more recent changes.

Many types of employees of the Illinois Public School System are covered by the TRS, including classroom teachers as well as administrators (e.g., principals, superintendents) and support staff (e.g., librarians, nurses, psychologists).[3] While employed, members of the TRS contribute 9 percent of their creditable earnings to the pension system and employers contribute another 0.58 percent.[4] Members accrue 'service credit' in the system for the time they are

[2] Even though the TRS does not cover employees of Chicago Public Schools, we do have some coverage of employees in Chicago Public Schools because many people work in both systems at some point of their lives.
[3] Employees in positions requiring less credentialing, like bus drivers and teachers aides, participate in a separate pension fund.
[4] Employees contribute another 1.24 percent and employers 0.92 percent to cover the retiree health insurance plan.

working (i.e., paid for work, including sick days) and can purchase additional years of service for time spent on maternity leave, teaching in private schools, etc. In addition, members can count up to two years of accrued and unused sick leave towards their creditable service.

Upon retirement, members are eligible for a retirement benefit that is proportional to the amount of service credit they accrued and to their final average earnings. Final average earnings is defined as the average of the four consecutive highest earning years in the last 10 of employment. Benefits accumulate as a percent of final average earnings, at a rate of 1.67, 1.9, and 2.1 percent for each year in the first, second and third decades of service, respectively, and 2.3 percent for any year of service thereafter. The maximum benefit is 75 percent of ones' final average earnings.

Members are eligible for their retirement annuity when they reach one of the following combinations of age and years of creditable service: 55 with 35 years of service, 60 with 10 years of service, or 62 with 5 years of service. In addition, employees are eligible for a reduced retirement annuity when they reach age 55 and have 20 years of service. Also, in the early 1990s, the state offered members of TRS an Early Retirement Incentive (ERI). Under this program, for a fee, employees could have purchased up to five additional years of age and service towards the calculation of their retirement benefit if they retired in either 1993 or 1994. Nearly 10 percent of employees participated in this program and retired earlier than they otherwise would have (Fitzpatrick and Lovenheim 2014).

Because of IRS rules, no annuitants can return to work in the same school-year in which they last contributed to the TRS, but after that they can return to work subject to some restrictions. In order to eliminate double-dipping – employees collecting retirement benefits while working full-time – the state of Illinois has placed limits on the number of hours annuitants

can work while collecting benefits. Over the period from 1990 to today, the rules regarding the maximum allowable number of hours worked changed four times. In 1990, the maximum number of hours of allowable employment was raised from 375 per year to 500. In 2001, the maximum was raised again to 600 hours. In 2011, the maximum number of hours was lowered back to 500. Finally, in 2018, the rules changed to return the limit to 600 hours.[5]

If an employee exceeds these limits in a position covered by TRS, their retirement annuity is suspended (and employer and employee contributions to the system resume) until she refiles for benefit collection. It is important to note that these rules do not prohibit employment in any private school (or other type of employer in the private sector), university, or college, or prevent employment in ISBE as an employee not covered by TRS (e.g., teachers' aide, a bus driver).

An exception to this rule is made for teachers in certified subject shortage areas in a district. Certified subject shortage areas are subject areas where a regional superintendent of schools has certified that a personnel shortage exists. Teachers in these positions may continue retirement benefit collection regardless of the amount of time they work in the public school system, a fact I make use of in my identification strategy outlined below.

[5] To be clearer, the limits are defined in combinations of days and hours. For example, in 2018, the maximum was 120 days or 600 hours. The days limit applies to all employees who work only full-time days (of at least 5 hours per day), while the hours limit applies to employees who have at least some days of part-time work. For the latter group, each full day only counts for five hours (even if the employee worked more than five hours). Because in the data I do not observe hours worked each day, I use the hours definition to define the binding constraint on workers.

III. Data

I use two sources of administrative data from Illinois to document patterns in post-retirement work and the relationship between rules restricting the number of hours of work for beneficiaries and decisions about retirement and post-retirement employment.

The first is the Teacher Service Record (TSR), which contains data on employees of IPS collected by the Illinois State Board of Education (ISBE) from 1978 to 2012. The TSR is a database compiled by the ISBE from school district administrators to track employment and earnings of teachers, staff and administrators in public schools throughout the state. Each observation in the TSR is an employee-school record for a given school year. The TSR includes the following information about employees in IPS: the school and district in which the employee works, total earnings (as reported to the relevant retirement system), number of months employed at the position, full-time equivalent percentage of the position and the percent of time that is administrative. The data also contain information on the number of years of school experience (within the district, within Illinois and out-of-state), the position of employment, and the highest degree held by the employee.

I also use data collected by the TRS. The TRS data contains information on the retirement benefits paid to its members. This includes information about the name of the benefit recipient, the timing of benefit receipt, and the creditable years of service and age of the employee.[6]

Several measures are of interest for the empirical analyses. An employee is deemed 'retirement eligible' if the combination of her age and years of service in ISBE would allow her

[6] I use fuzzy matching methods to combine these two data sources. The matching algorithm uses information on name, service, and employment dates to link the data. These methods lead to a match rate of 97 percent of employees outside of those in Chicago Public Schools. More information is available from the author upon request.

to collect a full retirement annuity (regardless of whether she is collecting benefits).[7] She is retired if she is collecting a retirement annuity (even if she is still working in IPS). A person is working full-time if they are employed for 100% of the full-time-equivalent for at least 9 or 10 months of the year (which is the traditional length of the school-year). If a person is working less than or equal to 60% FTE, I consider her a part-time employee in that school-year. I do not observe the exact number of hours worked, so I create a measure of hours using the months and FTE percentage recorded.[8] Since employees working in certified subject shortage areas are exempt from any restrictions on their post-retirement employment, I also create a measure of employment in non-shortage areas. To do this, I used information on an employee's position and main assignment the first time I observe her in the TSR and annual information on shortage areas in each district from ISBE and federal Department of Education.[9]

Because the data are from administrative records of all employed service in IPS covered by TRS over a period of more than 20 years, I can completely characterize the employment, retirement benefit receipt, and post-retirement work experiences of employees of IPS over the period. In Table 1, I present information on the samples of employees over the period from 1991 to 2011 that I use in the analyses.[10] Each observation in the data is a person-year combination. In the first column, the sample includes all employees of IPS. The second column contains

[7] In other words, we do not classify those ages 55 to 60 with service between 20 and 35 years as eligible even though they would be eligible for a discounted annuity. Also, it is worth noting that the measure of service I have is not a true measure of creditable service in the system because it does not necessarily include forms of service like sick leave.

[8] Assuming a 40-hour work week and the weeks in a year distributed evenly across months, there are about 170 work hours per month. To estimate hours worked in a year, I multiply these 170 hours per month by the percentage FTE recorded, then multiply by the number of months worked that year. For example, a teacher working 9 months per year at 50 percent FTE is estimated to work 765 hours (170*0.5*9=765) in the year.

[9] When available, which was 2002 to 2014, I used the shortage areas reported by ISBE. For other years, I used the shortage areas reported in the federal Department of Education data

[10] In order to create a measure of return to work, it is necessary to observe at least one year post-retirement. Therefore, the sample in this table and what follows only includes employees and retirees in the years before 2012.

information on those eligible for retirement (including observations up to 10 years after becoming eligible). The third column includes only retirees (within 10 years of retirement). In column 4, the sample includes those retirees continuing to work after benefit collection.

The average retiree is older and has more experience than other workers, as expected, but the average retiree who is working post-retirement is younger and has more experience than the average retiree. Only 2 percent of retirees work, and 71 percent of those who do work part-time. Women make up a smaller share of retirees who work (55 percent) than they do retirees in general (64 percent).

IV. Empirical Strategy

To identify how rules restricting the number of hours employees can work post-retirement affect retirement and other labor supply decisions, I use difference-in-difference techniques. In using this methodology, I compare outcomes of groups of employees who are affected by the rules regarding post-retirement employment to groups of employees whose labor supply should be unaffected. Since the rules regarding return to work only affect those who have retired, the labor supply of employees ineligible for retirement should not be affected and can be used as a counterfactual for employees who are retirement eligible. Similarly, although most retirees are restricted in the number of hours they can work in IPS schools after collecting their retirement benefit, employees in certified subject shortage areas in a given district are not. As such, the retirement decisions of those in certified subject shortage areas in a district should not be affected by rules limiting the number of hours that can be worked post-retirement. Therefore, I use employees ineligible for retirement and those in certified subject shortage areas to create

comparison groups that provide the counterfactual labor supply for those most likely to be affected by the policy change.

As a result, I can compare the retirement decisions of employees likely to be affected by the rules (the retirement eligible who are not in certified subject shortage areas within a district) to those unlikely to be affected by the rules (those in certified subject shortage areas within a district and those who are retirement ineligible) before and after the state alters the hours restrictions. In other words, I will make use of both the variation in who is bound by the rules regarding post-retirement hours worked and the variation over time in the rules regarding post-retirement hours worked to identify the effects of the restrictions on hours worked on retirement. Doing so will allow me to identify the effects of the hours restrictions under the assumption that there was nothing else that changed concurrently to the rules changes that also differed across these groups.

Since there are three potential sources of variation underlying the differences-in-differences comparisons (retirement eligibility, subject area, and time), I first present results using the two-dimensional comparison of the labor supply of the retirement eligible to those ineligible before and after the policy is introduced. In these difference-in-difference models, the estimation equation is the following:

$$Y_{it} = \beta X_{it} + \gamma PostXEligible_{it} + \theta Eligible_{it} + \delta_t + \omega_i + \varepsilon_{it}.$$

In the equation, *Y* represents a measure of labor supply including collecting pension benefits, working in the ISBE, and working part-time. The vector *X* includes individual time-varying characteristics, such as age and years of experience. As discussed in the previous section, a person is defined as retirement eligible in a given year if her age and years of experience would allow her to be eligible to collect a normal retirement annuity from the TRS. I include year fixed

effects (δ_t) to capture any variation in labor supply that is common across all people in the sample in a given year. I also include person fixed effects to capture heterogeneity in labor supply elasticity across people in the sample.

The coefficient of interest is γ, which represents the difference in labor supply of people who are retirement eligible versus those who are ineligible before and after the hours restriction is introduced in 2001. The assumption underlying this interpretation of γ is that there are no other policy or environmental changes in 2001 that would have differentially affected the labor supply of people eligible for retirement differently than those ineligible.

Since one might be concerned that economic conditions or other policy changes had differential effects on the labor supply of those nearing retirement, I also estimate a triple-differences model using the following equation:

$$Y_{it} = \beta X_{it} + \gamma PostXEligibleXNonShortage_{it} + \theta Eligible_{it} + \pi NonShortage_{it} + \vartheta EligibleXNonShortage_{it} + \mu PostXEligible_{it} + \rho PostXNonShortage_{it} + \delta_t + \omega_i + \varepsilon_{it}.$$

In this specification, I make use of the fact that teachers in certified subject areas are not bound by the post-retirement rules restricting the number of hours worked. As such, their behavior offers an additional comparison group to control for any economic trends or policy variation that occurred at the same time as the change in the rule regarding hours worked for retirees. With this specification, the assumption is that there were no other shocks to the labor supply of people in the sample in 2001 that would have differentially affected those retirement eligible who were not in shortage areas from either the retirement eligible in shortage areas or the retirement ineligible who also were not in shortage areas.

V. Results

In Figure 1, I plot the fraction of retired annuitants who are working at all or who are working part-time in a given year, indicated by the solid and dashed lines, respectively. Since few people work after they have been retired for more than a few years, the sample is limited to just retirees who began collecting benefits within the previous 10 years. For the most part, patterns of overall and part-time post-retirement work behavior trend together meaning that differences over time in post-retirement work are driven largely by retirees that work part-time. There is a sharp increase in both rates in 1995, which was the first year that retirees who took up the ERI could return to work without facing a penalty. Since about 10 percent of the workforce participated in the ERI program and the program involved leaving work earlier than one otherwise would, it is perhaps not surprising that the set of retirees post-ERI had higher levels of post-retirement labor supply. There is another uptick in employment of retirees in 2000. I am unaware of what might be driving this increase; to my knowledge there were no changes in pension policy in Illinois at this time. This slightly predates the policy change I study, making it clear that controlling for confounding factors will be important. After 2000, the fraction of retirees employed begins declining until, in 2011, there were about 2 percent of retirees working, about 80 percent of whom were working part-time.

Figure 2 contains information about post-retirement employment for retirees separately by either their current age (Panel A) or their age at retirement (Panel B). Although these ages are obviously mechanically correlated, some interesting patterns emerge when we compare the figures. In the first set of panels, labor supply after retirement declines monotonically with current age. In the second set of panels, we can see that it is those that begin retirement at the youngest ages (55 to 59) who have the highest levels of post-retirement employment. Therefore,

it is these 'early' retirees who are driving the differences in labor supply at different ages. This might seem surprising; given that these employees retire at such a young age, we might hypothesize that their labor force attachment is less than other workers. However, only those employees with the highest levels of accrued service are eligible to retire at 55, making it likely that this is the group with the strongest labor force attachment.

This is confirmed in Figure 3 where I plot rates of employment after retirement by years of service in the system at retirement. In this figure, it is the retirees with the most experience who have the highest rates of both overall and part-time employment. In general, the rates of employment decline monotonically with service.

Next, I examine the rates of overall and part-time employment by employee race (Figure 4) and gender (Figure 5). There are not large differences in labor supply of retirees of different races, though non-white annuitants might be slightly less likely to work part-time than their white counterparts. There are, however, clear differences in the post-retirement labor supply of men and women. Retired men are more likely to work and more likely to work part-time than their female counterparts. Also, male annuitant labor supply fluctuates more than that of female annuitants. Several factors could be driving these differences in labor supply across the genders, including differences in the composition of employees leading to differences in individuals' own labor supply elasticity and a difference in labor supply elasticity resulting from differences in spousal labor supply, as well as other differences. I return to this issue later.

There may be different returns to retiring and/or returning to work post-retirement based on one's income, status, and other labor supply opportunities. To shed light on some of these differences, in the next several figures, I explore how return-to-work patterns differ for annuitants by earnings and position. In Figure 6, I present differences in labor supply by

employees' earnings. The employees are grouped into quartiles based on their final average salary (as would be used in the calculation of their annuity payment).[11] In general, there is little difference across the quartiles. Over time, since 1999, the labor supply of annuitants in the bottom quartile has decline more rapidly than that of others; it also does not experience the fluctuations that the labor supply of the more highly paid workers does. Although this is interesting, this measure of earnings combines pre-retirement differences in hours worked and pay conditional on hours worked. So, it is difficult to know what drives these results.

In Figure 7, I plot the differences in labor supply by an employee's last position of employment in ISBE. I have divided positions into three categories: instructional staff (teachers), administrative staff (superintendents, principals, supervisors), and support staff (librarians, counselors, nurses, social workers, etc.). There are quite distinctive differences in the labor supply of these three groups of retirees. The labor supply of instructional staff is the lowest of the three groups and varies relatively little over time (though the time pattern does follow the same overall pattern as that of the other groups). On average over the period, 3 to 3.5 percent of retirees who were instructional staff work after retirement, the majority of which are employed part-time.

For the most part, before 2000, the labor supply patterns of employees who end their careers as administrative and support staff trend together. Before the ERI, about 4 percent work and about 25 to 50 percent of that group work part-time. After the ERI program, these retirees had much higher rates of employment: about 8 percent worked and 4 to 6 percent worked part-time. In 2000, the labor supply of administrative and support staff increased dramatically, though the increase was even more dramatic for support staff than for administrative staff. The

[11] (Quartiles are defined separately for each retirement-year cohort.)

employment rate of support staff jumped from 9 to 20 percent and the part-time employment rate jumped from 7 to 16 percent. The employment rate of administrative staff jumped from 8 to 12 percent and the part-time employment rate jumped from 6 to 9 percent. Since 2000, the employment rates of these retirees have been declining; it declined most rapidly from 2001 to 2005 and then more slowly after 2005. By the end of the period, employment rates for former administrative and support staff were between 3 and 4 percent. It is not clear what drives these differences in the employment patterns of annuitants who retired from different positions in ISBE. It may be that labor supply preferences are different across people who are in different positions or occupations. Or, perhaps there is more flexibility allowed for non-instructional retirees than for employees in traditional teaching positions.

Just like in the broader economy, there are differences in the gender make-up of public school employees by position or occupation. While women make up 70 percent of the retirees who retired from instructional positions, they make up just 55 percent of those who retired from non-instructional positions. At around just 20 percent, they represent an even smaller proportion of the administrative (or leadership) staff of ISBE. Of interest is whether the earlier differences in retirement rates by gender are related to these differences in occupation or whether employment rates of males and females conditional on gender are similar. In Panel A of Figure 8, I plot the full- and part-time employment rates of men and women who retired from instructional staff positions. Men in this group are about 50 percent more likely to work and about 100 percent more likely to be working part-time than the women. In Panel B, we see that the labor supply of men and women who retired from administrative and support staff positions is more similar. (The exception is in the more pronounced labor supply response by former non-instructional staff who are female.) Therefore, overall differences in the labor supply of male

and female annuitants is partly related to the fact that they have different positions (occupations) and partly to differences in their labor supply elasticity within position type (occupation).

Difference-in-Difference Estimates of the Effects of the Increase in Allowed Hours of Post-Retirement Work

In Table 2, I present the estimates of the effects of the 2001 increase in allowed hours worked on the retirement behavior of employees who are still working. In the table, I use two different dependent variables to measure retirement. The first, which is the dependent variable in the specifications reported in columns 1 and 2, is retirement defined by the collection of a retirement annuity. The second, used as the dependent variable in columns 3 and 4, is whether the employee is still employed in the following year. In the first and third columns, I present results from the two-dimensional difference-in-difference model. In these columns, the coefficient measuring the effect of the policy is the one from the term $PostXEligible_{it}$ (in the second row). In the second and fourth columns, I present the results from the three-dimensional model using both retirement eligibility and subject areas to define the comparison groups. In these columns, the coefficient measuring the effect of the policy is the one from the term $PostXEligibleXNonShortage_{it}$ (in the first row).

The coefficient estimates in the first two columns tell a similar story: when employees are permitted more flexibility in their post-retirement employment, they are more likely to begin collecting retirement benefits. Estimates from the triple-differences specification are the most conservative. They indicate that the increase in allowable hours leads to a 3.9 percentage point increase in the likelihood of collecting an annuity. Meanwhile, the results in the third and fourth columns suggest that affected employees are also less likely to work in the following year.

However, I do not emphasize this result since it is not statistically significant when the triple-difference specification is used.

In Table 3, I investigate whether the patterns of part-time employment changed because of the increase in allowable hours of work post-retirement. Here, I limit the sample to just those employees within five years of the retirement eligibility threshold. Again, the coefficient representing the effect of the policy is in the second row for the difference-in-difference specification in the first column and in the first row in the triple-difference specification in the second column. The two estimates are quite similar. The policy allowing for more flexible work arrangements increased the amount of part-time work among those most likely to be affected by the policy by 0.005 percentage points, or 38 percent.

In Table 4, I further investigate whether this effect is driven by the people collecting retirement benefits, as would be expected given the policy change. Although focusing only on retirees is problematic because the results in Table 2 showed that the policy changed the number, and perhaps composition, of retirees in ways that might lead to biased estimates of the policy's effects, it is still a useful exercise to check that it is retirees that are more likely to work part-time (rather than other types of employees). So, the sample I use in the estimates I present in Table 4 includes only retirees. The estimates are from difference-in-difference models comparing the labor supply of retirees who were in non-shortage subject areas (and thus subject to the post-retirement limits on hours) as compared to those in shortage subject areas before and after the policy change. The estimates of the treatment effect show that the policy had no effect on the propensity of retirees to be employed full-time, but increased the propensity to be employed part-time by 0.7 percentage points (37 percent).

Note that none of the comparison groups creates a perfect measure of the applicability of the return-to-work rules. The definition of retirement eligible does not include those eligible for a discounted early annuity. Additionally, our measure of service is inexact because I do not observe some forms of creditable service (like sick leave). In defining shortage areas, I classified all non-instructional staff as non-shortage unless they were listed as being in a shortage area, but the return-to-work rules do not apply to some types of non-instructional staff even if there is no shortage. As such, the results in Tables 2, 3, and 4 represent an under-estimate of the effects of the increase in allowable hours of employment post-retirement on labor supply.

Conclusion

To be done….

References

Fitzpatrick, Maria D. and Michael Lovenheim. 2014. "How Does Teacher Retirement Affect Student Achievement?" American Economic Journal: Economic Policy. 6(3): 120-154.

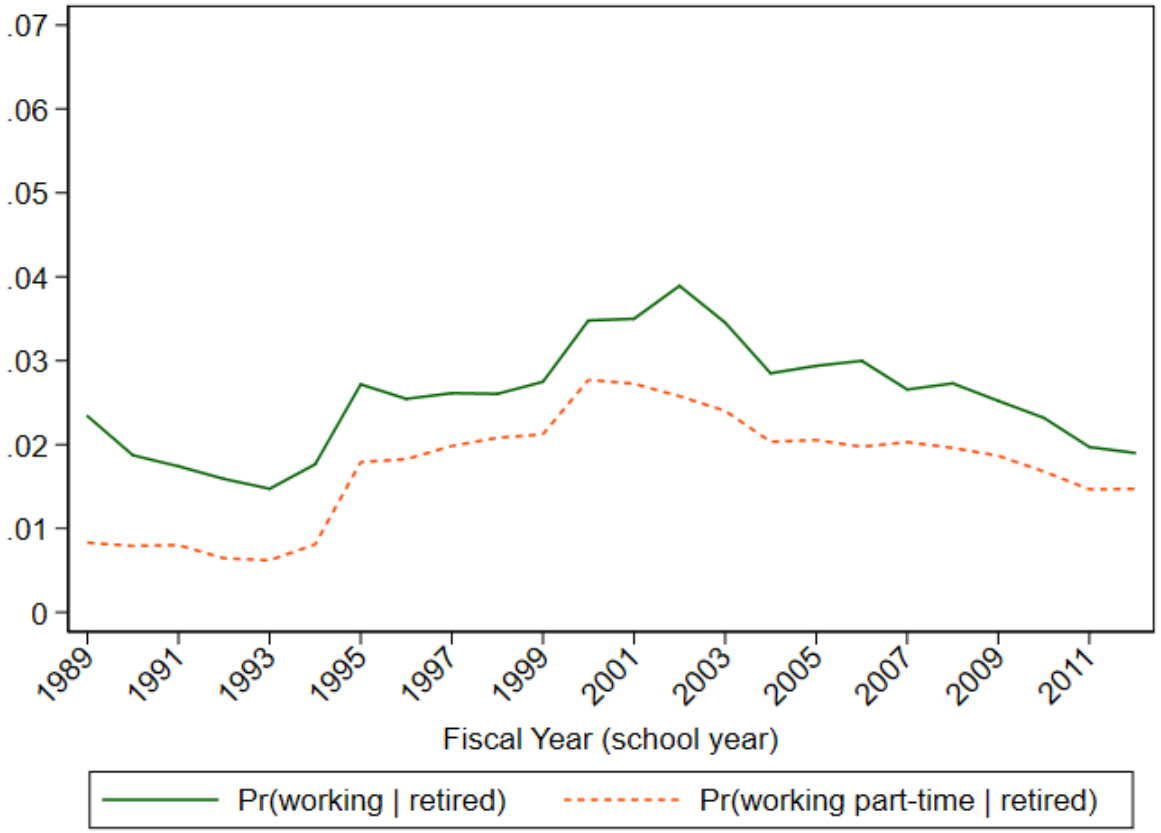
Friedberg, L. (1998), "The Social Security earnings test and labor supply of older men." In Tax Policy and the Economy (James M. Poterba, ed.), 121-150, University of Chicago Press.

Friedberg, L. (2000), "The Labor Supply Effects of the Social Security Earnings Test," Review of Economics and Statistics, 82, 48-63.

Gelber, A., D. Jones, and D. Sacks (2013), "Earnings Adjustment Frictions: Evidence from the Social Security Earnings Test," NBER Working Paper 19491.

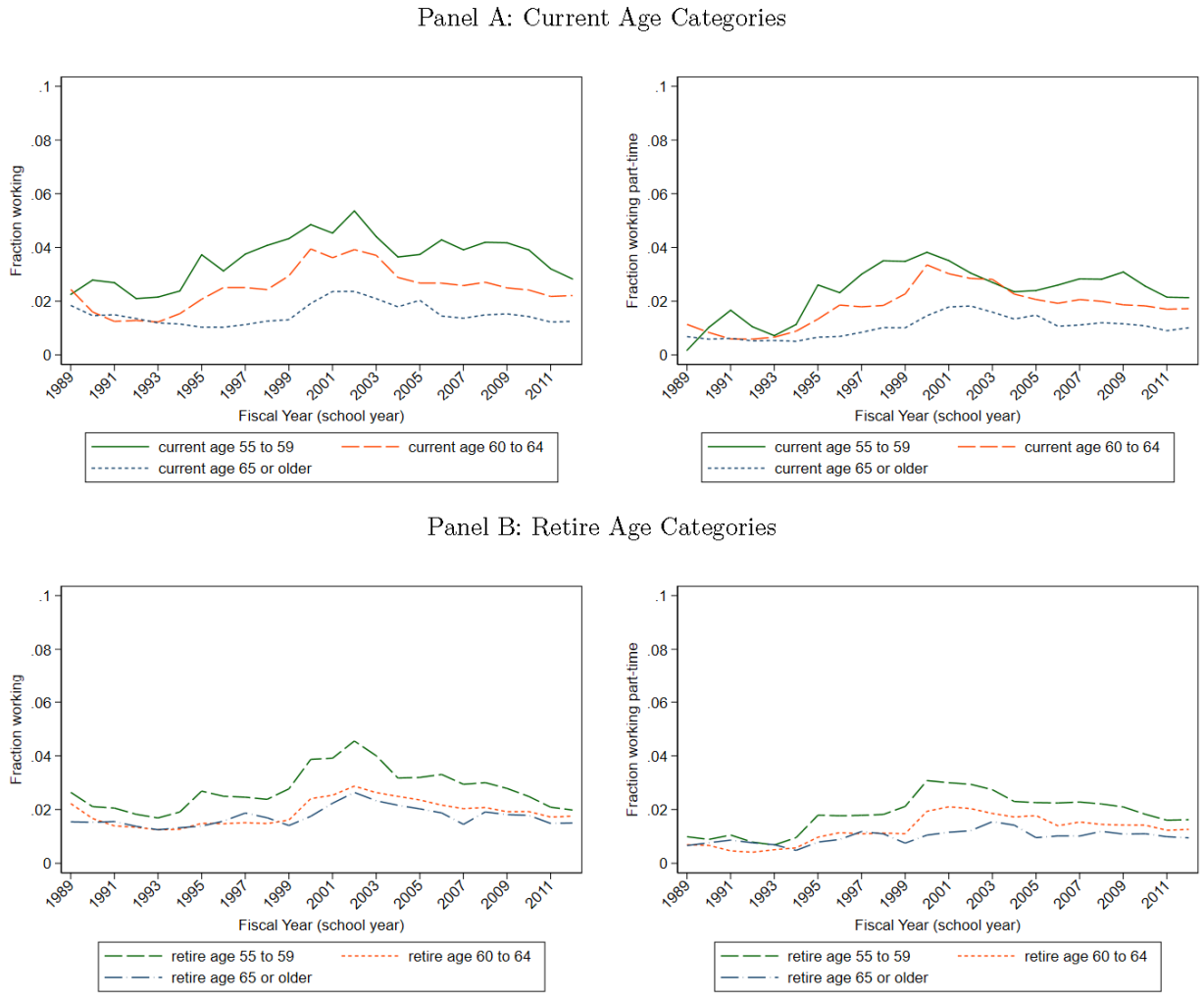
Gelber, A., D. Jones, and D. Sacks, J. Song (2017), "Using Kinked Budget Sets to Estimate Extensive Margin Responses: Evidence from the Social Security Earnings Test," NBER Working Paper 23362.

Figure 1. Fraction of Retired Annuitants who are Employed and Employed Part-Time, by Year



Note: Based on the author's calculation using data from the TSR and TRS from 1989 to 2012. The sample includes retirees within 10 years of their retirement benefit collection date.

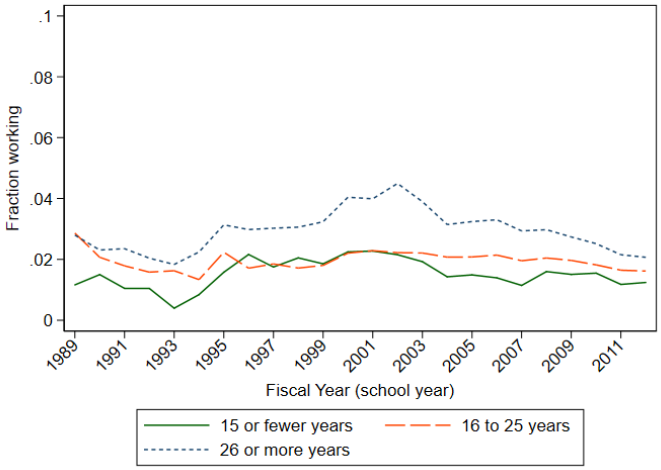
Figure 2. Fraction of Retired Annuitants who are Employed and Employed Part-Time, by Year and Age at Observation or Age at Retirement



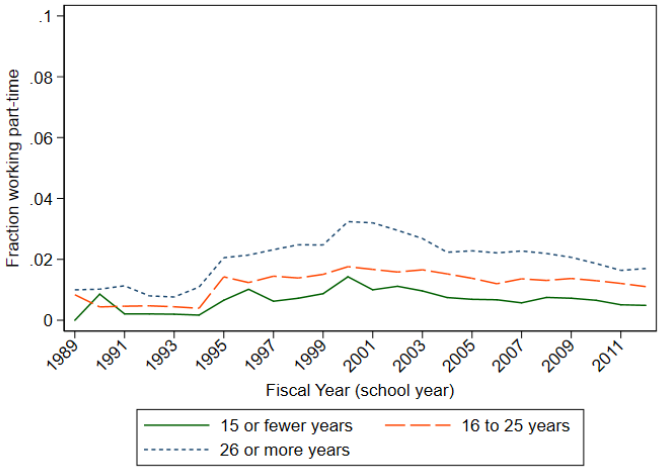
Note: Based on the author's calculation using data from the TSR and TRS from 1989 to 2012. The sample includes retirees within 10 years of their retirement benefit collection date.

Figure 3. Fraction of Retired Annuitants who are Employed and Employed Part-Time, by Year and Years of Service

Panel A: Fraction Working At All

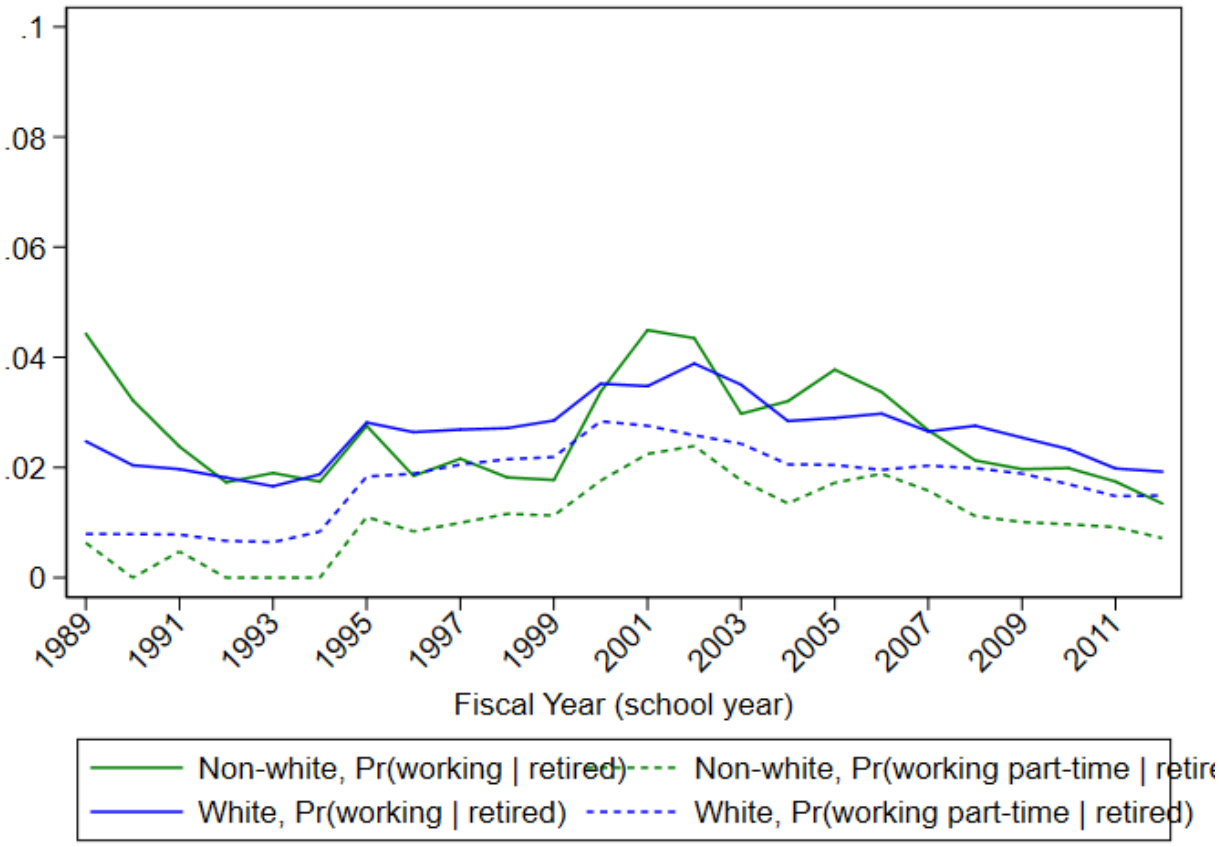


Panel B: Fraction Working Part-time



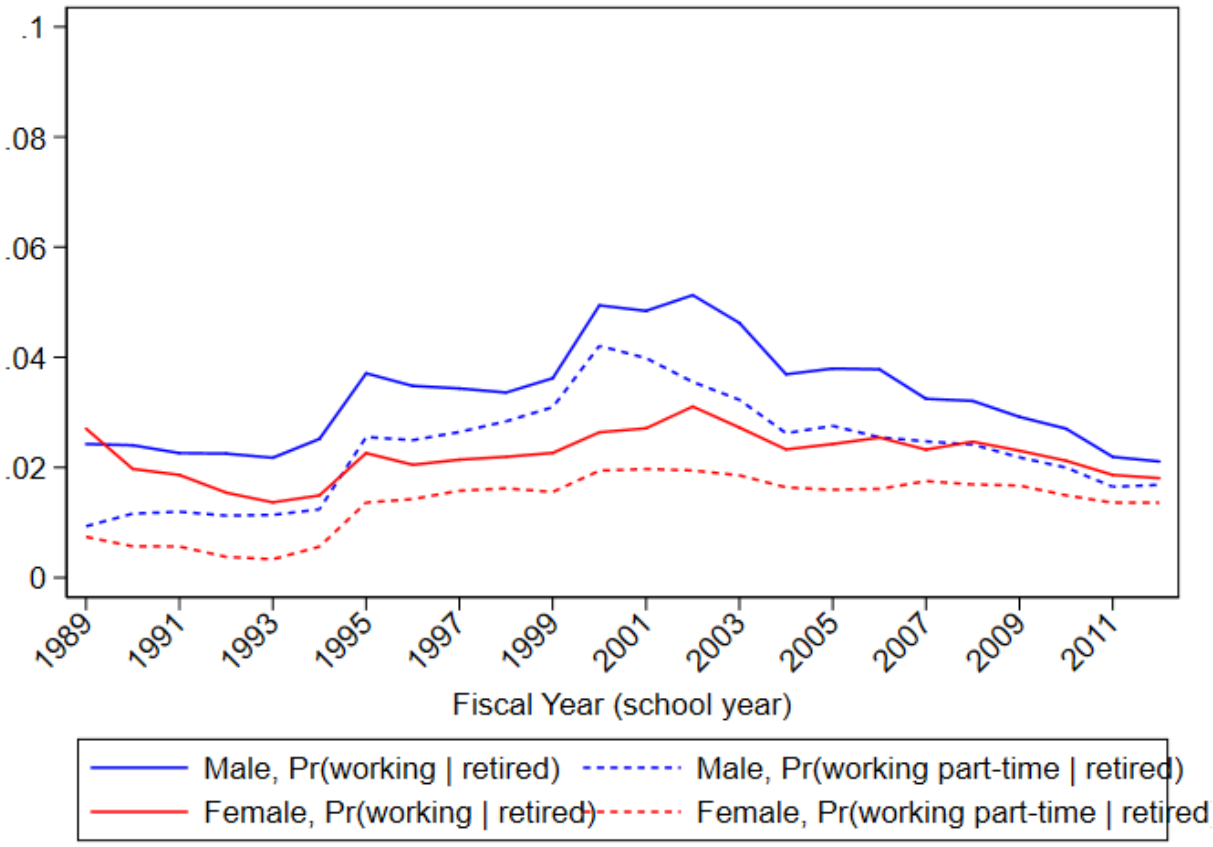
Note: Based on the author's calculation using data from the TSR and TRS from 1989 to 2012. The sample includes retirees within 10 years of their retirement benefit collection date.

Figure 4. Fraction of Retired Annuitants who are Employed and Employed Part-Time, by Year and Race



Note: Based on the author's calculation using data from the TSR and TRS from 1989 to 2012. The sample includes retirees within 10 years of their retirement benefit collection date.

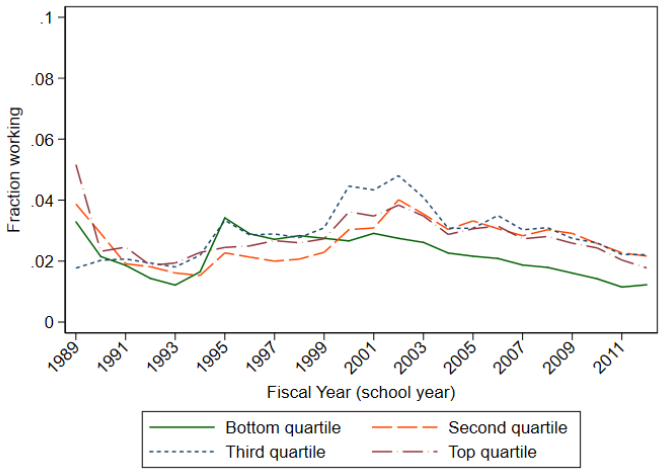
Figure 5. Fraction of Retired Annuitants who are Employed and Employed Part-Time, by Year and Gender



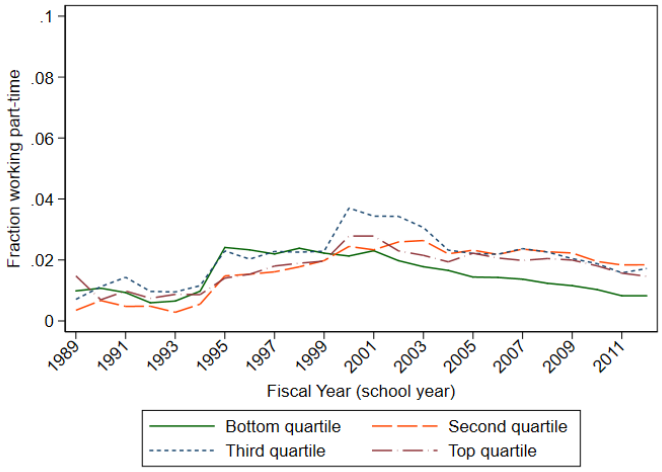
Note: Based on the author's calculation using data from the TSR and TRS from 1989 to 2012. The sample includes retirees within 10 years of their retirement benefit collection date.

Figure 6. Fraction of Retired Annuitants who are Employed and Employed Part-Time, by Year and Race

Panel A: Fraction Working At All

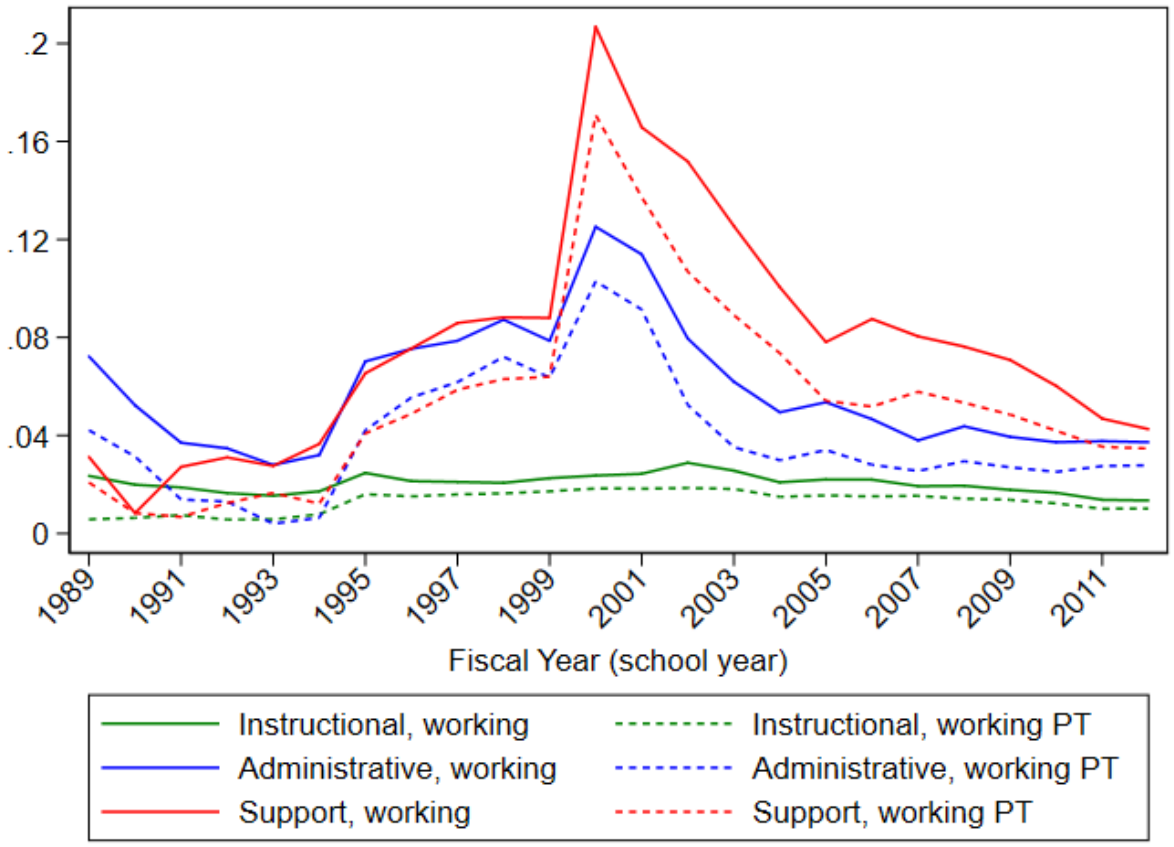


Panel B: Fraction Working Part-time



Note: Based on the author's calculation using data from the TSR and TRS from 1989 to 2012. The sample includes retirees within 10 years of their retirement benefit collection date.

Figure 7. Fraction of Retired Annuitants who are Employed and Employed Part-Time, by Year and Race



Note: Based on the author's calculation using data from the TSR and TRS from 1989 to 2012. The sample includes retirees within 10 years of their retirement benefit collection date.

Table 1. Average Characteristics

	All Workers	Retirement-Eligible	Retirees	Retired and Working
	mean	mean	mean	mean
Age	42.31	44.87	62.15	60.51
Years of experience	13.98	12.78	27.68	31.64
Instructional staff	0.77	0.82	0.82	0.55
Working part-time	0.04	0.03	0.02	0.71
Estimated hours worked per year	1,554	921	25	895
Female	0.74	0.74	0.64	0.55
White, non-Hispanic	0.94	0.94	0.95	0.96
Salary in 2012 dollars	62,710.07	62,707.88	34,403.09	34,403.09
Observations	2,479,158	4,182,417	399,609	11,287

Note: Based on the author's calculation using data from the TSR and TRS from 1991 to 2011. Each observation is a person-year combination. In the first column, the sample includes all employees, retired or not, between 1991 and 2011. In the second column, the sample includes all employees who are retirement eligible, retired or not, up to 10 years after becoming eligible, between 1991 and 2011. In the third column, the sample includes all retirees within 10 years of retirement between 1991 and 2011. In the fourth column, the sample includes all retirees within 10 years of retirement who are currently employed between 1991 and 2011.

Table 2. Estimates of the Effects of the Increase in Allowable Hours of Employment Post-Retirement on Retirement Benefit Collection and Employment, All Employees

	(1) Retire	(2) Retire	(3) Work next year	(4) Work next year
Retirement elig. X Non-shortage area X Post 2001		0.039***		-0.017
		(0.011)		(0.011)
Retirement eligible X Post 2001	0.060***	0.025*	-0.037***	-0.018
	(0.003)	(0.010)	(0.004)	(0.010)
Retirement eligible	0.186***	0.220***	-0.171***	-0.209***
	(0.003)	(0.009)	(0.003)	(0.010)
Age	-0.005***	-0.006***	-0.031***	-0.030***
	(0.000)	(0.000)	(0.000)	(0.000)
Years of experience	0.008***	0.008***	-0.053***	-0.053***
	(0.000)	(0.000)	(0.000)	(0.000)
Non-shortage area X Post 2001		0.008***		-0.012***
		(0.001)		(0.001)
Retirement eligible X Non-shortage area		-0.038***		0.042***
		(0.010)		(0.010)
Non-shortage area		-0.004***		0.006***
		(0.000)		(0.001)
Constant	0.119***	0.147***	2.831***	2.789***
	(0.003)	(0.004)	(0.014)	(0.014)
Mean of dependent var.	0.022	0.022	0.895	0.895
Standard dev. of dependent var.	0.145	0.145	0.306	0.306
N	2,593,424	2,593,424	2,593,424	2,593,424
R-squared	0.116	0.116	0.528	0.528

Note: Based on the author's calculation using data from the TSR and TRS from 1991 to 2011. Sample includes all employees, retired or not, between 1991 and 2011. Coefficients presented are from the difference-in-difference specifications presented in the text. Standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3. Estimates of the Effects of the Increase in Allowable Hours of Employment Post-Retirement on Part-time Employment, Employees Within 5 Years of Retirement Eligibility

	(1) Working part-time	(2) Working part-time
Retirement elig. X Non-shortage area X Post 2001		0.005*
		(0.002)
Retirement eligible X Post 2001	0.003***	-0.001
	(0.001)	(0.002)
Non-shortage area X Post 2001		-0.002
		(0.002)
Retirement eligible X Non-shortage area		-0.007***
		(0.002)
Non-shortage area		0.003*
		(0.001)
Retirement eligible	-0.000	0.006**
	(0.001)	(0.002)
Age	-0.002***	-0.002***
	(0.000)	(0.000)
Years of experience	0.004***	0.004***
	(0.000)	(0.000)
Constant	0.029***	0.014
	(0.005)	(0.010)
Mean of dependent var.	0.013	0.013
N	1,284,965	1,284,965
R-squared	0.005	0.005

Note: Based on the author's calculation using data from the TSR and TRS from 1991 to 2011. Sample includes all employees, retired or not, within five years or retirement between 1991 and 2011. Coefficients presented are from the difference-in-difference specifications presented in the text. Standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4. Estimates of the Effects of the Increase in Allowable Hours of Employment Post-Retirement on Part-time Employment, Retirement Annuitants Only

	(1) Working full-time	(2) Working part-time
Non-shortage area X Post 2001	0.001	0.007***
	(0.001)	(0.002)
Non-shortage area	0.000	-0.005**
	(0.001)	(0.002)
Age	-0.001***	-0.000*
	(0.000)	(0.000)
Years of experience	-0.017***	0.007**
	(0.002)	(0.002)
Constant	0.520***	-0.132*
	(0.050)	(0.067)
Mean of dependent var.	0.008	0.019
N	489,663	489,663
R-squared	0.014	0.005

Note: Based on the author's calculation using data from the TSR and TRS from 1991 to 2011. Sample includes all employees, retired or not, within five years or retirement between 1991 and 2011. Coefficients presented are from the difference-in-difference specifications presented in the text. Standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.