Teaching, Teachers' Pensions and Retirement across Recent Cohorts of College Graduate Women

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Abstract:
Labor force participation rates of college-educated women ages 60 to 64 increased by 20 percent (10 percentage points) between 2000 and 2010. One potential explanation for this change stems from the fact that fewer college-educated women in the more recent cohorts were ever teachers. This occupational shift could affect the length of women's careers because teaching is a profession where workers are covered by defined benefit pensions and, generally, defined benefit pensions allow workers to retire earlier than Social Security. I provide evidence supporting the hypothesis and show that older college-educated women who worked as teachers do not experience increases in labor force participation as large as their counterparts who never taught.

I. Introduction

Labor force participation rates of college-educated women ages 60 to 64 increased by 20 percent (10 percentage points) between 2000 and 2010. One potential explanation for this change stems from the fact that a lower proportion of the college-educated women in the more recent cohorts were ever teachers. The propensity of women to obtain a college degree increased by a factor of 5 between the 1925 and 1950 birth cohorts (from 5 to 25 percentage points). Since the number of female teachers remained relatively constant during the period, the fraction of college-educated women who were teachers fell precipitously.

This occupational shift among college-educated women could drive the recent increases in labor force participation for any number of reasons. For example, if teaching is more stressful than the other occupations that college-educated women are now more likely to be employed in, then the more recent cohorts of college-educated women will retire at older ages than previous cohorts. Alternatively, if teachers are more likely than other college-educated women to be secondary earners, they may retire earlier either because they are not the primary earner or in order to time retirement with an older spouse.

In this chapter, I examine a third potential difference between teachers and workers in other occupations: pension eligibility (and wealth). Public school teachers are almost universally covered by defined benefit pensions and, generally, defined benefit pensions allow workers to retire at earlier ages than Social Security. Therefore, as the fraction of college-educated women without access to these defined benefit pensions increased, the labor supply of older college-educated women increased. I provide evidence supporting the hypothesis in part by showing that older college-educated women who ever worked as teachers do not experience increases in labor force participation as large as their counterparts who never taught.

II.   The Changing Nature of College-Educated Women's Occupations

At various moments during the last hundred years, women made enormous strides in their educational attainment. In Figure 1, I use data from Godin and Katz (2008), updated by Goldin and Katz to include data up to 2012, to plot college graduation rates (by age 30) of women by birth cohort. Focusing on the cohorts most relevant for this study, in the 1925 cohort the female graduation rate starts around 5 percent and begins to climb. By the 1940 cohort, female graduation rates had more than doubled and by the 1950 cohort they doubled again, reaching nearly 25 percent.

As more women graduated from college, they also began to be employed in a more diverse set of occupations. In Figure 2, I plot the fraction of employed college-educated women in the Current Population Survey (CPS) between the ages of 46 and 50 who report being a teacher, by birth cohort.[1] The fraction of teachers decreases from around 40 percent for the cohorts born before 1940 to 30 percent for those born in 1950 and decreases further still to just 15 percent for the cohorts born after 1959. The shift in occupational choice may have implications for the labor supply of older women because, as described next, teachers, who are mostly public employees, have access to pensions that are different than those in other sectors.

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[1] The Current Population Survey only collects information about occupation and industry of those who report being employed. The fraction of college-educated women who are employed between the ages of 46 and 50 across the cohorts born between 1920 and 1965 varies little. Restricting to women ages 46 to 50 allows me to create a time-series for cohorts as far back as 1920. The fraction of college-educated women who are employed and report being teachers by cohort is similar when measured at earlier ages.

III.   Pensions

A. A Brief History of Teacher Pensions

Although the first statewide systems of teacher pensions in the U.S. were introduced in the last quarter of the nineteenth century, very few were in place before 1910 (Clark et al. 2003). At that time, Social Security did not exist and teaching was an occupation largely reserved for unmarried women. Those who remained in teaching for many years were those who had never married and therefore could not rely on a spouse's income for retirement support.[2] As such, teacher pension systems were seen as a mechanism to provide assistance to women who might not otherwise have late-in-life support. During the early part of the twentieth century the use of pensions expanded until, by the late 1920s, teachers in 28 states were covered by pensions.[3] By 2013, public school teachers in all states participated in publicly-funded pension plans.

Pensions generally take one of two forms: defined benefit or defined contribution. In a traditional defined benefit pension plan, upon retirement the employee receives a set benefit for life. The benefit size is determined by age, time spent with the employer and earnings history while employed, and is usually adjusted to account for inflation. In 2013, teachers in 44 states participated in either a traditional (39 states) or hybrid (five states) defined benefit pension system. In a defined contribution pension plan, employer and employee contributions are made throughout the employee's tenure. The firm and the employees choose among investment options for the contributions. In 2013, only one state, Alaska, offered teachers only a defined

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[2] Many districts had marriage bars that banned married women from working. For more information, see Goldin (1991a, 1991b, 2006).
[3] In contrast to the pension systems available to most policemen and firefighters at the time, which were operated by municipalities, most teachers participated in statewide pension plans.

contribution plan.[4] In the remaining five states, public school teachers had a choice of participating in a defined benefit plan, defined contribution plan or some combination.

Therefore, an overwhelming majority of public school teachers in the U.S. participate in some form of defined benefit pension program. It is important to note that the current widespread use of defined benefit pensions is unique to employers in the public sector. In 2006, 65 percent of older workers in the public sector participated in some form of defined benefit plan, while only 39 percent of private sector workers did (Gustman et al. 2010). Moreover, while only 22 percent of private sector workers participate only in a defined benefit plan, the same is true of 57 percent of public sector workers.[5]

Although relatively few people in the private sector have access to a defined benefit pension, nearly all private sector workers are covered by Social Security, which is itself a type of defined benefit pension. Teachers in many states also participate in Social Security, although that was not always the case. Starting in 1954, the Social Security Act was amended to allow state and local government employees who were members of a public retirement system to participate in the Social Security program. Since then, public employees have been able to gain membership in Social Security by majority vote of the employees. Such votes have been passed in 35 states and all teachers in these states participate in Social Security. In another three states teachers in some districts participate in Social Security. Estimates suggest that between 61 and 73 percent of teachers currently participate in Social Security (Doherty et al. 2012).

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[4] Even Alaska's defined contribution plan is sufficiently new that teachers in the cohorts relevant for this study participate in the preexisting defined benefit plan.
[5] The shift towards defined contribution plans in the private sector began in the 1980s. Potential causes include the introduction of 401(k) defined contribution plans, a shift in private sector employment away from heavily unionized industries, and the increased funding requirements for private sector pension plans.

B. The Structure of Teacher Pensions

Why might the type of pension plan influence labor supply at older ages? A notable characteristic of defined benefit pension plans is defined rules governing eligibility for benefit collection and benefit size. In addition to plan rules being clearly delineated, the rules are often structured such that the monetary gain for the employee of continued employment past a certain point is negative (Stock and Wise 1990).[6] These rules often lead to large discrete changes in the present discounted value of income to employees of retiring at a particular age or year of tenure. This feature is in stark contrast to defined contribution pensions where an employee can begin collecting benefits at almost any time and the present value of the pension wealth increases steadily with contributions (and oscillates only with market fluctuations).[7] Because there are no large eligibility-rule-induced discrete changes in the present value of defined contribution pension accounts at specific ages or levels of experience, there are no clear incentives to retire at a particular age or level of experience.

However, even employees in the U.S. without defined benefit pensions from their employer still participate in Social Security. The earliest age of retirement in Social Security is 62 and the full retirement age ranges from 65 to 67 depending on the individual's year of birth. As with any defined benefit pension system, Social Security eligibility ages are influential in the decision making of older Americans. About 40 percent of Social Security recipients begin

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[6] Specifically, continued employment with the employer offering the defined benefit pension begins to have negative returns. Workers may find it beneficial to pursue employment with other employers, particularly if they are also eligible for Social Security and expect to live awhile (Maestas, this volume). Later, I explore whether there have been changes in the patterns of employment among college-educated women after they begin collecting pension benefits.

[7] In 401k plans there is a 10 percent increase in present value of pension wealth when a worker hits age 55 and retires, at which point she avoids the early withdrawal penalty. If the worker retires before 55 or converts the 401k into an IRA, she must wait until age 59.5 to avoid the early withdrawal penalty.

collecting benefits at age 62 and another 10 percent begin collection at the full retirement age.[8]

At issue is how these incentives to retire at certain ages in Social Security compare with those in the defined benefit pensions provided to public school teachers.

Rules regarding eligibility for benefit collection in defined benefit pension plans for teachers are based on age, years of service within the public school retirement system, or some combination thereof. For example, in California, teachers who have vested in the system can retire at age 55. Teachers in the New York State pension system may retire with 35 years of service regardless of their age.[9] Still many other states use the combination of age and years of service. For example, in the Texas Teachers' Retirement System, eligibility is determined by the rule of 80: any combination of age and years of service totaling at least 80 makes someone eligible to begin collecting retirement benefits as long as the employee is at least age 60.[10]

As illustrated in the examples of these three states, traditionally, eligibility rules in public sector defined benefit pensions have been structured such that employees can retire much earlier than they would be eligible in the Social Security system. In Figure 3, I present information on the earliest age at which a continuously-employed teacher who started working at age 22 becomes eligible for an unreduced retirement benefit, known as the normal retirement benefit. The figure shows that the age of retirement eligibility for career teachers ranges from 47 to 67. The bulk of states (35) have retirement eligibility ages between 52 and 60. Recall that the first

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[8] Fitzpatrick and Moore (2017).

[9] Tier I members (those that started before 1973) of the New York State Teachers' Retirement System can begin collecting benefits with 35 years of service at any age. They can also collect benefits at age 55 with at least five years of service. The rules have changed over time and teachers entering New York state public schools since 2010 are eligible to receive benefits at age 55 with ten years of service. (https://www.nystrs.org/Benefits/Service-Retirement, Accessed August 12, 2015)

[10] If she entered the Texas Teacher Retirement System for the first time after 2014, the member must have at least 80 years of combined age and experience and be at least 62.

age at which Americans are eligible for normal benefit collection in Social Security is 65. In comparison, only three state systems have pension eligibility rules for career teachers that would preclude them from collecting their full pension benefits by age 65.

What makes the comparison more remarkable is that the information in Figure 3 is about teachers' eligibility for a normal retirement benefit. Teachers in many state pension systems can retire even earlier if they are willing to accept a reduction in their annual benefit.[11] The size of the reduction is based on how early the worker claims benefits, known as an early retirement option or early retirement benefit. Almost all state pensions systems (46) have an early retirement option for teachers. The option is similar to the early retirement option in Social Security, where benefit collection can start at age 62 with a reduction in the size of the benefit. I do not know of any source that has carefully cataloged the early retirement ages in teacher pension systems. However, since only 11 states have full retirement ages that are higher than the early retirement age in Social Security, it is safe to say that the vast majority of teachers can collect early retirement benefits at a younger age than Social Security participants.

In addition to eligibility rules that allow earlier retirement in teaching than other occupations, there is another dimension of defined benefit pensions that encourages retirement at relatively young ages. In many states there is a maximum allowed benefit. For example, in Illinois, the maximum benefit payable to a retiree is 75 percent of her final average salary, which is similar in size to the maximum benefit in other states. The annual benefit amount in a defined

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[11] For example, if a teacher in Texas satisfies the rule of 80 requirement, but is not yet 60 years of age, she can retire, but her benefit will be reduced by five percent for each year she is younger than age 60. In other words, the Texas teacher who started teaching at age 22 and worked continuously is eligible for a normal retirement benefit at age 60. She can retire at age 51 (with 29 years of service) with a benefit that is just 55 percent of what her normal benefit would have been, at 52 with a benefit 60 percent as large, and so on.

benefit plan is generally determined by years of service and some measure of final average salary. To be specific, the annual annuity, *B*, is defined by the formula:

$$B = F \times \text{Years of Service} \times \text{Final Average Salary}$$

where *F* is known as the benefit factor. Benefit factors for are generally around 2 percent or more per year of service. Given these benefit factors, career teachers often reach the maximum benefit point within 30 to 35 years of service, or in their mid-fifties to early-sixties. After reaching the maximum benefit point, the return to continued work decreases precipitously because benefits no longer accrue at 2 percent per year.

The combination of these eligibility and benefit rules set up changes in accrued pension wealth that lead to clear incentives to retire at certain points. The present value of benefits increases sharply when a worker becomes eligible for early retirement making early retirement eligibility a salient moment for teacher retirement. Pension wealth then continues increasing at a relatively fast rate (as compared to earlier in one's career) until the teacher hits the normal retirement age. At that point, the present value of pension wealth may still increase with time on the job, but it will do so at a slower rate than it did between early and normal retirement eligibility. Eventually, when the employee hits the point where she will receive the maximum benefit, her pension wealth accrual with an additional year of employment actually begins *decreasing*. This odd change occurs because, despite the increase in the salary used to calculate benefits, by continuing employment she forgoes some of the benefit payments entitled to her if she retired.

The large effect of these rules on teacher retirement behavior has been well-documented in the literature. For example, Harris and Adams (2007) calculated that nationally, in 2005, 54 percent of the teachers first reaching early retirement eligibility took that option. Another three-

quarters of teachers who reach normal retirement age began collecting benefits at that point. Therefore, nearly 90 percent of career teachers have retired by the normal retirement age in teaching, which, as I described, is at an earlier age in most states than the early retirement age in Social Security. Other researchers show that pension eligibility leads to similar increases in retirement using state administrative data (Brown 2013; Koedel et al. 2014; Mahler 2014). For example, in Missouri, the median retirement age is 57 (Koedel et al. 2014).

Finally, in addition to pensions, there is one other notable piece of retirement-related compensation available for former public school teachers (and other public sector workers) that is not as widely available for workers in the private sector: retiree health insurance. As of 2009, every state offered some form of retiree health insurance to its government employees, including teachers (Clark and Morrill 2010). These state-sponsored retiree health insurance programs provide subsidized health insurance to teachers collecting benefits from the state pension system. Therefore, these employees have access to health insurance that is not contingent on employment at younger ages than most people can receive it from the federal government (generally at age 65, through Medicare). Research has shown that the offer of retiree health insurance leads public school teachers to retire earlier than they would have otherwise (Fitzpatrick 2014).

IV.   Evidence from the Health and Retirement Study

A. *Employment, Retirement, and Benefit Collection*

The existing literature clearly illustrates that teachers leave their main jobs as public school teachers when they reach retirement eligibility. While informative, this fact does not provide a rich understanding of the labor supply of female teachers and how it compares with other college-educated women. This is, in part, because teachers can continue to work even after collecting retirement benefits from their pension system. Most existing research on teacher

retirement uses administrative data from teacher pension systems. Although such data offer large sample sizes, they do not include information on labor supply outside of a particular teachers' retirement system. Continued work unobserved in administrative data could include teaching for another school system and employment in another occupation or sector entirely.

I turn to the Health and Retirement Study (HRS, see Appendix for more information) to create a more comprehensive picture of the older-age labor supply of college-educated women who spent time as teachers as compared to other college-educated women who did not. For this study, I limit the sample to women who report having obtained at least a Bachelor's degree. I include information on women born between 1931 and 1950 whom I can observe at almost all ages between 60 and 64. Because of sample size issues, I present information for the following groups of cohorts: 1931 to 1935, 1936 to 1940, 1941 to 1945 and 1946 to 1950. The most recent wave of the HRS was conducted in 2014, so age 60 to 64 outcomes for the last cohort group (the 1946 to 1950 cohorts) are incomplete. In discussing comparisons below, I detail where this data limitation may be important for interpretation.

HRS respondents are asked a series of questions about their occupations at different points in time. These questions vary across waves of the survey. The most consistent way to identify teachers across waves of the survey is to categorize anyone who responds to any of the occupation questions as a teacher (one could say "ever a teacher"). More precisely, I compare outcomes for college-educated women who were teachers at any point in their lives to other college-educated women who were never teachers. Note that this includes both public and private school teachers; I use this definition because many teachers who spent time as private school teachers were also once public school teachers. Because there are relatively few private school teachers, I cannot examine them separately and the results are unchanged if I omit them.

There are important differences in training and professionalization between teaching and many other occupations, even those in which other college-educated women are employed. Therefore, in some of what follows, I also present comparisons between college-educated women who were teachers and other college-educated women classified to have been in the same general occupation category, managerial and professional specialization occupations, who were not ever teachers.

Just as in the CPS, the HRS data show evidence of a shift in the occupations of college-educated women (Figure 4).[12] More than 45 percent of college-educated women born between 1931 and 1940 were employed as teachers at some point in their work-lives, but just 31 percent of those born between 1946 to 1950 report ever being employed as teachers.[13] During this 20-year span of birth cohorts, there was a 30 percent decline in the fraction of college-educated women who spent time employed as teachers.

Goldin and Katz (this volume) showed that college-educated women in the 1931 to 1951 cohorts who spent time employed as teachers were about 5 percentage points, on average, less likely to be in the labor force at ages 59 to 63. Information in Figure 5 confirms this pattern using employment rates between the ages of 60 and 64 of college-educated women born between 1931 and 1950. However, the information in the Figure shows that, not only are college-educated women who spent time as teachers less likely to be employed across all of these cohorts, there is a widening of the older-age employment gap between those who spent time as teachers and other college-educated women. This is because college-educated women who were

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[12] The same pattern is seen when using single-year cohorts and moving averages of three-year cohorts, see Figure 6 of Goldin and Katz (this volume).

[13] The HRS asks information about occupation and pensions for the jobs about which it collects information. This includes jobs held at the time of each survey, the last job held and as well as up to three previous jobs if they were held for at least five years.

teachers at some point in their careers do not experience the same increase in labor force participation at older ages that other college-educated women who were never teachers do, particularly women in the category of managerial and professional specialization occupations who were never teachers (Figure 5).[14] Employment of those who were teachers increased from 53 to 59 percent for the 1931-1935 to the 1946-1950 cohorts, respectively, an increase of 6 percentage points. This is only slightly more than half the increase in employment of college-educated women who were never teachers in these cohorts, which was 11 percentage points. The employment rate of other college-educated women in managerial and professional specialty occupations who were never teachers increased by nearly 20 percentage points across these cohorts. Therefore, the increase in employment of those who were once teachers was only 30 percent as large as the increase for other college-educated women in these similarly professionalized occupations who were never teachers. Clearly, the difference in occupational choices between these cohorts is related to the longer work-lives of more recent cohorts of college-educated women.

Notably, although teachers were about as likely to be working between the ages of 60 and 64 as other college-educated women in the early cohorts, this was no longer the case for women born between 1946 and 1950 (Figure 5). Instead, women who spent some time as teachers in the more recent cohorts were about 10 percent (6 percentage points) less likely to be employed at ages 60 to 64 than the rest of their college-educated peers who were never teachers. The

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[14] The censoring of data in 2014 means the women in the 1946 to 1950 cohorts are on average younger than those in the earlier cohorts. This factor likely makes the employment rates for these cohorts slightly higher than they should be. Fully 90 percent of career teachers retire when they reach pension eligibility milestones, which occur in one's late fifties and early sixties. There is no similar decline in employment of women when they reach Social Security eligibility. Therefore, the censoring of the data is likely leading me to underestimate the differences in employment growth across teachers and other college-educated women.

difference in employment rates is even starker when compared to other women in managerial and professional specialization occupations who were never teachers. More than three quarters (77 percent) of college-educated women born between 1946 and 1950 who worked in the broader set of managerial and professional specialization occupations but were never teachers were employed at ages 60 to 64. In other words, college-educated women in occupations similar to teaching have a 30 percent (18 percentage points) higher employment rate than teachers.

Relatedly, there has been an 11 percentage point (30 percent) decline in the fraction of women in professional service occupations who did not teach that report being retired. At the same time, the fraction of college-educated women who spent time as teachers who say they are retired has increased by about 2 percentage points (Figure 6). The recent relative decline in retirement and increase in employment of college-educated women who were never teachers is likely driven in part by the decreased likelihood that these women had access to pension benefits in their early sixties. As I now detail, the retirement and employment patterns are reflected in the relative decreased likelihood of collecting pension benefits among those who were never teachers.

As can be seen in Panel A of Figure 7, the fraction of those who spent time as teachers and who are collecting pension benefits between ages 60 and 64 hovered around 40 percent for those born between 1931 and 1945. The fraction collecting Social Security benefits also remained steady across these cohorts (Panel B, around 23 percent). However, the pension and Social Security benefit collection of other college-educated women who were never teachers across the same cohorts both fell slightly (by about 5 percentage points each).[15]

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[15] In part, this may be due to the slowdown in the growth of Social Security benefits discussed in Gelber et al. (this volume).

For both the college-educated women who were once teachers and those who were never teachers, there is a relatively sharp decline in pension benefit collection among the 1946 to 1950 cohorts. This decrease is a distinct break from the previous pattern, particularly for those who were once teachers. Likely, the censoring of the data for these cohorts drives the drop. Only two of these cohorts (1946 and 1947) are observed at all of the ages from 60 to 64. The other cohorts are only observed at the youngest ages in the 60 to 64 range, meaning the set of workers observed in the HRS in these cohorts is younger, on average, than the set of workers observed from other cohorts. Since defined benefit pension collection, particularly among teachers, occurs in the late fifties and early sixties, the censoring causes the pension benefit collection rates among people who spent time as teachers to be lower than if we were able to observe these cohorts at all ages from 60 to 64.

To determine whether the censoring is likely to be driving the drop in pension benefits, in Panel C of Figure 7, I present pension benefit collection for the same cohorts, but at ages 55 to 59. By observing people at earlier ages, I avoid the problem of censoring. Other than an uptick in pension benefit collection for the 1941 to 1945 cohorts, the benefit collection between ages 55 and 59 of college-educated women who were once teachers is steady across these cohorts.[16] Therefore, the pension collection between ages 55 to 59 of college-educated women who spent time as teachers and were born in the 1946 to 1950 cohorts is similar to that of earlier cohorts of college-educated women who spent time as teachers. This exercise provides evidence that the censoring of the data for the 1946 to 1950 cohorts when in their sixties drives the lower pension

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[16] Why is there an uptick among the 1941 to 1945 cohorts? Those cohorts reached their late 50s in the late 1990s, which was a period of increased pension generosity and pension buyouts that enabled teachers to retire earlier than they would have otherwise. We can also see the influence of the buyouts and other benefit generosity changes of the late 1990s in the slight increase in retirement of teachers ages 60 to 64 from the 1936 to 1940 cohorts.

receipt among women who spent time as teachers seen in Panel A of Figure 7. If we extrapolate from their behavior at earlier ages, we would expect their fully-realized pension receipt between ages 60 and 64 to be near 40 percent and similar to that of earlier cohorts of college-educated women who spent time as teachers.

B. Concurrent Employment and Pension Collection

To this point, I have shown that college-educated women who spent time as teachers have different patterns of labor supply and retirement at older ages than their similarly educated and professionalized counterparts. Namely, while the patterns of employment and retirement did not change much for the women who spent time as teachers that were born between 1931 and 1950, other older college-educated women in these cohorts who were never teachers saw increases in the propensity to be employed and decreases in the likelihood of being retired.

Retirement and employment are not binary; people may continue to work even once they consider themselves retired or begin collecting pension benefits (Maestas 2010). This may be particularly true for teachers who begin collecting benefits from a state pension system, but are not precluded from working for other employers. Of interest is whether the patterns of increased labor supply at older ages are driven by increased labor supply among those who are not collecting retirement benefits or if they are driven by increases in labor supply among those who have begun collecting benefits, but desire to keep working. Since teachers can begin benefit collection at such early ages, relative to other occupations, the distinction may be of particular relevance for understanding the labor supply of older workers who have spent time in teaching.

In Figure 8, I examine whether there were shifts in concurrent employment and pension benefit collection among 60- to 64-year-old college-educated women born between 1931 and 1950 who spent time as teachers and those who did not. In Panel A, the lines plot the rates of

employment for women who were collecting pension or Social Security benefits in their early sixties. There is little change across cohorts in the rate of employment for these "retired" older women if they did not spend time in teaching. Among college-educated women who spent time in teaching and are collecting retirement benefits between ages 60 and 64, there is a large decrease in the likelihood of employment. In Panel B, we see that the increases in labor supply of older college-educated women are driven by increases in the propensity of working and not collecting retirement benefits.

C. Teachers or Public Sector Workers?

Teachers are not the only employees with employer-provided defined benefit pension that incentivize early retirement. The most obvious group of other employees with defined benefit pensions are other public sector workers. The labor supply of college-educated women ages 60 to 64 who worked in the public sector increased by 5 percentage points across the cohorts born between 1931 to 1935 and 1946 to 1950 (Figure 9). As such, the labor supply of government workers more closely mirrors that of teachers, rather than that of other college-educated workers who were not teachers. The comparison makes sense since both groups have disproportionate access to defined benefit pensions relative to college-educated women in other occupations, though it could be the case that teachers and other government workers have other things in common (e.g. preferences) that drive their similarity and the differences between their labor supply and that of other college-educated women.

V.   Conclusion

To summarize, teachers have different patterns of retirement and labor supply at older ages than their similarly educated and professionalized counterparts. Namely, recent cohorts of teachers are less likely to be employed and more likely to be retired between the ages of 60 and

64 than recent cohorts of similarly educated and professionalized women. A likely reason for these differences is that teachers in these recent cohorts have access to traditional defined benefit pensions, while women who were never teachers do not. As shown, these defined benefit pensions allow for, and even incentivize, retirement at earlier ages than Social Security. Support for this hypothesis stems from similar patterns of employment between ages 60 and 64 among teachers and other government workers, who also have access to defined benefit pensions.

The difference in pension access across occupations is also likely a primary driver of changes in the patterns of labor supply among older college-educated women in recent decades. Specifically, while the patterns of older teachers' employment and retirement did not change much for the cohorts between 1931 and 1950, other older college-educated women who were never teachers saw significant increases in the propensity to be employed and decreases in the likelihood of being retired.

The employment changes for more recent cohorts correspond to the patterns of change in pension use in the private sector. Namely, there was a large decrease in the use of defined benefit pensions in the private sector over the course of recent decades. At the same time, there was a large decline in the propensity of college-educated women to work as teachers, meaning more and more college-educated women were employed in the private sector where they had less access to defined benefit pensions. The combination of these two shifts seems to have played a significant role in the recent increase in labor supply of older college-educated women.

As mentioned in the beginning of the chapter, the decline in the fraction of college-educated women who were teachers was driven by an enormous increase in educational attainment of women. Of interest is understanding the relative role of these two shifts – the increase in the fraction of women who were college-educated and the decrease in the fraction of

college-educated who were teachers – in determining the increased labor supply of older women. In the appendix, I outline a simple two-period model of older-age female labor supply. Using data reported in this chapter, the model suggests that the decrease in the fraction of college-educated women who were teachers had an impact on the recent labor supply of older women that was less than one-tenth as large as the increase in the fraction of women who were college-educated.
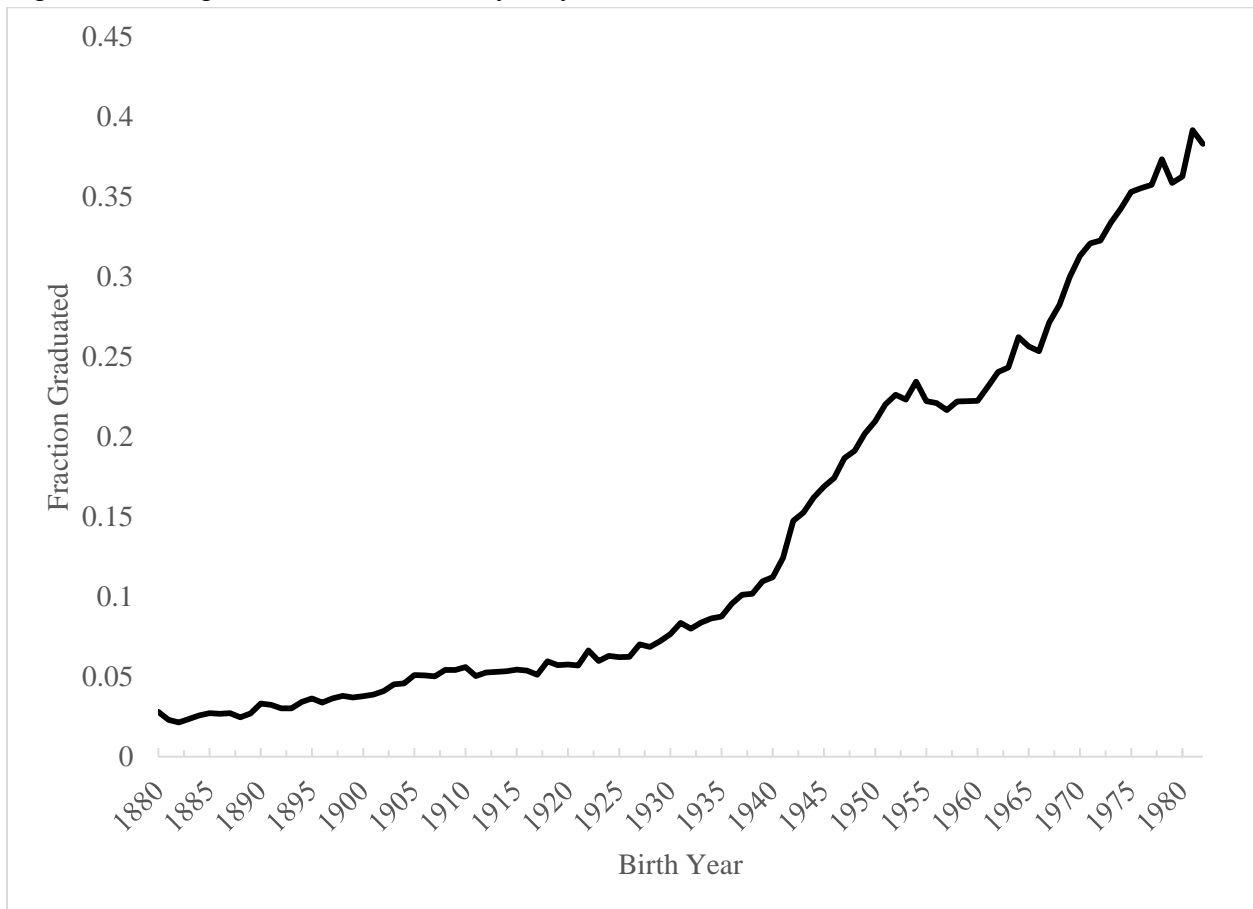
That said, evidence in this chapter suggests that there is some scope for the occupational shifts among recent cohorts of women to have played a role in the recent increases in the labor supply of older women. In the context of the model, it is useful to consider how the labor supply of older women would have changed if there had been an increase in the education of women without the corresponding decrease in the fraction of college educated women who were ever teachers. In this counterfactual, the increase in female labor supply between ages 60 and 64 would have been just one-fifth as large as in the setting where the fraction of college-educated women who were ever teachers decreased. In other words, the combination of increased educational attainment and changing occupational choice both played a role in the increases in the labor supply of older women.

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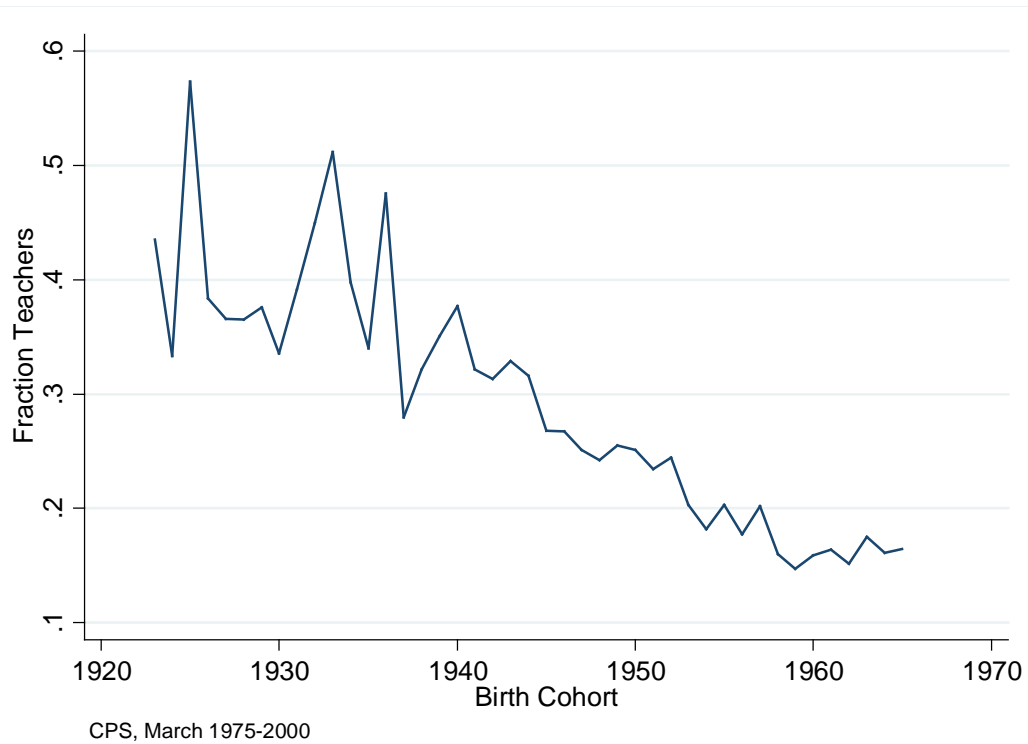Goldin, Claudia and Lawrence F. Katz. This Volume. "Women Working Longer: Facts and Some Explanations."

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Figure 1. College Graduation Rates (by 30 years) for Women: Cohorts Born from 1880 to 1982
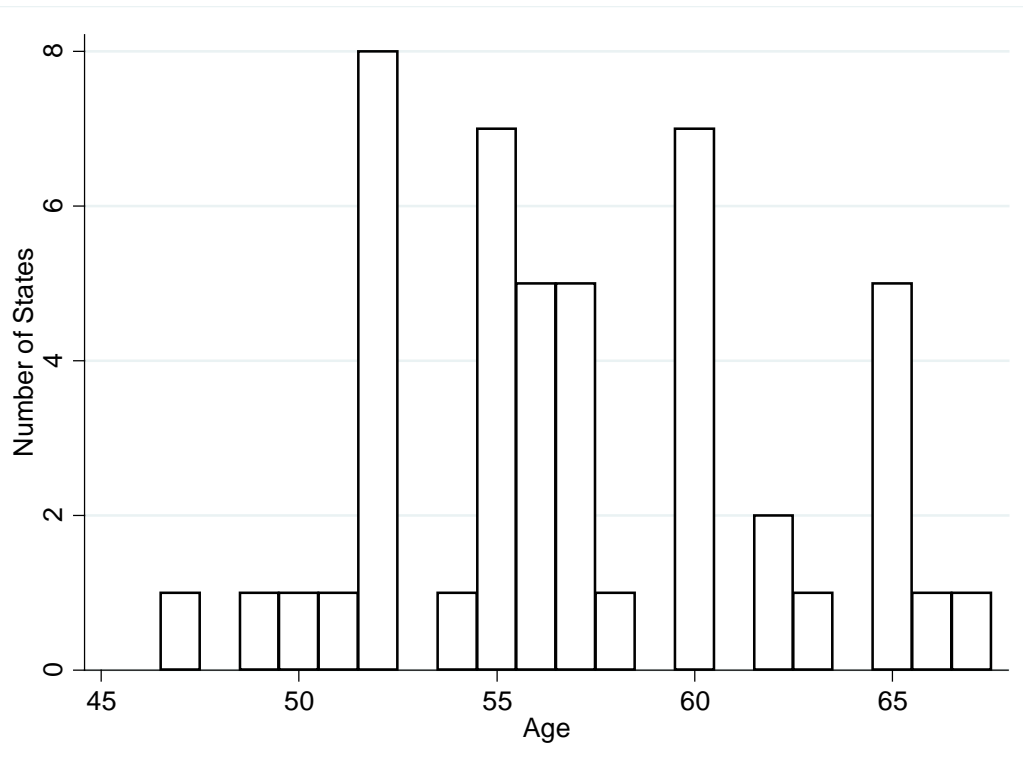

Source: Goldin and Katz, 2008, with updates from Goldin and Katz for 1976 to 1982 birth cohorts using CPS MORG, 2006-2012 and evaluated at age 30 for each birth cohort.

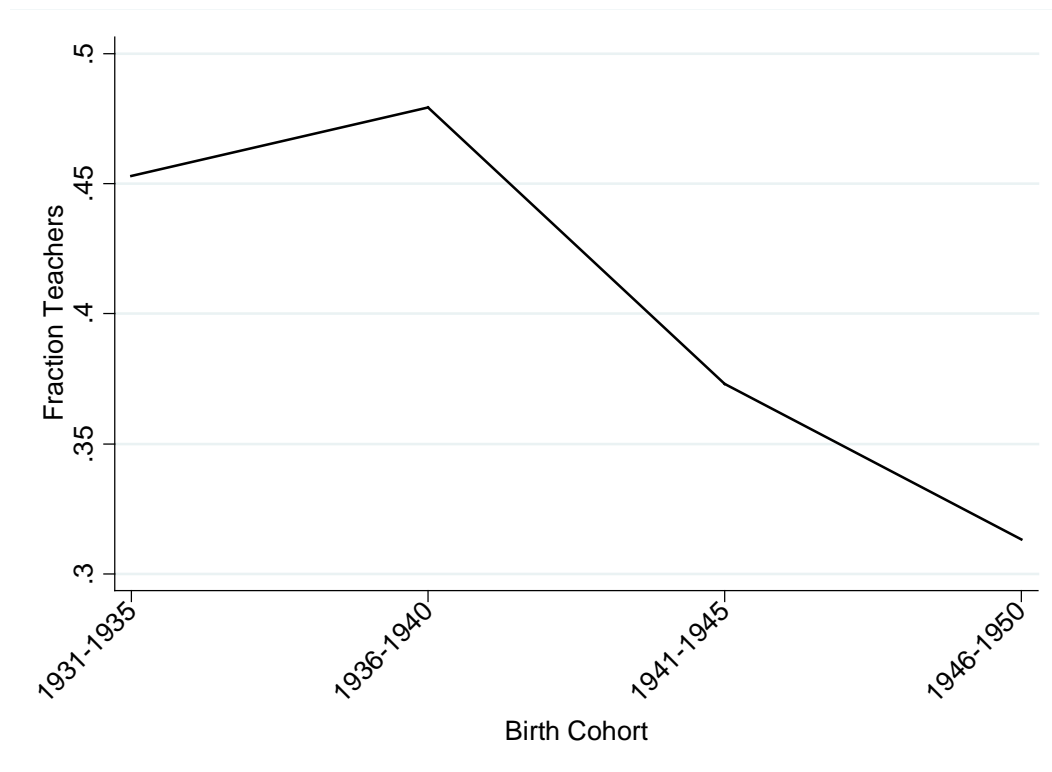Figure 2. Fraction of Employed College-Educated Women Who Are Teachers, by Birth Cohort

CPS, March 1975-2000

Source and Notes: Based on the author's calculations using the Current Population Survey, 1975 to 2000. Sample includes employed college-educated women ages 46 to 50.

Figure 3. Number of States with Each Normal Retirement Age for State Teacher Pensions Systems

Source and Notes: Dougherty et al. 2012. Includes the 49 states with defined benefit pension systems for teachers in 2011. The normal retirement age is defined as the earliest retirement age at which someone who starts teaching at age 22 can retire and receive an unreduced retirement benefit.

Figure 4. Fraction of College-Educated Women Ages 60 to 64 in the Health and Retirement Study Reporting Having Ever Been Employed As a Teacher, by Birth Cohort

Source and Notes: Based on the author's calculations using the Health and Retirement Study. Respondents were asked the type of work done at each job about which they were surveyed (current, last and previous). A woman is classified as a teacher if the occupation recorded was teaching for any of these jobs. The sample includes all college-educated women between the ages of 60 and 64.

Figure 5. Employment of College-educated Women Ages 60 to 64, by Occupation and Birth Cohort

Source and Notes: Based on the author's calculation using the Health and Retirement Study. Respondents were asked the type of work done at each job about which they were surveyed (current, last and previous). A woman is classified as a teacher if the occupation recorded was teaching for any of these jobs. Women were classified into the managerial and professional specialty occupations using similar methodology. The sample includes all college-educated women between the ages of 60 and 64.
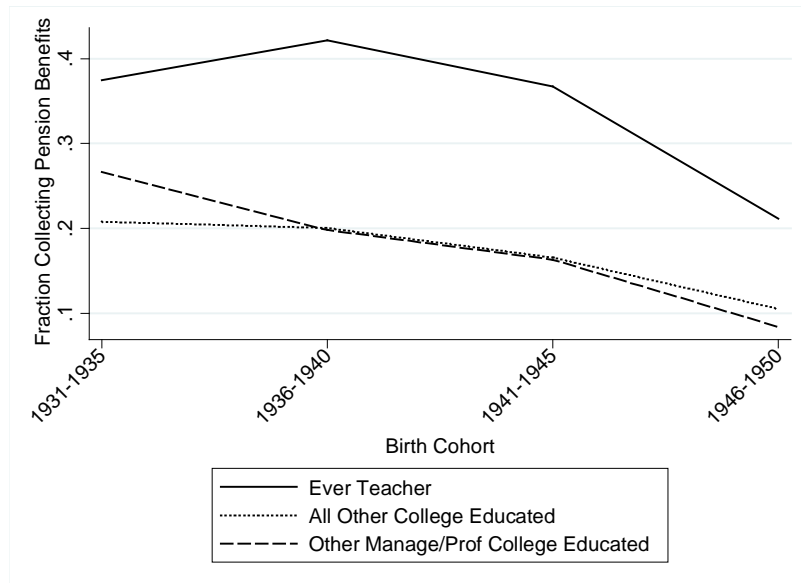
Figure 6. Retirement Status of College-educated Women Ages 60 to 64, by Occupation and Birth Cohort
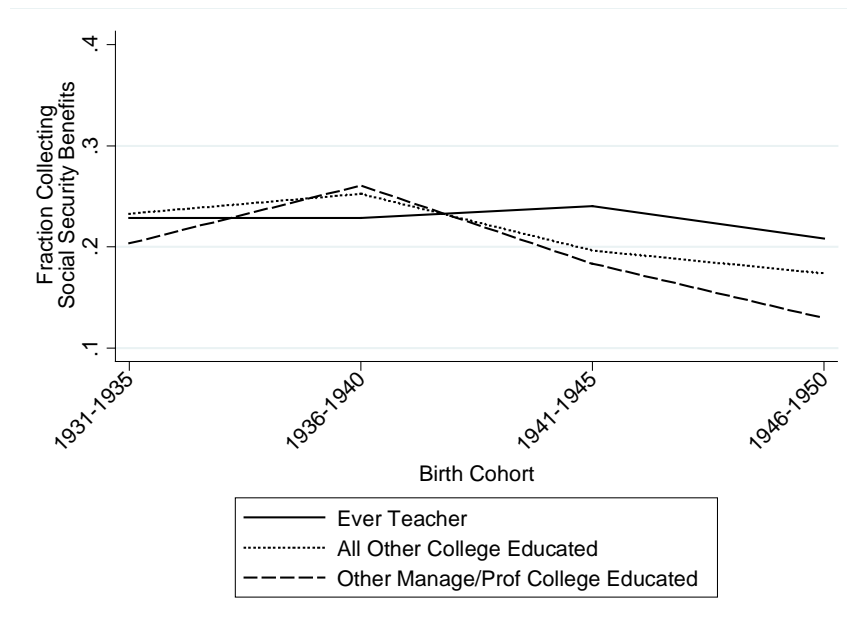

Source and Notes: Based on the author's calculation using the Health and Retirement Study. Respondents were asked the type of work done at each job about which they were surveyed (current, last and previous). A woman is classified as a teacher if the occupation recorded was teaching for any of these jobs. Women were classified into the managerial and professional specialty occupations using similar methodology. The sample includes all college-educated women between the ages of 60 and 64.

Figure 7. Fraction of College-educated Women Collecting Employer Pensions and Social Security Benefits, by Occupation, Age and Birth Cohort
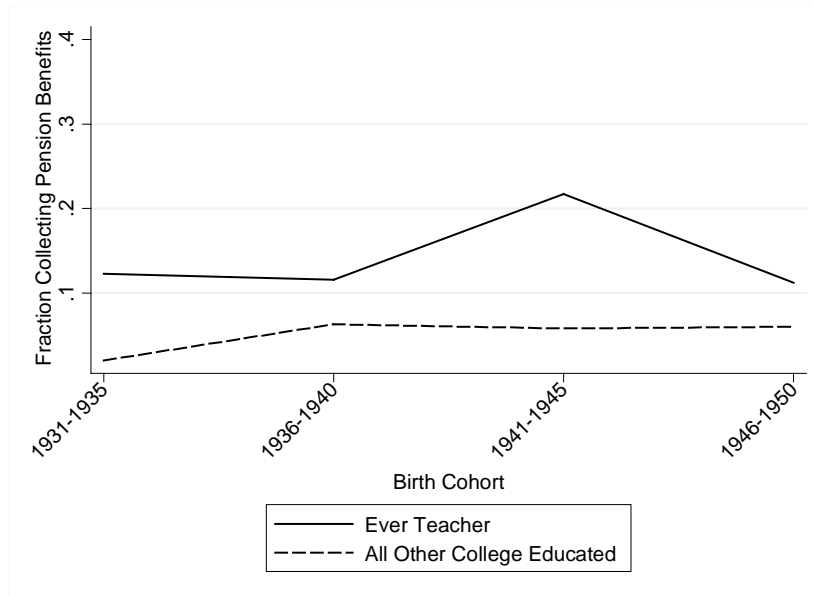
Panel A. Pension Benefit Collection, Ages 60 to 64

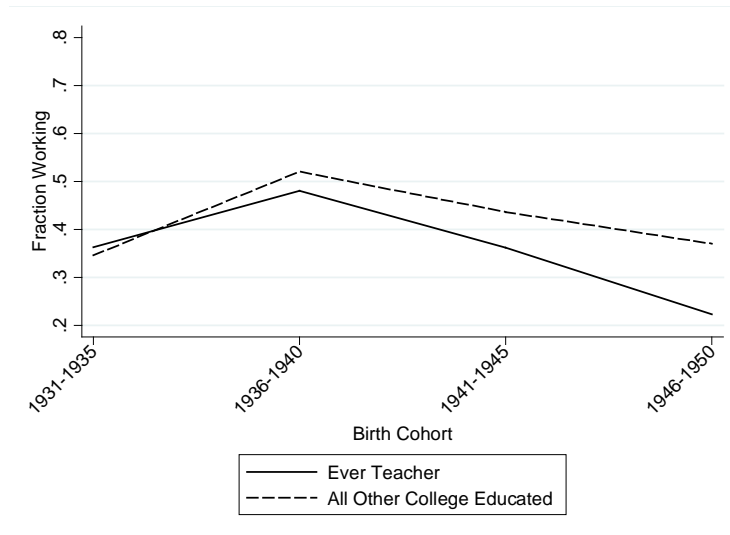Panel B. Social Security Benefit Collection, Ages 60 to 64
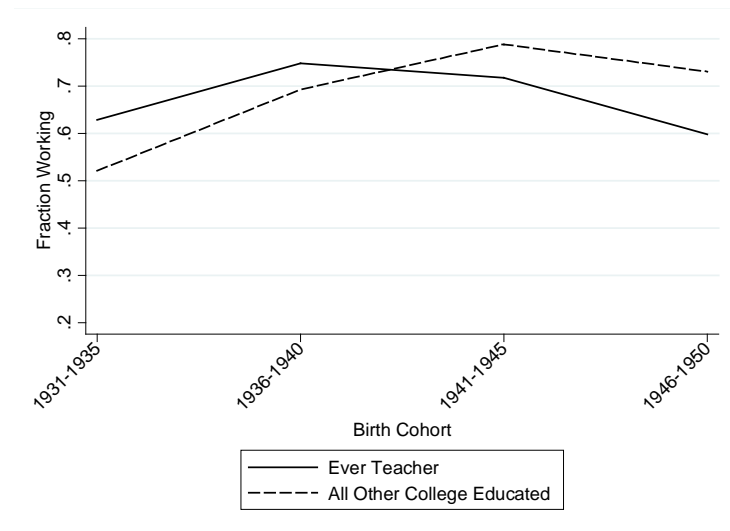
Panel C. Pension Benefit Collection, Ages 55 to 59

Source and Notes: Based on the author's calculation using the Health and Retirement Study. Respondents were asked the type of work done at each job about which they were surveyed (current, last and previous). A woman is classified as a teacher if the occupation recorded was teaching for any of these jobs. Women were classified into the managerial and professional specialty occupations using similar methodology. The samples include all college-educated women between the ages of 55 and 64, as indicated in each panel. Pension and Social Security benefit collection is determined by whether a respondent reports any income from an employer-provided pension or Social Security, respectively.

Figure 8. Fraction of College-educated Women Working between Ages 60 and 64, by Occupation, Birth Cohort, and Whether Collecting Pension Benefits
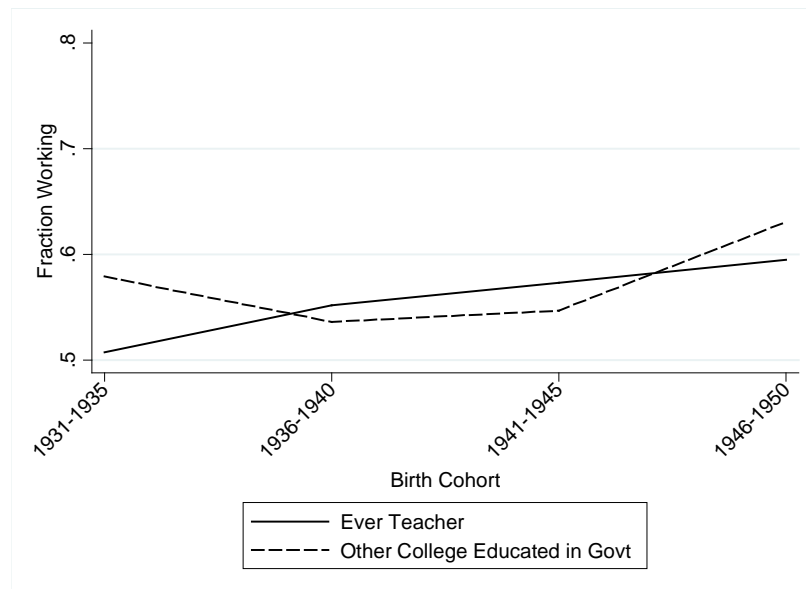Panel A. Employment of Those Collecting Retirement Benefits, Ages 60 to 64

Panel B. Employment of Those Not Collecting Retirement Benefits, Ages 60 to 64

Source and Notes: Based on the author's calculation using the Health and Retirement Study. Respondents were asked the type of work done at each job about which they were surveyed (current, last and previous). A woman is classified as a teacher if the occupation recorded was teaching for any of these jobs. Women were classified into the managerial and professional specialty occupations using similar methodology. The sample includes all college-educated women between the ages of 60 and 64. Pension and Social Security benefit collection is determined by whether a respondent reports any income from an employer-provided pension or Social Security, respectively.

Figure 9. Fraction of College-educated Women Ages 60 to 64 Employed, by Occupation and Birth Cohort

Source and Notes: Based on the author's calculation using the Health and Retirement Study. Respondents were asked the type of work done at each job about which they were surveyed (current, last and previous). A woman is classified as a teacher if the occupation recorded was teaching for any of these jobs. Women were classified into other government related occupations using similar methodology. The sample includes all college-educated women between the ages of 60 and 64 who spent some time employed in government.

Appendix. Two period model of female labor supply

  Consider a two-period model of female labor supply for a given cohort. The fraction of women with a college degree in the cohort is α; the fraction of these college-educated women who are teachers is t. Therefore, fraction αt of the cohort are teachers and $\alpha(1-t)$ are college-educated, but not teachers. The share of the cohort that is not college-educated is $(1-\alpha)$.

  In period one, all women work. In the second period, some women work and others retire. The fraction of teachers who work in the second period is λ. The fraction of college-educated women who are not teachers and who work in the second period is β. The fraction of the less-educated women who work in the second period is γ. Therefore, the fraction of women working in the second period is

$$E_2 = \lambda\alpha t + \beta\alpha(1-t) + \gamma(1-\alpha).$$

  The change in the fraction working in second period that results from a change in the fraction who are college-educated is:

$$\frac{dE_2}{d\alpha} = t(\lambda - \beta) + \beta - \gamma.$$

The change in the fraction working in second period that results from a change in the fraction who are teachers is:

$$\frac{dE_2}{dt} = \alpha(\lambda - \beta).$$

Using data from the HRS on the proportion of each group working at older ages (λ, β, γ), the proportion college-educated (α), and the proportion of college educated who are teachers (t), I can estimate the relative importance of changes in α and t. Using information on these parameters from the earliest cohorts, the effect of a change in the fraction of college-educated women who are teachers on employment in the second period is 1 percent as large (in absolute value) as the effect of a change in the fraction of women who are college-educated. Using information on the parameters from the more recent cohorts, the former is one-tenth as large as the latter.

Appendix Table 1. Parameters of Model from Early and Late Cohorts

	1931-1935	1946-1950
α	0.1	0.3
t	0.45	0.3
λ	0.53	0.59
β	0.55	0.65
γ	0.33	0.47
$\dfrac{dE_2}{d\alpha}$	0.229	0.198
$\dfrac{dE_2}{dt}$	-0.002	-0.018
$\dfrac{dE_2}{d\alpha}$, holding t fixed at 0.45		0.018