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Employment Trends by Age in the United States: Why Are Older Workers Different?

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Abstract

Employment trends in the US were similar across age groups in the 1960s, 1970s, and 1980s: male employment rates declined or were flat at all ages and female employment rates increased or were flat at all ages. But employment trends diverged more recently, with employment rising at older ages and falling at younger ages, for both men and women. This paper seeks to explain this divergence. We estimate labor supply models for men and women, allowing differences in behavior across age groups. The results indicate that changes in the educational composition of the population and Social Security reforms can account for a modest proportion of the divergence. An additional factor for men was the increase in age at first marriage. However, much of the divergence remains unexplained.

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1. Introduction

Perrachi and Welch (1994) summarize empirical findings from their analysis of US labor force behavior from the 1960s through the 1980s as indicating that "…the forces shaping employment for younger men do not appear to be fundamentally different from the forces determining the participation behavior of the oldest." (p. 238). On the basis of this interpretation of the evidence they argue that

> "…the search for explanations of trends in the labor force behavior of older people should primarily emphasize the larger question surrounding participation in general, and only secondarily should the peculiarities of advancing age be addressed. ...we believe that the retirement literature is too specialized. Obviously, old age has its distinguishing aspects, but it seems that the major trends in the data cannot be attributed to them." (p. 212).

These recommendations may seem strange to researchers who study labor force behavior at older ages. Workers rarely withdraw permanently from the labor force in their prime working years, but the great majority of workers do exactly this at older ages. Older workers often leave the labor force around the time at which they become eligible for Old Age and Survivors Insurance (OASI) benefits from Social Security, or benefits from an employer-provided pension, or health insurance coverage from Medicare. Obviously, these institutions were created precisely to deal with the "distinguishing aspects" of old age, and there is abundant evidence that labor force behavior is influenced by these programs.

Nevertheless, the trends in employment documented by Perrachi and Welch (PW) did in fact show many similarities across age groups. Figure 1 presents our replication of a graph in their paper (Figure 7) illustrating trends in full-time equivalent weeks worked per year (divided by 52), using data from the 1966-1990 March supplements to the Current Population Survey. The trends are easily summarized: male employment generally declined until the 1980s, with larger drops at older ages. Female employment generally increased, with larger increases at younger ages. Female employment at older ages began to increase in the 1980s. The levels and rates of change differ by age group, but the trends are mainly in the same direction: down (or flat) for men, up (or flat) for women. These data do not prove that common forces have shaped employment trends across the life cycle, but they demonstrate that there were common trends in employment by age that in principle *could* be explained by broad economic, demographic, and social forces without resorting to age-specific explanations.

Furthermore, differences in the institutional environments facing older and younger workers are not as large as one might think. The most important long term social insurance program available to prime age workers is Social Security Disability Insurance (SSDI). SSDI is an increasingly important source of support for individuals who are deemed unable to work and are not yet eligible for retirement benefits. PW and others have pointed out that the characteristics of older workers who tend to retire relatively early are similar to those of workers who withdraw from the labor force during the prime working years: poor health, low education, black, and for men, unmarried. Not coincidentally, these characteristics are associated with low wage rates. The opportunity cost of withdrawing from the labor force is relatively small for low-wage workers, regardless of age (Juhn, 1992). Older and disabled low-wage workers face an especially low opportunity cost of labor force exit, because the progressivity of the Social Security benefit schedule results in a relatively high replacement rate of earnings for low wage workers.

The last year of data used by PW was 1990. Since 1990 there have been major changes in labor force behavior at both older and younger ages. These changes are illustrated in Figure 2, which updates Figure 1 through 2010. PW noted that the long downward trend in employment at older ages had ended by 1990, but since 1990 the employment rate of older men has *increased* substantially. Aggregating the three older groups shown in the figure (62-64, 65-67, 68-69), the male employment rate rose from around 30% in 1990 to 37-38% in 2007-2010. Aggregating over ages 25-39 and 40-54, the employment rate of younger men declined from around 84% in 1990 to 83% in 2003-2007 and 76% in 2009-2010[1]. The changes for women were also quite striking. The long trend of rising female employment at younger ages ended around 2000, and the female employment rate at ages 25-54 has been declining since 2000. At older ages, female employment has been increasing at a rate very similar to that of older men. If common forces were driving employment across the age distribution pre-1990, those forces have either ended or been swamped by age-specific factors in the last two decades.

Changes in the institutional environment facing older workers have been proposed as explanations for the rise in employment at older ages. Social Security reforms that affected cohorts reaching their 60s during the 1990s and 2000s raised the

[1] The low employment rate in 2009 and 2010 is obviously a result in large part of the Great Recession, but it is likely that some portion of the decline will persist.

Full Retirement Age (FRA) from 65 to 66, eliminated the Social Security Earnings Test for workers at or above the FRA, and increased the actuarial adjustment in benefits for delayed claiming past the FRA (the Delayed Retirement Credit, or DRC). These reforms all encourage employment at older ages (Blau and Goodstein, 2010). Defined Benefit pension plans have become increasingly scarce in the private sector, largely replaced by Defined Contribution plans such as the 401k (Poterba, Venti, and Wise, 2007). Defined Benefit plans typically encourage early retirement, while Defined Contribution plans have no specific retirement incentives. In addition, the increase in employment of older married women has resulted in a large increase in the proportion of older married couples in which both spouses have had significant attachment to the labor force. This makes joint labor force decisions of greater importance and may encourage employment of older men (Schirle, 2008).

Potential explanations for employment declines at younger ages are less obvious. Moffitt (2012) shows that part of the drop for men aged 16-64 in recent years can be explained by falling wages and part by demographic changes. The end of the upward trend for women and the beginning of the recent decline have been more difficult to explain (Goldin, 2006; Macunovich, 2010). Blau and Kahn (2007) and Heim (2007) have shown that the elasticity of women's labor supply with respect to the wage rate declined substantially in the 1980s and 1990s, and Moffitt (2012) reports a negligible elasticity for women in the 2000s. But this does not explain a reversal of the age-specific employment trends for women.

Understanding trends in employment by age is important because these trends determine the future size and age composition of the US labor force, and have important implications for the Social Security system. The US experienced an unprecedented decline in the employment-population ratio beginning in 2000 (Moffitt, 2012), even before the deep recession of the last few years. This was largely due to the decline in employment of younger workers, noted above, as well as less educated workers. This decline has been widely discussed, but analysis has been fairly limited (Aaronson et al., 2006; Moffitt, 2012). This literature has focused mainly on labor supply in the prime working years, but the rising employment trend at older ages will help offset the decline among younger workers. There will be a large increase in the share of the elderly population in the next two decades, increasing the importance of understanding labor supply at both younger and older ages.

In this paper, we evaluate potential explanations for the divergence in employment trends by age group in recent years. Like Moffitt (2012) and others, we use a labor supply framework to motivate the empirical specification, but unlike other papers we focus on differences in labor supply behavior across age groups.[2] We analyze the effects on labor supply by age group of two broad sets of driving forces: economic factors, including the wage rate, Social Security policy, pension coverage, and the income tax rate; and demographic factors, including education, marital status, race and ethnicity, number of children, and health.[3] The effects of these variables are

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[2] Aaronson et al. (2006) estimate employment models by age group using aggregate data. They have an extensive discussion of trends in employment by age group, but their analysis focuses on how age-specific trends affect the aggregate employment rate, rather than on explaining age-specific trends.

[3] We also analyze the effects of the minimum wage, life expectancy, the SSDI award rate, and

allowed to differ by age group, and we use the results to analyze the contribution of age-specific trends in the explanatory variables to explaining differences in employment trends across age groups. We use data from 1965 through 2010 to estimate the labor supply models. The models are specified and estimated in levels, and the results are used to explain trends, i.e. growth and decline, as well as levels.

We have three main findings. First, changes in demographic composition can explain most of the decline in employment of men aged 25-61. The two main drivers are changes in marital status and race/ethnicity. We estimate that never-married and divorced, separated, and widowed men are 20-27 percentage points less likely to work than their married counterparts, other things equal. The share of men in this age group who were never married increased by 10 percentage points from 1965-1988 to 1989-2010, and the share widowed, divorced, or separated rose by four percentage points. The increase in the share never-married is a result mainly of a delay in first marriage; there was no increase in the share never-married at older ages. So this difference in an important age-specific demographic trend clearly contributed to the divergence in employment trends across younger and older men. Black, other race, and Hispanic men have lower employment rates than white men, and the share of each group in the population increased substantially, contributing to the decline in prime age male employment. Changes in marital status and racial and ethnic composition each can explain about half of the decline in the employment growth rate of men aged 25-61 from 1965-1988 to 1989-2010.

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net imports. However, these variables vary only in the aggregate, so we do not have much confidence in our ability to identify their effects.

Second, Social Security reforms can explain a modest portion, 9%, of the increase in employment of men and women at older ages, and a moderate share, 16%, of the decline in employment of younger men. For given lifetime earnings, Social Security benefits have declined for recent cohorts as a result of the increase in the FRA, and the incentive structure has tilted to favor later claiming. These changes resulted in increased employment at older ages for both men and women according to our estimates, confirming results of other recent studies (Blau and Goodstein, 2010, Mastrobuoni, 2009). A novel contribution of our paper is to show that Social Security reforms also contributed to the decline in employment of younger men. Thus these reforms help explain divergence in employment trends across age groups.

Third, changes in the educational composition of the labor force account for a moderate share of the increase in employment at older ages: 11% for older men and 23% for older women. Cohorts that experienced large increases in high school graduation and college attendance reached their 50s and 60s in recent years, while more recent cohorts have had a much slower rate of increase in educational attainment.

We argue that the effect of Social Security reforms on the divergence in labor supply by age will persist and perhaps increase in magnitude as cohorts with an FRA of 67 reach their sixties in the 2020s. In contrast, the effects of rising educational attainment will be transitory, as future cohorts of older workers will be as well-educated as their younger counterparts. We think it is unlikely that the proportions never-married and divorced, widowed, or separated at older ages will ever approach the proportions observed at younger ages. In this case the effects of the increase in age at first marriage on the divergence in employment trends by age likely will be persistent.

The next section briefly reviews related literature and highlights our contributions. Section 3 describes the employment data, and section 4 discusses model specification and measurement of the explanatory variables. Section 5 presents and discusses the results, and section 6 concludes. We discuss implications for Social Security policy reforms in the conclusion.

2. Related Literature

Our analysis is related to three main areas of the labor supply literature: the effects on labor supply of the wage rate, OASI, and SSDI. We discuss these in turn, followed by a brief discussion of other employment determinants that do not fit neatly into the labor supply framework.

A. Wages. The labor market returns to skill have increased substantially over the last four decades (Acemoglu and Autor, 2011). Low-skill workers have faced declining relative wages and in many cases declining *absolute* real wages as well. Changes in the wage structure affect workers of all ages, but the effects may differ by age, as suggested by the life cycle model. We analyze the effect of the wage rate on labor supply at different ages, but we find that wage effects on labor supply are small and differences in wage trends across age groups cannot account for divergence in employment trends. These findings are similar to those of Moffitt (2012) for women, but Moffitt finds somewhat larger explanatory power of wages for men, most likely because he includes men ages 16-24 in the population analyzed.

B. OASI. Social Security retirement benefits became increasingly generous from the beginning of the program in the 1930s through the mid-1970s. However, the evidence suggests that increased generosity of OASI was not the main cause of the decline in employment of older men during this period (Blau and Goodstein, 2010; Krueger and Pischke, 1992). Social Security reforms in 1977 and 1983 increased the incentive to work at older ages, as discussed above. Blau and Goodstein (2010) estimate that changes in Social Security can explain between one quarter and one half of the increase in employment of older men since the 1980s. We analyze how OASI benefits affect employment behavior at younger ages as well older ages.

C. SSDI. SSDI benefits do not depend on the age of claiming, conditional on earnings, so a decline in OASI benefits increases the relative attractiveness of SSDI (Duggan et al., 2007). Von Wachter et al. (2011) found that 30% of new awards and over half of rejected applications in 2007 were from individuals aged 30-44. There is no evidence of a decline in health of younger men, suggesting that a growing share of applications is "induced" by the program. A large literature analyzes the effect of SSDI on labor supply. Almost all studies find a negative effect, but most conclude that the effect is relatively small.[4] However, Autor and Duggan (2003) and Black, Daniels, and Smith (2002) show that labor supply of low-skill workers is more sensitive to the value of SSDI benefits, likely because the benefit schedule is progressive, replacing a higher

[4]Recent studies include Bound et al. (2010), Chen and van der Klaauw (2005), French and Song (2012), Kim (2013), Maestas, Mullen, and Strand (in press), and Low and Pistaferri (2012).

proportion of earnings at low levels of earnings. We analyze the impact of SSDI benefits and award rates at both younger and older ages.

D. Other determinants of employment. Employment is affected by demand-side factors that are not fully captured by the wage rate, and labor-demand effects on employment may differ by age. For example, older workers are less likely to experience loss of a job due to layoff or business closing, but the consequences of job loss are more severe for older workers. They are much less likely to be re-employed within 1-3 years, and experience much larger wage losses upon re-employment (Johnson and Mommaerts, 2010; Farber, 2005). Age discrimination in employment is another example of a demand-side factor that has differential effects by age. Employment protection aimed at older workers may reduce age discrimination in firing, but also alters hiring incentives (Lahey, 2008; Neumark and Song, 2012). We do not analyze the effects of labor demand, but it is important to consider the possibility of such effects in interpreting our results.

3. Employment Data

The main source of data for the analysis is the March supplement to the CPS. We use data from the 1966 through 2011 surveys on individuals aged 25 to 69.[5] To

[5] Alexander, Davern, and Stevenson (2010) report that the Census Bureau inadvertently introduced errors in age and sex in the CPS public use files in several years in the 2000s as part of their procedures to avoid disclosure. These errors apply to the population aged 65 and above, and the authors report that there may have been a significant effect on studies of the older population. Fisher (undated) uses Social Security administrative records matched to the CPS for 2001-2006 to explore the extent of age misclassification. She finds that the probability of misclassification of age by more than one year increases linearly with age beginning at 65, reaching about 15% for men at ages 68-69 and 10% for women. She also reports that there are errors in years that were not subject to inadvertent Census Bureau errors, so the net effect of the misclassification introduced by the change in disclosure practices was 12

facilitate computation and merging with data from other sources, we aggregate the individual data into cells defined by gender, age, calendar year, and education group. Calendar year refers to the year prior to the March survey, and age is measured as age at the March survey minus one.[6] The four education groups are high school dropout, high school graduate, college attendee, and four year college graduate.[7]

The dependent variable is the number of full-time-equivalent weeks worked in the calendar year, divided by 52, with weeks worked part-time (35 or fewer hours) treated as half of full-time weeks. This measure, which we refer to as Full Time Weeks worked (FTW), combines the intensive and extensive margins of labor supply behavior. [8]

A useful way to characterize changes in trends across age groups is in the form of growth rates. We compute the average annual growth rate in FTW for two sub-periods, 1965-1988 and 1988-2010, for three aggregated age groups: 25-54, 55-61, and 62-69. Figure 3 shows the results. For men, there is little difference in growth across the periods for the two younger groups, but at older ages the contrast is stark: a 2.2% average annual rate of decline in FTW in the earlier period and an increase of 1.2% in the more recent period. The contrast is sharp for women as well, in this case for all

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and 7 percent for men and women, respectively.

[6]Birth year is an important variable in our analysis because it determines the applicable Social Security rules. We assume that individuals were born after the survey date, which implies that birth year equals calendar year minus age minus one. This introduces some measurement error. Blau and Goodstein (2010) indicate that their results are not very sensitive to alternative assumptions. See Mastrobuoni (2009) for an alternative approach to inferring birth year in the CPS.

[7] There is a great deal of variation over time and across age groups in education differentials in wages and other explanatory variables, so it is useful to incorporate education in the definition of the cells in order to exploit this variation in the analysis.

[8] The trends in alternative employment measures such as labor force participation in the survey week are very similar to those reported here for FTW. Parameter estimates and simulation results are also very similar.

three age groups. In the earlier period growth was most rapid for the youngest group at 2.4% per year and declined with age, while in the more recent period the age pattern was reversed, with essentially no growth for the youngest group, 1.5% for the middle group, and 2.4% at ages 62-69.

In the analysis that follows we further aggregate the age groups in order to simplify the analysis. Based on Figure 3, we pool ages 25-54 and 55-61 for men, while for women we combine ages 55-61 and 62-69. We estimate models of FTW in levels, and then use the results to derive implications for the growth rate.

4. Model Specification and Measurement of Explanatory Variables

We specify an empirical model of employment behavior based on the life cycle labor supply framework. As noted above, we aggregate the individual data to cell means, with cells defined by single year of age, education group, and single calendar year. The analysis is carried out separately for men and women, so we omit gender from the definition of the cells. The model is linear in order to facilitate aggregation. Using the cell as the unit of observation, the dependent variable is E_{jat}, the weighted mean value of FTW for the population in education group j observed at age a in year t.[9] Define $c = t - a$ as birth year, and let g denote an age group. The model is

$$E_{jat} = \beta^{g}X_{jat} + \gamma^{g}Z_{jc} + \alpha^{g}Y_{t} + \delta_{a} + f^{g}(c) + h^{g}(t) + \varepsilon_{jat},$$

where X_{jat} is a vector of education-age-and-time-varying variables (e.g. the wage rate), Z_{jc} is a vector of variables that varies across birth cohorts and education groups but not

[9] We use the March supplement weight to construct cell means. In the regression analysis we weight each cell by the number of individual-level observations used to construct the cell mean.

by age within a cohort (e.g. the OASI benefit for a given earnings history, claimed at a given age), Y is a set of aggregate variables, δ_a is an age fixed effect, $f^g(c)$ is a function of birth cohort, $h^g(t)$ is a function of calendar year, and ε_{jat} is a disturbance. All coefficients are allowed to differ by age group but not by period.

The coefficients of most interest are β^g and γ^g. The specification of cohort, age, and time effects is crucial for identification and interpretation. OASI rules differ only by cohort, so we cannot be completely flexible in specifying cohort effects without losing identification of γ^g.[10] We specify the birth cohort function f as a third order polynomial. Alternative specifications, including 2 year and 4-year fixed effects, yielded very similar results. The age fixed effects absorb any persistent differences in employment behavior by age in a flexible way.

The most flexible specification of time effects is age-group-specific individual year fixed effects. In this case identification of β^g is mainly from variation in time trends in the explanatory variables by education group within age group. For example, wage trends differ considerably by education within age groups. This flexible specification of time effects does not exploit variation in age-group-specific trends that are common across education groups, such as SSDI benefits (controlling for lifetime earnings) and some demographic trends. A more restrictive specification limits year fixed effects to be common across age groups: $h^g(t) = h(t)$. However, even this specification does not permit identification of the effects of aggregate variables such as

[10] Benefits vary within birth cohorts as a result of differences across education groups in lifetime earnings. But this source of variation does not identify the effects of changes in the OASI rules, which do not vary across education groups. We include lifetime earnings in the model as a control variable, so the effect of OASI benefits is identified solely by changes in the benefit formula.

the minimum wage and life expectancy.[11] The most restrictive specification excludes time effects altogether. We estimate all three specifications and compare results.

We discuss measurement of the following variables suggested by the life cycle framework as determinants of employment behavior: the hourly wage rate, the average income tax rate, OASI benefits, SSDI benefits, the SSDI award rate, pension coverage, and demographic variables. We discuss these in turn, followed by a brief discussion of other variables and limitations of the specification.[12]

A. Wage Rate and Tax rate.

The hourly wage rate net of taxes is a key variable in any labor supply model.[13] We use the CPS data to compute average hourly earnings of full time year round workers (at least 45 weeks and 35 hours per week). The sample is limited to ages 25 to 59 in order to reduce the potential for selection bias from participation decisions at older ages.[14] In order to eliminate composition effects on wage rates, the log wage is regressed on education group dummies, a quadratic in age, and dummies for race, ethnicity, marital status, and census division, separately by gender and year. The estimates are used to compute the fitted value of the log wage, holding the explanatory variables other than age and education constant (white, non-Hispanic, married, geographic division 1). Further details are provided in the Appendix. This approach

[11] Life expectancy differs by age, but the trends are virtually identical across age groups. Life expectancy by age and education is not available.

[12] The specification ignores joint labor supply issues. In one of the extensions discussed below, we include spouse characteristics and spouse earnings or employment as explanatory variables.

[13] The results were very similar using the weekly wage rate in place of the hourly wage rate.

[14] However, selection bias could be important at prime ages, especially for women. We attempted to generate a correction for selection into the wage sample following the linear probability model approach of Moffitt (2012), but we were unable to find exclusion restrictions that could produce stable and plausible selectivity-corrected wage equation estimates.

preserves variation in the wage rate by education and age, the two main dimensions of interest.[15]

We compute the income tax rate facing each individual based on marital status, number of children, and the predicted wage rate. The combined federal income, state income (beginning in 1977), and payroll average tax rate (ATR) is computed using the NBER TAXSIM program under the following assumptions: (a) income from sources other than earnings, interest, dividends, and rent is ignored, (b) hours of work are assumed to be 2000 per year, and (c) married couples file jointly and single individuals file as singles or head of household depending on whether they have dependent children. Tax rates for married individuals are computed under two alternative assumptions: the spouse works 2000 hours and the spouse does not work. The results were very similar for the two alternative measures, so we report results only for the former case. There is a noticeable drop in the average tax rate on earnings at younger ages beginning in the mid-1980s (not shown here), around the time of the Tax Reform Act of 1986. We include the wage rate and tax rate as separate explanatory variables because preliminary results showed a better fit than in a specification in which they are restricted to have the same effect.

B. Social Security Retirement Benefits.

[15] Trends in wages by age group (not shown here) indicate that the wage gap between younger and older men has widened considerably over time, reflecting an increase in the returns to labor market experience. The gap reached a maximum in the mid-1990s and has remained stable since then. The trends for women are much less striking, but this may be due to the fact that age is a much less accurate proxy for experience than for men. Wage trends by education are well-documented elsewhere (e.g. Acemoglu and Autor, 2011), so we do not discuss them here.

Social Security benefits are computed using birth-cohort-and-education-specific mean age-earnings profiles derived from the CPS, supplemented by published Social Security Administration (SSA) data for years before CPS data are available. The Appendix describes the computation of these profiles. Benefits are computed using the ANYPIA program provided by the SSA, for several alternative scenarios: work continuously (from an assumed age of labor force entry that depends on education) through age 61 and claim at 62; work through 64 and claim at 65, and work through 69 and claim at 70. In each case it is assumed that exit from employment is permanent. We compute the present discounted value (PDV) of benefits as of age 55, using life table mortality and a real interest rate of 3.0%. The PDV of benefits at ages 62 and 70 are specified as differences from the PDV of the age-65 benefit. In this specification, the age-65 benefit captures the wealth effect of benefit generosity for a given payroll tax, while the differences between the age-62 and age-65 and age-65 and age-70 PDV of benefits capture incentives to claim and retire early and late, respectively (Blau and Goodstein, 2010).[16] The earliest age of eligibility for OASI benefits is 62, but behavior at younger ages may be influenced by expectations of future benefits, so we allow the benefit to affect employment decisions at younger ages.

C. Social Security Disability Insurance.

The SSDI benefit is equal to the Primary Insurance Amount (PIA), which is a function of the earnings history as of the time of the award. The PDV of the benefit varies by the age at claiming because both life expectancy and average lifetime

[16] This approach to measuring benefits is arbitrary, but Blau and Goodstein (2010) show that benefit measures computed under a variety of alternative assumptions are highly correlated with the benefit measures used here.

earnings depend on age. The OASI reforms discussed above do not affect the SSDI benefit, so there is much less variation in the SSDI benefit across birth cohorts, conditional on lifetime earnings.

The incentive to apply for SSDI benefits is likely to be influenced by the probability of a successful application, known as the award rate (Low and Pistaferri, 2012). We have aggregate time series data on the award rate for the entire period, and age-group-specific data beginning in 1992[17]. Figure 4 shows that the award rate increases with age, but the time trends in the award rate are very similar across age groups. Thus, in practice we have only time series variation. The award rate may be endogenous to labor supply if the composition of the applicant population with respect to severity of disability is influenced by the award rate. We cannot account for this directly, but we include the fraction of the insured population that applied for SSDI in a given year to control for the composition of the applicant population.

D. Pension coverage

Employer-sponsored pension plans are quite heterogeneous, and it is difficult to compute benefits without knowing the details of each plan. We use the CPS to compute a measure of pension coverage that varies by birth cohort and education but not by age, as described in the Appendix. This is a crude proxy for the influence of pensions. Unfortunately, data on pension type are not available in the CPS.

E. Other variables

[17] We are grateful to the Social Security Administration for providing these unpublished tabulations.

The specification includes race (black, other), marital status (widowed, divorced, or separated, and never married), Hispanic ethnicity, and number of children under 6 and under 18, all derived from the CPS. We also include measures of self-reported health and work days lost as a result of illness, derived from the National Health Interview Survey. These data are aggregated to the sex-age-education-year cell level and merged with the CPS data. The Appendix provides further details.

5. Results

A. Coefficient estimates

Table 1 shows coefficient estimates from models of FTW estimated for age groups 25-61 and 62-69 for men, and 25-54 and 55-61 for women. In addition to the variables shown in the table, the specifications include age and year fixed effects, a cubic polynomial in birth year, and geographic division dummies. The upper panel shows results for the economic variables. The log wage coefficient estimate is 0.11 for younger men and .04 for older men. The implied elasticities at the sample mean values of FTW (see the bottom of the table) are 0.13 for younger men and 0.01 for older men. The coefficient estimates for women are 0.01 and -0.14. The negative effect for women is anomalous.[18] The wage rate was predicted assuming full-time year-round employment, which could produce misleading results for women. The average tax rate has negative effects for younger men and women, but the estimates are positive for older individuals. The implied elasticities at the means are -0.28 and -0.08 for younger

[18] A negative wage effect could result from a relatively large income effect. This is unlikely, but there are few studies of the labor supply behavior of older women.

men and women, and 0.49 and 0.09 for older men and women (see Appendix Table B for the sample means of the explanatory variables). The estimated effect of the present discounted value of lifetime earnings is negative for men, with elasticities of -0.08 and -0.12, and positive for women, with elasticities of 0.06 and 0.46. Recall that this variable is included as a control, and we do not attach any particular interpretation to it.

The estimated effects of the present discounted value of Social Security benefits at age 65 are positive at younger ages and negative for the older groups. The elasticities at the sample means are small for younger men and women (0.09 and 0.04), and somewhat larger for older men and women (-0.15 and -0.29). At older ages we would expect a negative wealth effect, while at younger ages the sign of the effect is theoretically ambiguous. There is a wealth effect, but in the presence of a borrowing constraint more generous benefits could induce greater work effort at younger ages in anticipation of less work effort at older ages. We expect the gain from claiming at 62 relative to 65 to have a negative effect on labor supply, and the results show this except for younger men. We expect the gain from claiming at 70 relative to 65 to have a positive effect on labor supply, and the results show this as well, again except for younger men. In both cases the effects are quite small, with elasticities of 0.04 or less in absolute value.

The effect of the present discounted value of SSDI benefits is positive except for prime age men. This is a surprising result, as higher SSDI benefits should make work relatively less attractive. The effects are very small for men, with elasticities of -0.004 and -0.009, and a bit larger for women: 0.06 and 0.13. As noted above, the earnings assumptions behind the calculation of SSDI benefits are likely to be more inaccurate for women than for men. This specification does not include the SSDI award rate because the year fixed effects absorb the effects of all aggregate time series. Below we report results from alternative specifications that include the award rate.[19]

The results for demographic and health variables shown in the lower panel of Table 1 are similar to those in many other studies: unmarried men work less and unmarried women work more than their married counterparts; blacks, members of other racial groups, and Hispanics generally work less than whites, with the notable exception of younger black women; men and women with children present in the household work less; individuals who report fair or poor health and more days lost due to illness generally work less; and less educated individuals work less, especially at older ages.

B. Counterfactual Simulations

Table 2 shows the results of counterfactual simulations of the change in the average annual growth rate of FTW from 1965-1988 to 1989-2010. We use the regression results to simulate the level of FTW under alternative assumptions, and then compute the implied growth rates. The growth rates are reported in Table 2 since they are more informative about changes in trends (results for levels, reported in Appendix Table A, are briefly discussed below). The first three rows of Table 2 show the observed average annual growth rate of FTW in each period, and the change in the

[19] Pension coverage has a positive effect on labor supply for all four groups, with small elasticities for men (0.04 and 0.03), and modest elasticities for women (0.21 and 0.17). These pension effects are difficult to interpret in economic terms because of the absence of measures of benefits or even pension type.

growth rate from the earlier to the later period. For example, column 2 shows that in the earlier period FTW declined by 2.23% per year on average, while in the later period it rose by 1.21%. The change in the annual growth rate from the earlier to the later period was 3.44%. The fourth row shows that the model predicts the difference in growth rates perfectly (thanks to the year fixed effects), using the observed values of the explanatory variables.

The subsequent rows show the predicted change in the growth rate holding constant the value of each variable or group of variables at their 1965-1988 means, one at a time. The percent of the observed change that can be accounted for by changes in the explanatory variables is shown in parentheses for cases in which the explanatory power is non-negligible (at least 5%) *and* is in the right direction. For example, the row labeled "education" indicates that if the educational composition of the older male population had remained at its average 1965-1988 value during 1989-2010, the change in the employment growth rate would have been only .0305 instead of the observed increase of .0344. So the change in education can account for 11% ([.0344 - .0305)]/.0344) of the decline in the employment growth rate of older men and 23% for older women.[20] [21]

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[20] The entries in Table 2 are rounded, so the percent change in the table, which is based on unrounded figures, is slightly different in some cases from the percent change calculated from the rounded entries.

[21] The large changes in educational attainment over this period were probably accompanied by changes in the average unobserved skill of the education groups. For example, as high school completion approaches 90%, the remaining dropouts may be more negatively selected than when high school graduation was only 75%. This suggests allowing the effect of education to differ across periods. We re-estimated the models allowing education effects to differ across the two periods. The explanatory power of education increased form 23% to 53% for older women, and was unchanged for the other groups. This suggests some caution in interpreting the education results.

Table 3 shows the changes in the mean values of the explanatory variables from 1965-1988 to 1989-2010. The share of men aged 62-69 who were high school dropouts decreased by 29 percentage points, and Table 1 indicates that high school dropouts work substantially less than their more educated counterparts. As a result, the increase in educational attainment can account for a modest part of the increase in employment of older men.

Table 3 indicates that the mean real wage rate increased by 9-16 log points for men across periods, and by 24-27 log points for women. However, these wage increases cannot explain changes in employment for any of the groups. The positive wage coefficients are too small for the wage changes to make much difference, and the negative coefficient for older women implies that their wage increase should have caused a decline in their labor supply rather than the observed increase. The decline in the average tax rate of .07-.09 shown in Table 3 also cannot account for the observed changes in employment growth between periods. Overall, changes in the net reward to working in a given year cannot help explain the observed changes in employment.

In contrast, changes in retirement benefits do have a modest amount of explanatory power. The OASI simulation assigns the benefit computation rules for the 1937 cohort to everyone, but uses each cohort's observed (predicted) lifetime earnings. This approach isolates the effect of rule changes, holding lifetime earnings constant. The 1937 cohort was the last to have an FRA of 65.[22] As indicated in Table 3, the PDV of lifetime OASI benefits if claimed at age 65 would have been higher by 16-18K in

[22] Alternative counterfactuals based on the rules for other cohorts yielded very similar results. The results using benefit levels in place of the present discounted value of benefits were qualitatively similar, but the explanatory of OASI rule changes was smaller.

1989-2010 for the younger cohorts if the 1937 SS rules had remained in effect for subsequent cohorts, and by 2-4K for the older groups.[23] Table 2 shows that the decline in benefits can account for 15% of the decline in employment growth of younger men and 7% of the increase for older women. The increase in the gain from later claiming caused by the increase in the DRC also contributed modestly to the increase in employment at older ages, while the small increase in the gain to early claiming contributed little. The combined effect of the OASI reforms can explain 9% of the increase in employment of older men and women, and 17% of the decline for younger men.[24]

Concerning the demographic characteristics, the row labeled "marital status" indicates that if the marital status composition of the younger male population had remained unchanged from 1965-1988 to 1989-2010, the decline in the employment growth rate would have been only -0.0012 instead of the actual decline of -0.0027. So changes in marital status can account for 54% ([-0.0027-(-0.0012)]/-0.0027) of the decline in the employment growth rate of younger men over this period. This was a consequence of substantial increases in the proportion of the younger male population that was never-married and divorced, widowed, and separated. There were increases of similar magnitudes for women, but they cannot explain changes in employment, since never-married women work more at younger ages and female employment growth

[23]These are declines of 11%, 3%, 14%, and 5% for the four groups, using the overall sample means reported in the Appendix as the base. The magnitude of the decline depends on the mix of birth years in the period 2 samples.

[24] It is not possible to perform a counterfactual simulation of the SSDI benefit because the benefit is equal to the PIA, which is determined entirely by earnings. The OASI reforms did not affect the PIA, so the only source of change in the SSDI benefit is changes in earnings. This also suggests that identification of the effects of SSDI benefits is tenuous, which may help explain the counterintuitive positive effects of SSDI benefits reported in Table 1.

declined at younger ages. The only other change in the demographic characteristics that can help account for changes in employment growth (aside from education, which was discussed above) is the change in the racial and ethnic composition of the younger male population. The black, other race, and Hispanic shares of the population increased for all groups (see Table 3), but the effects of these variables on labor supply are largest for the younger groups. These composition changes can explain about half of the slowdown in employment growth for younger men. For younger women, blacks work more than whites, so the increased share of blacks offset the effects of the increased shares of the other groups.

C. Alternative Specifications and Simulations

As discussed above, we simulate the growth rate of employment, because this is more informative about trends than are employment levels. Nevertheless, it is worth examining simulation results for levels briefly. These are reported in Appendix Table A, using the estimation results from Table 1. Qualitatively, the results are very similar. The explanatory power of several of the variables is much larger for younger men, but similar in magnitude for the other groups.

A key issue discussed in the previous section is how to control for time-trending unobservables that could be correlated with the explanatory variables. The results reported in Table 1 are from a specification that includes age-group-specific year fixed effects, which control for such unobserved factors in a very flexible way. In fact, this specification might be too flexible for our purposes, since we are interested in common trends. We estimated two other specifications to gauge the importance of this issue in practice. The first goes to the other extreme by omitting all calendar year effects, replacing them with a small number of observed aggregate variables. These include the minimum wage, SSDI award and application rates, net imports, life expectancy, and GDP growth as a measure of the state of the business cycle.[25] The simulation results based on these estimates are shown in Table 4. Qualitatively, they are quite similar to the results in Table 2. For example, marital status and race can separately explain 60 and 69% of the change in FTW growth of younger men, compared to 54 and 47% in Table 2. The tax rate and health explain 19 and 10% respectively, compared to negligible amounts in Table 2. The results for the other three groups are very similar to the results from the main specification.

The simulated effects of the aggregate variables are shown at the bottom of Table 4. The results suggest that changes in the minimum wage and the SSDI award rate can account for part of the changes in employment growth, but these results should not be taken too seriously given that they are identified by the very strong assumption of the absence of unobserved aggregate trends correlated with the included variables.

A second alternative specification incorporates a full set of year fixed effects with coefficients constrained to be equal across age groups, by sex**.** The results from this specification (not shown) are also quite similar qualitatively to the results in Table 2, and most of the effects are quantitatively similar. The exceptions are that the explanatory power of OASI for older men vanishes while it increase for older women, and the explanatory power of pensions is larger for older women.

[25] Life expectancy varies by age, but the time trends are very highly correlated across age groups, so there is effectively only an aggregate trend.

Another issue of interest is the sensitivity of the results to the sample period used in estimation. We use all available years (1965-2010), but it is possible that behavior has changed over time, and as a result the restriction that the coefficients do not vary over time could be incorrect. This seems plausible given the relative lack of explanatory power of many of the explanatory variables. We re-estimated the models for two sub-periods: 1965-1991 and 1992-2010. This choice of periods is motivated by the availability of some additional data on the SSDI award rate beginning in 1992. Many of the coefficient estimates (not shown) have qualitatively and quantitatively similar effects in the two periods, but there are some notable differences as well. The simulation results (not shown) are quite different in some cases. This is not surprising: if changes in the values of the explanatory variables cannot account for much of the employment trends, changes in the effects of the explanatory variables are likely to have played a role.

Beginning in 1992, data on SSDI applications and awards are available by age group. This provides an additional source of variation beyond the pure time series available back to 1965. As noted above, we expect a negative effect of the award rate on employment, other things equal. However, the award rate is determined in part by the composition of the applicant population, so other things may not be equal as the award rate varies. We use the application rate (the share of the insured population that applies in a given year) as a rough proxy to control for changes in the composition of the applicant population. The results (not shown here) reveal small positive effects of the award rate on employment for men, a negative effect for younger women, and no effect for older women. Unfortunately, a counterfactual simulation is not possible, since we lack data before 1992.

To check if the results are sensitive to the choice of periods for the simulations, we re-computed the simulations for an alternative pair of periods: 1980 – 1988 as period 1 and 1998 – 2006 as period 2. These periods correspond to the turning point for labor supply at older ages (period 1) and a recent period before the Great Recession (period 2). The results (not shown) are qualitatively very similar to the original analysis. For older men, OASI and education are still the only factors that can explain a significant part of the change in the annual average growth rate between periods. For young women, race/ethnicity and number of kids continue to be the only factors that can explain the change in growth rates. But for this set of periods, the percentage changes in growth rate explained by these factors are much higher. For older women also, the same factors as in the original analysis continue to have the most explanatory power. For younger men, marital status, race, and pensions have increased explanatory power.

Finally, we estimated several specifications that included spouse variables for married individuals.[26] A family or collective labor supply model implies that the spouse's wage rate should be included in the specification. The spouse's predicted wage rate had a statistically significant coefficient estimate for three of the four groups, but changes in the spouse's wage rate had no explanatory power in simulations. In

[26] The spouse's age, education, predicted wage rate, observed employment (FTW), and observed annual earnings (including spouses outside the 25-69 age range) were added to each married individual's record before collapsing the data to the cell level, with means taken over the married subsamples. The spouse variables are included in the regression interacted with the fraction married in the cell.

another specification, the spouse's age, education, employment and/or earnings were included. Counterfactual simulations indicated that changes in the spouse's education could explain 6-13% of observed employment changes for men, changes in spouse's employment status could explain 9-13% of the increase in employment for older men and women, and the spouse's earnings could explain an addition 7% for older women. The explanatory power of the other variables remained unchanged. These are interesting findings, but it is quite likely that spouse earnings and employment are endogenous, so we interpret the results as mainly of descriptive interest.

D. Discussion

The main goal of this paper is how to explain the divergence in employment trends by age group in recent years. Our results suggest three partial explanations for men. The first is demographic change, specifically the delay in first marriage and increases in the population share of non-white non-Hispanic men. Most men eventually marry, and despite the large increase in the share of younger men who have never married, there has been no increase among older men (see Table 3). Never-married men are much less likely to work at any age, so the delay in marriage can explain reduced employment growth of younger men but had no impact on older men. In addition, while the increase in the share of divorced, widowed, and separated men was about the same for both age groups (4 percentage points), there is a negative effect of this marital status on employment only for younger men.

In quantitative terms, the change in the rate of employment growth is much larger for older men. The increase across periods in the annual rate of male employment growth at older ages was .0344 and the decline at younger ages was -.0027, so the difference across age groups was in the rate of change was .0363. The results in Table 2 indicate that the change in marital status can explain a large share of the small decline in growth at younger ages, but only a very small share (3%) of the much larger *difference* in the change in growth rates by age. The same logic implies that the change in racial and ethnic composition can explain only a small share of the divergence in employment growth for older and younger men. Thus, demographic change was not a major factor in the divergence in employment growth by age.

The second explanation is the increase in educational attainment. This can account for 10% of the observed divergence in employment growth by age for men, also a rather small share of the change.[27]

The third explanation is Social Security reform. Our results add to a growing body of evidence indicating that the decline in benefits and the increased incentive to delay claiming have contributed to the increase in employment at older ages. Our study is the first to investigate the impact of these reforms at younger ages. The results show that OASI benefits have a positive impact on labor supply at younger ages, and the decline in benefits contributed to the reduction in employment at younger ages. As noted above, a positive effect of benefits at younger ages is consistent with the life cycle framework, although our reduced form approach does not reveal whether a life cycle explanation for the finding is warranted. The contribution of OASI reform to the .0363 difference in the change in the average annual growth rate is 6%. Thus, the

[27] This is calculated as (.0344-.0305) - (-.0027 –[-.0029]) = .0037, which is 10% of .0363.

combination of changes in marital status, educational attainment, and Social Security policy can explain only about one fifth of the observed age difference in the change in employment growth for men.

For women, OASI reform contributed to the divergence in growth across age groups, but only via increasing employment at older ages. The estimates indicate that OASI benefits have a positive impact on labor supply at younger ages, but the effect is too small to matter. The increase in employment growth at older ages was .0144 and the decline at younger ages was -.0236, so the difference in the change across age groups was .0380. The results in Table 2 indicate that the change in OASI reform can explain .0004 of this difference, or 1%. Education can explain .0037, or 10% of the observed change. So we can explain only about 10% of the observed change for women.

6. Conclusions

Social Security reforms, the delay in first marriage, and changes in the education distribution can account for 10-20% of the recent divergence in employment growth by age. As discussed in the introduction, the impact of Social Security reforms should persist, because all future cohorts are affected. The impact of increases in educational attainment is unlikely to persist, since the major changes of recent decades have ended, and future retiring cohorts will have an educational composition similar to today’s retirement-age cohorts.

The future effects of delayed marriage are more difficult to predict. Median age at first marriage increased by two full years from 2000 to 2010 for men, and increased by 4.5 years from its low point in the 1950s and 1960s (Elliot et al., 2012). The share of the male population that was never married by age 45 increased by three percentage points from 1990 to 2010. Even if these trends have run their course, they will have persistent effects as long as the share never married remains low at older ages.

OASI reforms have contributed modestly to the age divergence, but they are clearly not the main factor. We have been unable to convincingly analyze the impact of SSDI policy, but we speculate that it might have played a significant role in reducing labor supply at younger ages, as suggested by Autor and Duggan (2003), Duggan et al. (2007), and others. If this is correct, the main implication is that SSDI policy reforms to tighten screening criteria may be of more importance than OASI reforms. However, Low and Pistaferri (2012) have argued that tighter screening criteria would reduce social welfare. Further research on the role of SSDI should be a priority.

Another important area for future research is the impact of labor demand and institutional factors on the divergence in employment growth by age. Age discrimination and policies intended to counteract it is one example of such a factor. These factors are more difficult to measure than the determinants studied here, but the payoff to such an effort could be high.

Data Appendix

1. Dependent variables

The main outcome analyzed in this paper is full-time-equivalent weeks worked per year (FTW), defined as weeks worked in the previous calendar year if usual hours worked were at least 36, and weeks work divided by two if usual hours worked were between one and 35. The measure is divided by 52 to restrict it to the unit interval for ease of interpretation. An alternative outcome analyzed is a categorical measure of labor force status in the week prior to the survey date. An individual is defined as employed if the employment status recode indicates that he was employed or searching for work.

2. Social Security

We use CPS earnings from ages 25-59 to compute OASI benefits, assuming continuous employment at cell-specific average annual earnings (truncated at the maximum taxable amount), as in Blau and Goodstein (2010). The CPS data are augmented with published Social Security Administration data on median covered earnings by age prior to the availability of CPS data. Cells are defined by gender, age, education, and year. We use ages 25-59 because most individuals are finished with schooling by age 25 and have not yet retired by age 59. Thus we do not have to deal with issues of selection on entry to and exit from employment, at least for men. This provides the 35 years of earnings used in the computation of Average Indexed Monthly Earnings (AIME), the basis for determining the Social Security benefit. This is an arbitrary approach, but the resulting benefit is highly correlated with benefits computed using alternative assumptions about the earnings history (see Blau and Goodstein, 2010). We do the same for women, despite the fact that many women do not work continuously. For women the assumption of no selection bias is implausible, but there is no straightforward way to deal with this.

Benefits are computed under three alternative assumptions about the age of claiming: 62, 65, and 70. SSDI benefits are computed for all ages from 27 to FRA-1. We use the batch version of the SSA computer program “anypia” to compute the OASI and SSDI benefit for each of the three OASI claiming ages and all possible SSDI claiming ages. We compute the Expected Present Discounted Value (EPDV) of benefits using standard mortality schedules and an assumed real interest rate of 3%. Benefits are assumed to be constant in real terms (as they have been since the automatic COLA was introduced). Benefits are discounted to the year in which the individual turns age 55. This is arbitrary but has no impact on the results. We also compute the EPDV of lifetime earnings using the same approach, but without capping earnings at the maximum taxable level.[28]

The details of the earnings and benefit calculations are as follows. We use data on wage-salary income, with the bottom and top 1% within each cell trimmed. Earnings are capped at the taxable maximum earnings applicable in each year. The

[28] We use a slightly different approach for the counterfactual simulations. The anypia program cannot be used to compute benefits for a given earnings history and a counterfactual OASI formula. Instead, we use the PIA produced by anypia as input into our own program that computes benefits for alternative policy regimes. This introduces some measurement error since our program does not produce the same benefits as anypia for the actual rules for each cohort. We do not have the code for the anypia program and cannot determine the source of the error. Nevertheless, our calculations yield benefits that are very highly correlated with the benefits produced by anypia (0.98). We use the benefits from anypia in estimation, and we use our program to generate both counterfactual and baseline benefits, to ensure that any errors in calculations cancel out when we take the difference.

CPI-U is used to convert earnings from nominal to real, using base year 2010. Earnings data from the CPS for calendar years1961-2010 (from March 1962-2011 files) are used to compute the cell mean of positive values of capped earnings. We use published SSA median earnings data for various years and ages from 1937-1960, prior to the availability of CPS data. The medians are transformed to means using mean/median ratios from the CPS. The means are then capped, and data are filled in for missing years and ages using regression imputations. Combining CPS and SSA data, we have information for birth years 1878-1985 at ages 25-59. The specific steps involved in combining CPS and SSA data are as follows:

a. Compute the CPS mean/median ratio, and run sex-age-group-specific regressions to project backward.

b. Compute the ratio of education-specific mean earnings to overall mean earnings using the CPS 1961-2010, for use in adjusting 1937-1960 SSA data, which are not available by education. Regress the ratio on year by sex and age group.

c. Apply the adjustments from steps a and b to the SSA data on median earnings, which are available only for selected ages and years. Interpolate missing years and ages.

d. Run sex-education-group-specific log earnings regressions for ages 25-59 on a cubic in age, a cubic in birth year, and interactions, in order to smooth earnings profiles.

e. Use the regression coefficients to generate predicted earnings paths for each of the alternative retirement age scenarios and for each SSDI claiming age scenario, assuming constant real earnings at ages 60 and above (using the age-59 value). We also use average earnings growth by year for future years implied by the predicted earnings paths to generate a wage index and price index values in future years (2011+).

3. Wage rate

We use observations on average hourly wage-salary earnings for individuals who worked at least 36 weeks for at least 30 hours per week. Cases are dropped if average hourly earnings were less than $5 or greater $500 in 2010 dollars. We compute the mean predicted log hourly wage rate for each cell from sex-education-group-year-specific log wage regressions on a quadratic in age, education, race, ethnicity, marital status, and census division. We use the regressions to predict the wage rate by sex, education group, and age, holding the other variables constant (white, married, non-Hispanic, census division 1). The regression uses only ages 25-59, but we predict up to age 69 assuming a constant real wage for ages 60+ at the age-59 level.

4. Other variables

Data on pensions and health insurance are available beginning with the 1980 CPS survey. We do not use the health insurance data because the trends show unexplained breaks related to changes in the survey. Pension coverage is measured by enrollment, and we limit the universe for measuring coverage to non-agricultural private sector workers. Pensions are important only if an individual is covered for a long period of time and expects to receive a benefit. We approximate this by measuring pension coverage at ages 45-55 and assigning coverage at those ages as a permanent characteristic. The type of pension is not recorded.[29]

We use data on self-reported health and days lost due to illness from the National Health Interview Survey, downloaded from the Minnesota Population Center's IHIS web site. Data on work days lost due to illness are available beginning in 1969. The reference period changed from the previous two weeks to the previous calendar year in 1997. The self-reported health measures is available as a four point scale (poor, fair, good, excellent) from 1972 to 1981 and as a five point scale (poor, fair, good, very good, excellent) beginning in 1982.

[29]Cohorts that are never observed at these ages are assigned the mean value of the 1925-29 cohort if they were born before 1925, or the mean value of the 1963-65 cohort if they were born after 1965. We explored another source of aggregate data on pensions from EBRI, but while this source provides a time series of total coverage by DB and DC plans, it does not provide a measure of the eligible population, so a coverage rate cannot be computed. It is also an aggregate time series, with no variation across groups. Other sources of pension data such as the National Compensation Survey provide only a very limited time series.

References

Aaronson, Stephanie, Bruce Fallick, Andrew Figura, Jonathan Pingle, and William Wascher (2006). "The recent decline in the labor force participation rate and its implications for potential labor supply," *Brookings Papers on Economic Activity* 1: 69-134.

Acemoglu, Daron, and David Autor (2011). "Skills, Tasks, and Technologies: Implications for Employment and Earnings," in Orley Ashenfelter and David Card (eds.) Handbook of Labor Economics Volume 4B, North Holland Elsevier: 1044-1171

Alexander, J. Trent, Michael Davern, and Betsey Stevenson (2010). "Inaccurate age and sex data in the Census IPUMS files: evidence and implications," NBER Working Paper 15703, January.

Autor, David H., and Mark G. Duggan (2003). "The rise in the disability rolls and the decline in unemployment," *Quarterly Journal of Economics* 157-205.

Black, Dan, Kermit Daniel, and Seth Sanders (2002). "The impact of economic conditions on participation in disability programs: evidence from the coal boom and bust," *American Economic Review* 92 (1): 27-50

Blau, David M., and Ryan M. Goodstein (2010). "Can Social Security Explain Trends in Labor Force Participation of Older Men in the United States?" *Journal of Human Resources* 45 (2): 328-63.

Blau, Francine, and Lawrence Kahn. 2007. "Changes in the labor supply of married women," *Journal of Labor Economics* 25 (3): 393-438.

Bound, John, Stephan Lindner, and Timothy Waidmann (2010). "Reconciling findings on the employment effect of disability insurance," Michigan Retirement Research Center Working Paper 2010-239.

Chen, Susan, and Wilbert van der Klaauw (2008). "The work disincentive effects of the disability insurance program in the 1990s," *Journal of Econometrics* 142: 757-84.

Duggan, Mark G., Perry Singleton, and Jae Song (2007). "Aching to Retire? The Rise in the Full Retirement Age and its Impact on the Social Security Disability Rolls," *Journal of Public Economics* 91: 1327-50.

Elliott, Diana, Kristi Krivikas, Matthew Brault, and Rose Krieder (2012). "Historical Marriage Trends from 1890-2010: A Focus on Race Differences," paper presented at the annual meetings of the Population Association of America, San Francisco, CA, May 3-5.

Farber, Henry (2005). “What do we know about job loss in the United States? Evidence from the Displaced Worker Survey, 1984-2004,” *Economic Perspectives*, Federal Reserve Bank of Chicago: 13-28.

Fisher, T. Lynne (undated) “The Income of the Elderly: The Effect of Changes to Reported Age in the Current Population Survey,” Social Security Administration working paper.

French, Eric, and Jae Song (2011). “The Effect of Disability Insurance Receipt on Labor Supply: A Dynamic Analysis,” Working Paper 2012-12, Federal Reserve Bank of Chicago, December.

Goldin, Claudia (2006). “The quiet revolution that transformed women’s employment, education, and family” *American Economic Review* 96 (2): 1-21.

Heim, Brad (2007). “The incredible shrinking elasticities: married female labor supply, 1978-2002” *Journal of Human Resources* 42 (3): 881-918.

Johnson, Richard W., and Corina Mommaerts. (2010) “Age Differences in Job Loss, Job Search, and Re-employment,” Working Paper, The Urban Institute.

Juhn, Chinhui (1992). “Decline of male labor market participation: the role of declining market opportunities,” *Quarterly Journal of Economics* 107 (1): 79-121.

Krueger, Alan B. and Pischke, Jorn-Steffen (1992). “The Effect of Social Security on Labor Supply: A Cohort Analysis of the Notch Generation.” *Journal of Labor Economics* 10 (4) 1992: 412-37.

Lahey, Joanna N. (2008). “Age, women, and hiring: an experimental study,” Journal of Human Resources, 43 (1) 30-56.

Low, Hamish, and Luigi Pistaferri (2012). “Disability insurance and the Dynamics of the Incentive-Insurance Tradeoff,” Working Paper, Stanford University, December.

Macunovich, Diane (2010). “Reversals in the patterns of women’s labor supply in the United States, 1977-2009,” *Monthly Labor Review* 133 (11): 16-36

Maestas, Nicole, Kathleen Mullen, and Alexander Strand (in press). “Does Disability Insurance Receipt Discourage Work? Using Examiner Assignment to Estimate Causal Effects of DI Receipt,” RAND, forthcoming in *American Economic Review*.

Mastrobuoni, Giovanni (2009). "Labor Supply Effects of the Recent Social Security Benefit Cuts: Empirical Estimates Using Cohort Discontinuities," *Journal of Public Economics* 93 (11-12), December: 1224-33.

Moffitt, Robert A. (2012). "The U.S. Employment-Population Reversal in the 2000s: Facts and Explanations," NBER Working Paper 18920, November.

Neumark, David, and Joanne Song (2012). "Barriers to Later Retirement: Increases in the Full Retirement Age, Age Discrimination, and the Physical Challenges of Work," MRRC Working Paper 2012-265, September.

Perrachi, Franco, and Finis Welch (1994). "Trends in Labor Force Transitions of Older Men and Women," *Journal of Labor Economics* 12 (2): 210-42.

Poterba, James, Steven Venti, and David A. Wise. (2007). "The Changing Landscape of pensions in the United States," NBER Working Paper 13381, September.

Schirle, Tammy (2008). "Why Have the Labor Force Participation Rates of Older Men Increased Since the Mid-1990s?" *Journal of Labor Economics* 26 (4): 549-94.

Von Wachter, Till, Jae Song, and Joyce Manchester (2011). "Trends in employment and earnings of allowed and rejected applicants to the Social Security Disability Insurance program," *American Economic Review* 101 (7): 3308-29.

Table 1: Coefficient Estimates from regressions of Full-Time Equivalent Weeks Worked/52 (FTW)

	Men		Women	
	25-61	62-69	25-54	55-69
Economic Variables				
Log wage	.104 (.012)	.042 (.040)	.014 (.019)	-.136 (.036)
Average tax rate	-.54 (.05)	.45 (.21)	-.12 (.08)	.08 (.16)
PDVLE	-.020 (.005)	-.017 (.018)	.017 (.011)	.11 (.02)
PDVBEN65	.56 (.12)	-.51 (.35)	.17 (.26)	-1.00 (.25)
Gain from early claiming	.64 (.17)	-.69 (.39)	-.05 (.28)	-1.05(.29)
Gain from later claiming	-.30 (.09)	.83 (.26)	.83 (.17)	.39 (.17)
PDVSSDI	-.01(.01)	.05 (.05)	.12 (.02)	.45 (.05)
Pension coverage	.06 (.02)	.02 (.07)	.24 (.02)	.12 (.04)
Demographic Variables				
Divorced, Widowed, or Sep.	-.20 (.01)	-.04 (.03)	.15 (.02)	.16 (.02)
Never married	-.27 (.01)	-.11 (.05)	.19 (.02)	.13 (.04)
Black	-.06 (.02)	-.03 (.05)	.08 (.02)	-.04 (.03)
Other race	-.17 (.03)	.06 (.08)	-.14 (.03)	.02 (.05)
Hispanic	-.15 (.01)	-.01 (.06)	-.13 (.02)	-.01 (.04)
No. of kids<6	-.02 (.004)	-.07 (.06)	-.09 (.01)	.02 (.04)
No. of kids<18	.012 (.002)	-.02 (.02)	-.03 (.002)	-.10 (.02)
Health very good	.03 (.01)	-.01 (.03)	.05 (.01)	.03 (.02)
Health good	-.07 (.01)	-.02 (.03)	-.03 (.01)	.01 (.02)
Health fair	-.12 (.01)	-.07 (.03)	-.10 (.02)	.05 (.02)
Health poor	-.18 (.02)	-.02 (.05)	-.25 (.03)	.02 (.03)

Fraction of year unable to work due to illness	-.08 (.01)	-.05 (.03)	.02 (.02)	-.01(.02)
High school graduate	-.044(.006)	-.16 (.02)	-.05 (.01)	-.14 (.02)
Some college	-.012 (.004)	-.10 (.01)	-.003 (.01)	-.08 (.01)
College graduate	-.012 (.003)	-.08 (.01)	.01 (.01)	-.03 (.01)
Mean of dependent variable	.815	.349	.546	.315
R^2 (number of cells)	.89 (6808)	.94 (1472)	.94 (5520)	.95 (2760)

Notes: PDVLE = Present Discounted Value of Lifetime Earnings. PDVBEN65 = Present Discounted Value of OASI benefit if claimed at age 65 (discounted to age 55). Gain from early claiming = PDVBEN62 – PDVBEN65. Gain from later claiming = PDVBEN70 – PDVBEN65. PDVSSDI = Present Discounted Value of Social Security Disability Benefits. Reference groups for categorical variables are white, married, health excellent, and college graduate. All monetary amounts except the log wage are measured in millions of year-2010 dollars.

Table 2: Counterfactual Simulations of the Annual Average Growth Rate of FTW

	Men		Women	
	25-61	62-69	25-54	55-69
1965-1988 annual growth rate	-.0020	-.0223	.0240	.0040
1989-2010 annual growth rate	-.0047	.0121	.0004	.0184
Observed Change	-.0027	.0344	-.0236	.0144
Predicted change	-.0027	.0344	-.0236	.0144
Counterfactual predicted change, replacing 1989-2010 values of explanatory variables with 1965-1988 values (percent of total change explained)				
Economic Variables				
Wage rate	-.0032	.0341	-.0238	.0178
Average tax rate	-.0055	.0367	-.0244	.0147
PDVLE	-.0028	.0364	-.0241	.0038 (74)
OASI	-.0019 (16)	.0356 (9)	-.0237	.0147 (9)
PDVBEN65	-.0021 (15)	.0355	-.0233	.0139 (7)
Gain from early claiming	-.0027	.0352	-.0236	.0159
Gain from later claiming	-.0025	.0338 (8)	-.0240	.0138 (4)
Pension coverage	-.0025 (7)	.0345	-.0235	.0137 (5)
Demographic Variables				
Marital status	-.0012 (54)	.0347	-.0248	.0143
Race/ethnicity	-.0014 (47)	.0343	-.0224 (5)	.0144
Number of children	-.0028	.0363	-.0221 (6)	.0182
Health	-.0027	.0337	-.0235	.0142
Education	-.0029	.0305 (11)	-.0239	.0110 (23)

Notes: The counterfactual change replaces the observed value of each variable or group of variables (one at a time) in 1989-2010 with its 1965-88 mean value. The OASI simulations replace the 1989-2010 values with the values for the 1937 birth cohort, but using observed lifetime earnings of each cohort to compute the benefit. The Data Appendix discusses some of the issues involved in this approach. Health is not measured before 1972, so the means for the earlier period use 1972-88 values (the very good category was not introduced until 1982, so the mean is measured from 1982-88). Hispanic ethnicity is not available until 1970, so the mean is measured for 1970-88. State tax rates are not available until 1977, so the mean tax rate is measured for 1977-88. PDVLE = Present Discounted Value of Lifetime Earnings. OASI = Old Age and Survivors Insurance. PDVBEN65 = Present Discounted Value of OASI benefit if claimed at age 65 (discounted to age 55). Gain from early claiming = PDVBEN62 – PDVBEN65. Gain from later claiming = PDVBEN70 – PDVBEN65. The OASI simulation changes PDVBEN65 and the gains from early and late claiming jointly.

Table 3: Change in means of the explanatory variables from 1965-1988 to 1989-2010

	Men		Women	
	25-61	62-69	25-54	55-69
Log wage	.093	.162	.243	.269
Average tax rate	-.088	-.079	-.092	-.075
PDVLE	.0072	-.124	.616	.083
PDVBEN65	-.0163	-.0030	-.0184	-.0043
Gain from early claiming	.0015	.0003	.0023	.0006
Gain from later claiming	.0112	.0044	.0113	.0057
PDVSSDI	.145	.042	.153	.064
Pension coverage	-.063	-.009	.014	.042
Divorce, Widowed, or Separated	.043	.039	.025	.0001
Never married	.090	-.008	.083	.002
Black	.015	.004	.020	.015
Other race	.038	.026	.039	.034
Hispanic	.068	.033	.061	.049
No. of kids<6	.036	.053	.067	.064
No. of kids<18	.006	.156	.030	.192
Health very good	.044	.055	.036	.057
Health good	-.064	-.036	-.099	-.070
Health fair	-.013	-.043	-.021	-.047
Health poor	-.009	-.032	-.003	-.014
Fraction of year unable to work due to illness	-.027	-.105	-.008	-.035
High school dropout	-.147	-.295	-.136	-.268
High school graduate	-.021	.066	-.121	.034

Some college	.095	.097	.128	.122

Notes: See Table 2.

Table 4: Counterfactual Simulations of Annual Average Growth Rate of Full-Time Equivalent Weeks Worked/52 (FTW), No Controls for Calendar Time

	Men		Women	
	25-61	62-69	25-54	55-69
1965-1988 annual growth rate	-.0020	-.0223	.0240	.0040
1989-2010 annual growth rate	-.0047	.0121	.0004	.0184
Observed Change	-.0027	.0344	-.0236	.0144
Predicted change	-.0021	.0306	-.0191	.0176
Counterfactual change, replacing 1989-2010 values with 1965-1988 values of explanatory variables (percent of total change explained)				
Economic Variables				
Wage rate	-.0023	.0305	-.0190	.0186
Average tax rate	-.0017(19)	.0282 (8)	-.0169 (11)	.0178
PDVLE	-.0023	.0335	-.0183 (4)	.0082 (53)
OASI	-.0014 (22)	.0307 (9)	-.0166 (6)	.0177 (10)
PDVBEN65	-.0012 (27)	.0307	-.0159 (8)	.0170(6)
Gain from early claiming	-.0022	.0313	-.0191	.0191
Gain from later claiming	-.0022	.0299 (9)	-.0199	.0166 (5)
Pension coverage	-.0021 (15)	.0305	-.0190	.0165 (6)
Demographic Variables				
Marital status	-.0008(60)	.0311	-.0209	.0174
Race/ethnicity	-.0007(68)	.0303	-.0179 (7)	.0180
Number of children	-.0023	.0303	-.0180 (6)	.0194
Health	-.0020(5)	.0297	-.0189	.0177
Education	-.0025	.0257 (16)	-.0190	.0155 (12)
Aggregate Variables				

Minimum wage	-.0014 (32)	.0275 (10)	-.0181 (5)	.0182
SSDI award and application rates	.0012 (155)	.0259 (15)	-.0152 (20)	.0170
Net imports	-.0025	.0295	-.0196	.0174
Life expectancy	-.0030	.0468	-.0194	.0201

Notes: The SSDI award and application rates are the fractions of applicants receiving an award and the fraction of the insured population that applies for SSDI. Net imports are measured as a fraction of GDP. See Table 2 for additional notes.

Appendix Table A: Counterfactual Simulations of the Level of Full-Time Equivalent Weeks Worked/52 (FTW)

	Men		Women	
	25-61	62-69	25-54	55-69
1965-1988 mean FTW	.830	.379	.450	.266
1989-2010 mean FTW	.807	.327	.613	.355
Observed Change	-.023	-.053	.163	.089
Predicted change	-.023	-.053	.163	.089
Counterfactual change, replacing 1989-2010 values with 1965-1988 values of explanatory variables (percent of total change explained)				
Wage rate	-.032	-.059	.160	.123
Average tax rate	-.069	-.018 (66)	.152 (6)	.094
PDVLE	-.023	-.055	.153 (6)	.084 (6)
OASI	-.015 (42)	-.044	.155	.096 (5)
PDVBEN65	-.018 (34)	-.047	.165	.097
Gain from early claiming	-.024	-.054	.163	.088
Gain from later claiming	-.020 (15)	-.048	.153 (6)	.090
Pension coverage	-.020 (15)	-.053	.160	.085 (5)
Marital status	.009 (140)	-.052	.144 (12)	.089
Race/ethnicity	-.007 (72)	-.054	.174	.090
Number of children	-.022	-.047 (12)	.168	.103
Health	-.034	-.061	.156	.091
Education	-.029	-.084	.155 (5)	.058 (35)

Notes: See Table 2.

Appendix Table B: Descriptive Statistics for Estimation Samples

	Men		Women	
	25-61	62-69	25-54	55-69
FTW	0.815	0.345	0.546	0.315
Log wage	3.195	3.179	2.803	2.732
Average tax rate	0.370	0.380	0.350	0.360
PDVLE	3.13	2.40	2.095	1.316
PDVBEN65	0.136	0.099	0.129	0.087
Gain from early claiming	-0.0053	-0.0082	-0.0087	-0.0084
Gain from later claiming	-0.0053	-0.0071	0.0041	-0.0006
PDVSSDI	0.345	0.062	0.290	0.091
Pension coverage	0.547	0.603	0.468	0.456
Divorce, Widowed, or Separated	0.116	0.149	0.172	0.318
Never married	0.175	0.054	0.138	0.052
Black	0.103	0.086	0.124	0.099
Other race	0.041	0.028	0.045	0.029
Hispanic	0.097	0.050	0.098	0.057
No. of kids<6	0.339	0.058	0.391	0.069
No. of kids<18	1.101	0.235	1.363	0.263
Health very good	0.313	0.256	0.322	0.268
Health good	0.258	0.330	0.282	0.345
Health fair	0.072	0.173	0.0788	0.164
Health poor	0.026	0.079	0.0216	0.063
Fraction of year unable to work due to illness	0.125	0.334	0.110	0.272
High school dropout	0.190	0.375	0.169	0.325
High school graduate	0.344	0.297	0.378	0.374
Some college	0.210	0.142	0.228	0.163
Age	41.4	65.3	38.8	61.5
Sample size	6808	1472	5520	2760

Notes: See Table 1.

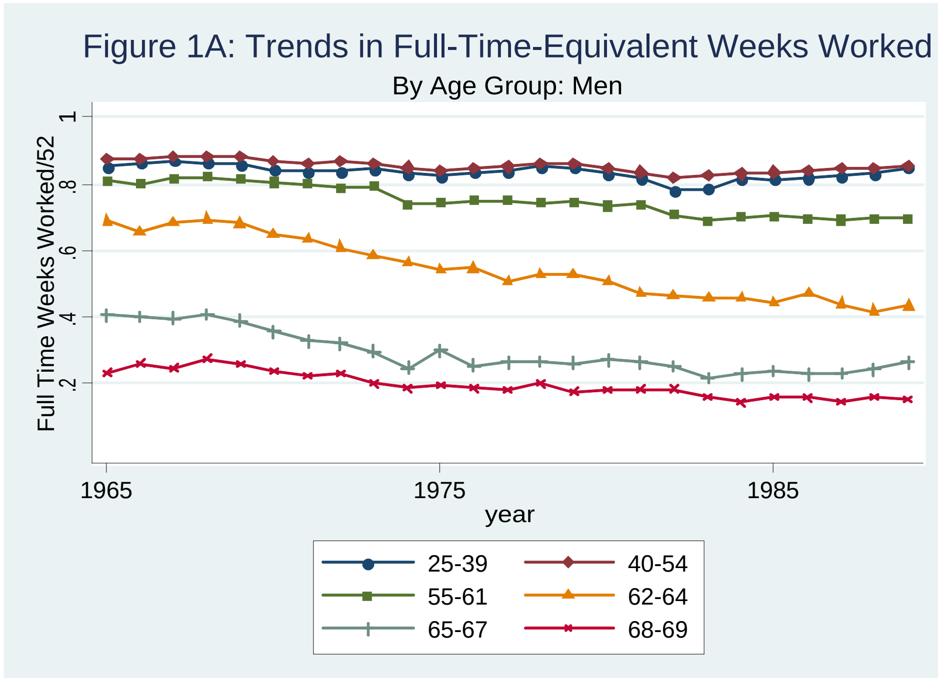

Figure 1A: Trends in Full-Time-Equivalent Weeks Worked
By Age Group: Men
Full Time Weeks Worked/52
1
.8
.6
.4
.2
1965
1975
1985
year
25-39
40-54
55-61
62-64
65-67
68-69

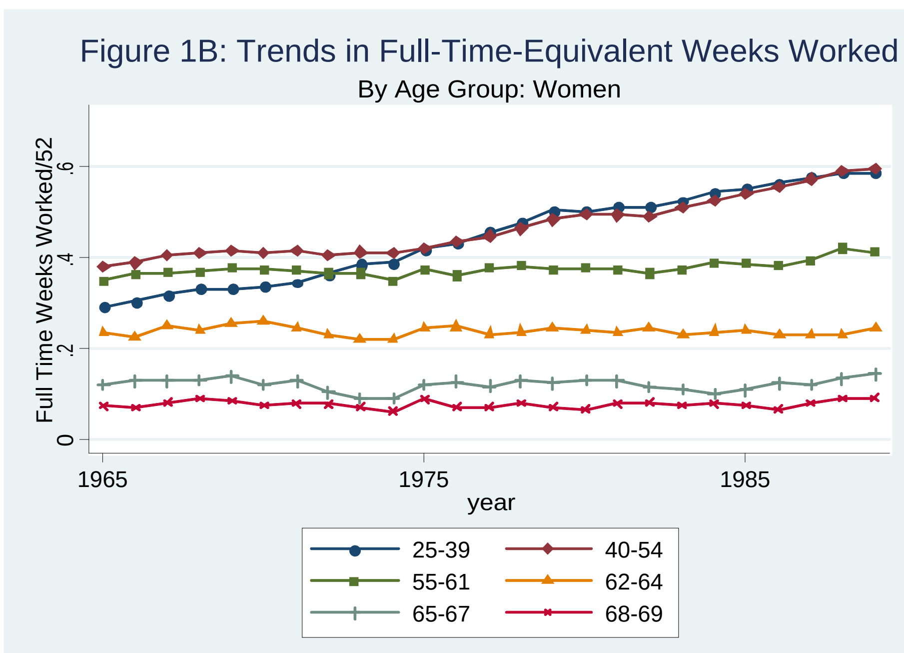

Figure 1B: Trends in Full-Time-Equivalent Weeks Worked
By Age Group: Women
Full Time Weeks Worked/52
.6
.4
.2
0
1965
1975
1985
year
25-39
40-54
55-61
62-64
65-67
68-69

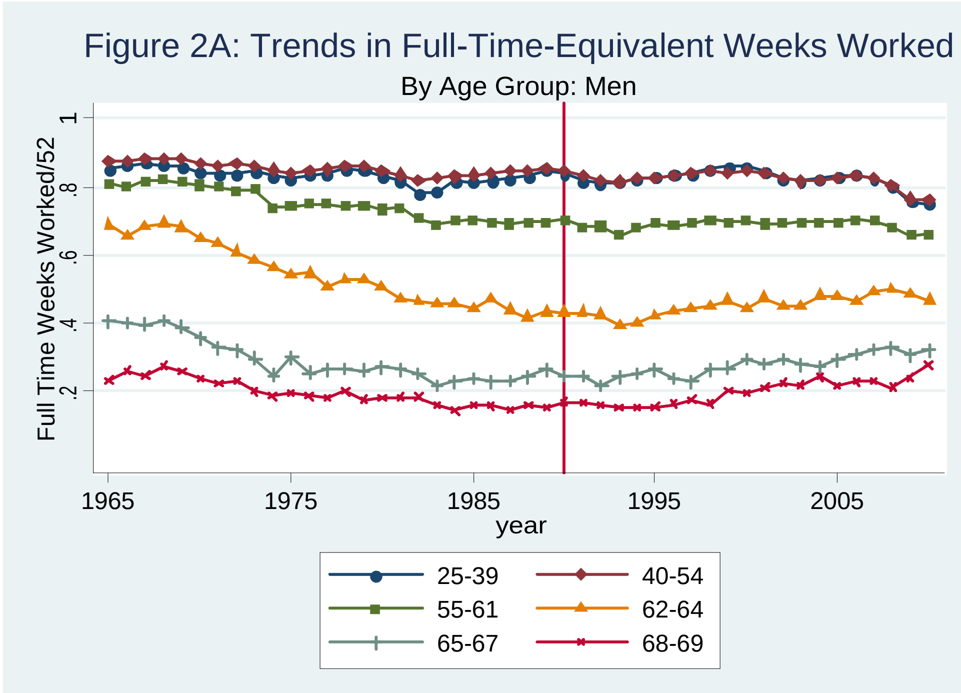
Figure 2A: Trends in Full-Time-Equivalent Weeks Worked
By Age Group: Men
Full Time Weeks Worked/52
.2
.4
.6
.8
1
1965
1975
1985
1995
2005
year
25-39
40-54
55-61
62-64
65-67
68-69

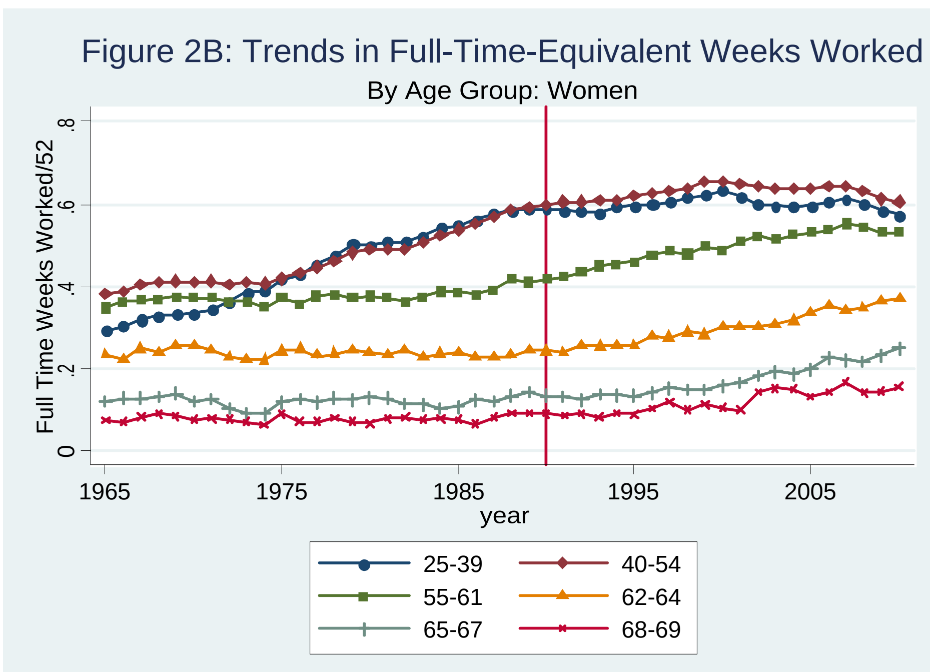
Figure 2B: Trends in Full-Time-Equivalent Weeks Worked
By Age Group: Women
Full Time Weeks Worked/52
0
.2
.4
.6
.8
1965
1975
1985
1995
2005
year
25-39
40-54
55-61
62-64
65-67
68-69

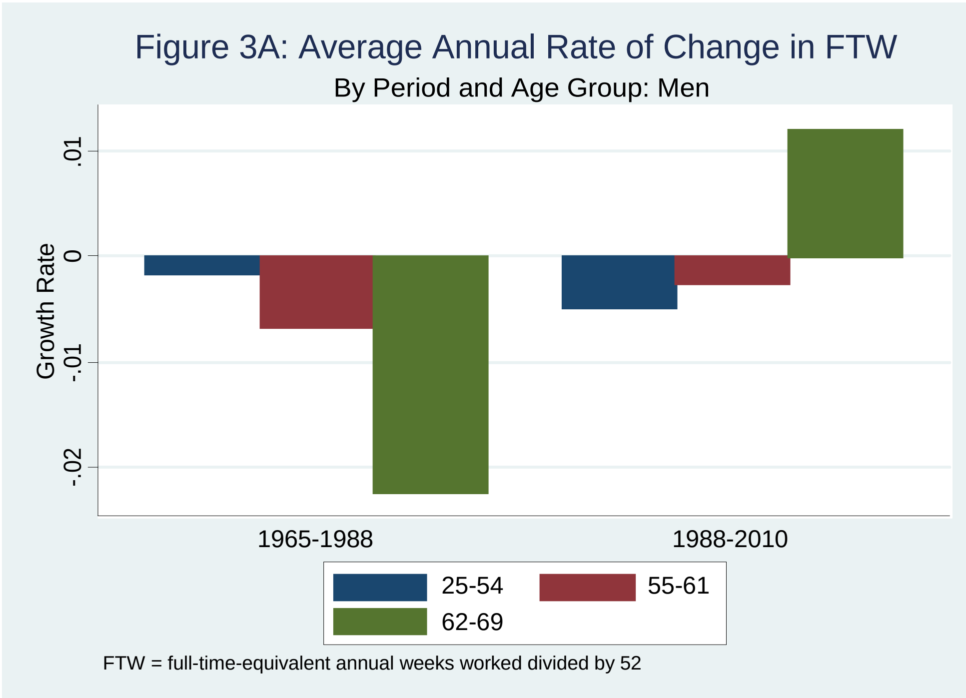
Figure 3A: Average Annual Rate of Change in FTW
By Period and Age Group: Men
Growth Rate
.01
0
-.01
-.02
1965-1988
1988-2010
25-54
55-61
62-69
FTW = full-time-equivalent annual weeks worked divided by 52

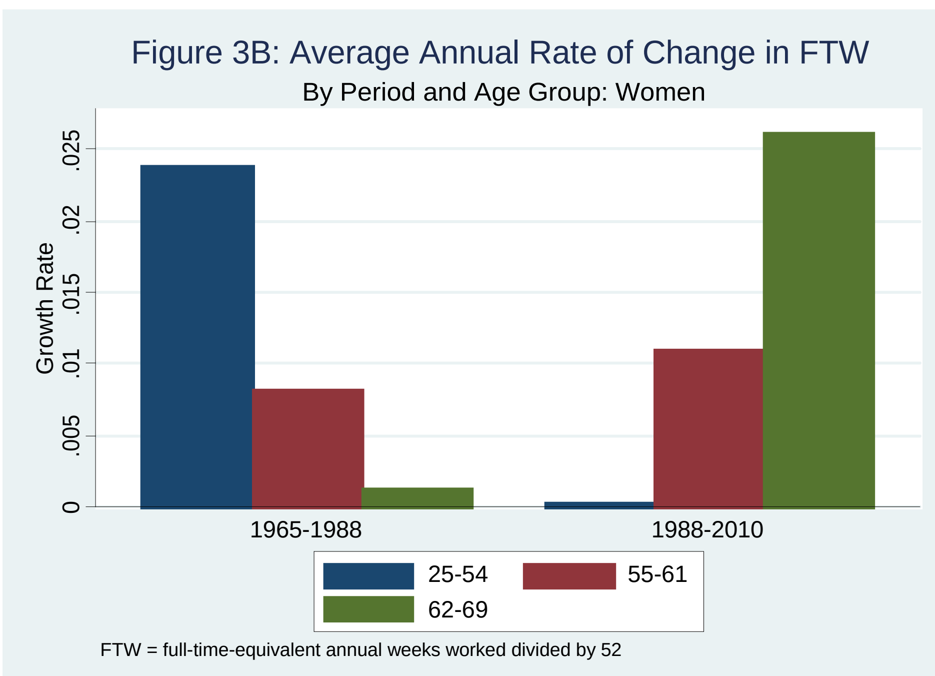
Figure 3B: Average Annual Rate of Change in FTW
By Period and Age Group: Women
Growth Rate
.025
.02
.015
.01
.005
0
1965-1988
1988-2010
25-54
55-61
62-69
FTW = full-time-equivalent annual weeks worked divided by 52

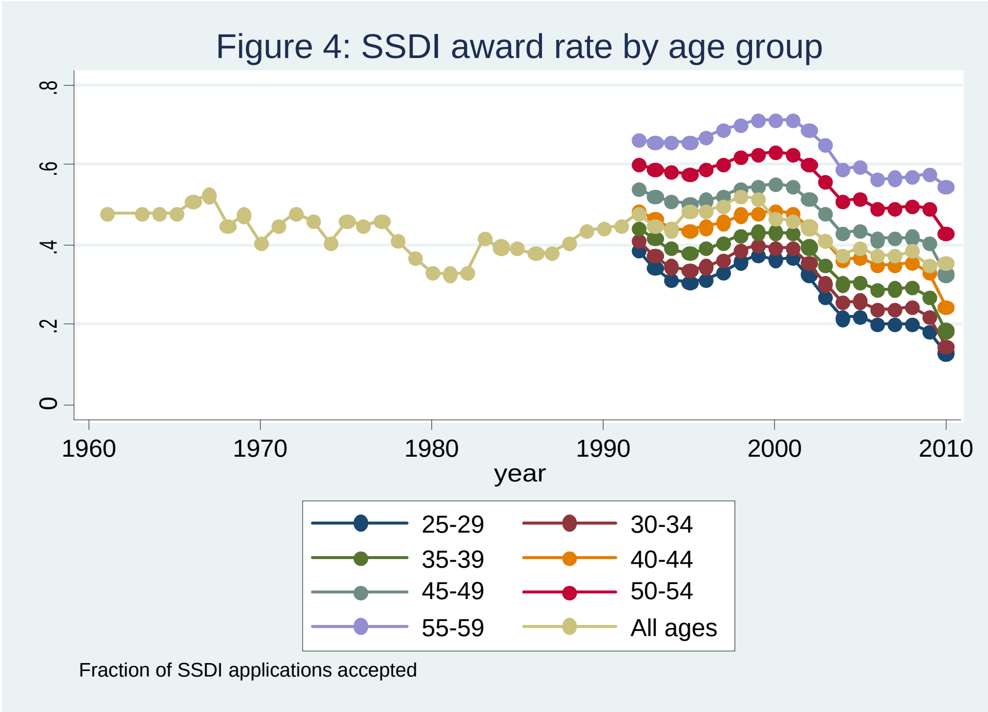
Figure 4: SSDI award rate by age group
0
.2
.4
.6
.8
1960
1970
1980
1990
2000
2010
year
25-29
30-34
35-39
40-44
45-49
50-54
55-59
All ages
Fraction of SSDI applications accepted