Changing Retirement Incentives and Retirement in the U.S.

Courtney Coile
Wellesley College and NBER
ccoile@wellesley.edu

Abstract:
Employment rates of older Americans have been rising since the 1990s. While the U.S. is fairly unique among advanced economies in not experiencing any large-scale pension reforms in recent decades, there have been multiple changes to Social Security policy that have strengthened the incentive to work at older ages. This study builds on prior work documenting the changes in retirement incentives over time to explore the effect of these changes on retirement behavior, using over two decades of data from the Health and Retirement Study (HRS). Regression results indicate that workers who face a higher implicit tax rate on additional work have an increased probability of retirement. Counterfactual simulations suggest that the changes in Social Security incentives since the early 1990s that result from increases in the Full Retirement Age and Delayed Retirement Credit can explain around one-fifth of the increase in work at ages 65 to 69, but essentially none of the increase at younger ages.

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The aging of the population, driven by falling mortality rates and declining fertility rates, has led to long-term fiscal imbalances in the U.S. Social Security system and in other pay-as-you-go public pension systems around the world. While many countries have enacted large-scale pension reforms in recent decades in response to fiscal pressures (Börsch-Supan and Coile, 2021), reforms in the U.S. have been more modest and incremental. The 1983 Social Security Act Amendments raised the Full Retirement Age (FRA) from 65 to 67 gradually over 22 years. Other changes raised the actuarial adjustment for delaying the initial claim of Social Security benefits beyond the FRA and eliminated the retirement earnings test after the FRA.

The incentive to work at older ages depends on program parameters like those affected by recent reforms. Work past the Early Entitlement Age (EEA) of 62 has multiple effects on expected lifetime benefits – it raises the monthly benefit amount through the inclusion of another year of earnings in the benefit calculation and through the actuarial adjustment for delayed claiming (if workers wait to claim until they retire), but results in the loss of a year of benefits and requires additional payroll tax contributions. The net return to work can therefore be positive or negative. The implicit tax on work (ITAX), which is defined as the change in the net present discounted value of Social Security Wealth (SSW) associated with working another year relative to earnings, is a useful summary measure of the financial incentive to work at older ages. Each worker's ITAX depends on the Social Security program provisions they face as well as their earnings history and other characteristics.

Social Security policy changes over the past several decades have altered the incentive to work at older ages. In calculations that hold constant workers' earnings and mortality risk to isolate the effect of policy changes, Coile (2021) finds that the ITAX on work at ages 65 to 69 has fallen by about 15 percentage points since 1980, from a tax rate of 25 to 30 percent to a rate

of 10 to 15 percent. Conversely, ITAX below age 65 has remained essentially constant, since Social Security policy changes have only affected the FRA and work beyond the FRA.[1]

These policy changes have occurred during a time of rising employment at older ages for men and women in the US, as shown in Figures 1 and 2. For men, the largest absolute increase in participation over the last three decades was among those ages 65 to 69, whose participation rose from 26 percent in 1990 to 39 percent in 2019, while the participation of men ages 60 to 64 rose from 56 to 64 percent. For women, the largest absolute increase was among those ages 60 to 64, whose participation rose from 36 to 52 percent, followed by women ages 65 to 69, whose participation rose from 17 to 30 percent. The fact that these large – 8 to 16 percentage point – increases in labor force participation for men and women in their 60s occurred during a time of changing program parameters naturally raises the question: what share of the increase in work at older ages over the past few decades can be attributed to changes in Social Security policy?

This paper aims to provide an answer to this question. Following the methodological approach used throughout this volume, we first calculate ITAX values for a large sample of workers using data from the Health and Retirement Study (HRS) for the period 1992 to 2016. We use these data to run retirement regressions estimating the effect of ITAX on the transition from being employed to being out of the labor force. Finally, we compute counterfactual ITAX measures for our sample reflecting the incentives that workers would have faced if the pre-reform Social Security program rules had remained in place and combine these measures with our regression estimates in order to simulate retirement behavior under an alternative policy regime without reforms. By comparing simulated and actual behavior, we obtain an estimate of

[1] An exception is that there has been a change to the actuarial adjustment for early claiming at ages 62 and 63 to accompany the increase in the FRA – see background section for details. Note that this discussion refers to changes in ITAX resulting from policy changes; changes over time in mortality risk, earnings histories, or other characteristics can also affect ITAX.

the share of the increase in work at older ages since the early 1990s that can be attributed to changes in Social Security policy.

We have several key findings. First, using a large sample of workers in the HRS, we observe patterns in ITAX values by age and over time that are similar to results obtained in Coile (2021) for stylized worker types. Second, our regression estimates indicate that ITAX has a statistically significant and economically meaningful effect on retirement transitions – an increase in the tax rate of 10 percentage points increases the probability of retirement by 0.6 percentage points, or 7.8% relative to the mean annual retirement rate of 8 percent. Third, our counterfactual simulations suggest that changes in Social Security incentives since the early 1990s can explain around one-fifth of the increase in work at ages 65 to 69, but essentially none of the increase in work at ages 60 to 64, as incentives at younger ages are largely unchanged. This suggests that other factors – including changes to employer-sponsored pensions and retiree health insurance benefits, improvements in health and education, and greater labor force participation among women of all ages – are also important contributors to the working longer trend.

This paper contributes to an existing literature on the effects of Social Security reforms on retirement. Several studies have examined the effect of increases in the FRA on labor supply and claiming (Mastrobuoni, 2009; Song and Manchester, 2007; Behaghel and Blau, 2012), with more recent work that uses large administrative data sets finding a bigger effect on claiming behavior than on retirement (Deshpande et al., 2020). A recent study of changes to the DRC that uses administrative data finds large effects on claiming but does not examine employment (Duggan et al., 2021), while an earlier study that uses survey data finds substantial employment effects (Pingle, 2006). The current study complements these earlier studies by estimating the

effect of changes to the FRA and DRC on the incentive to work at older ages and using retirement models relating retirement incentives to retirement behavior in order to project how changes in retirement incentives have affected retirement behavior.

The remainder of the paper is organized as follows. Section I provides some background on the U.S. Social Security system and relevant reforms. Section II explains the calculation of the ITAX variable and introduces the data and empirical approach. In Section III, we compare ITAX values for the HRS sample with the results for stylized workers in Coile (2021) and report retirement regression results. Section IV provides the counterfactual simulations of retirement behavior under an alternative regime of no policy changes. Section V concludes.

I. Background on Social Security

The U.S. Social Security program was established in 1935. We first describe the program under current rules before discussing relevant reforms.

Workers are entitled to Social Security benefits if they have 40 quarters of work in covered employment, which encompasses nearly all paid work. Benefits are based on the worker's highest thirty-five years of wage-indexed earnings, or the Average Indexed Monthly Earnings (AIME). A progressive non-linear formula is applied to the AIME to generate the Primary Insurance Amount (PIA), the standard monthly benefit amount.[2] The replacement rate is 39 percent for a worker with average earnings throughout their career, versus 50 percent for a worker earning half the average wage and 28 percent for a worker earning twice the average

[2] For a worker turning age 62 in 2023, the first $1,115 of AIME is replaced at 90%, the next $5,606 is replaced at 32%, and any amount of AIME above $6,721 is replaced at 15% in the conversion to PIA.

wage. These benefits are modest by international standards, as the mean replacement rate for an average worker in OECD countries is 52 percent (OECD, 2021).

Benefits may be claimed as early as age 62, the EEA, or as late as age 70. A worker claiming at the FRA, which is now age 67, receives a monthly benefit equal to the PIA, while an actuarial adjustment is applied for any months of benefit receipt before the FRA or a Delayed Retirement Credit (DRC) for any months of delay after the FRA. A worker claiming at age 62 receives 70 percent of PIA (a 30 percent reduction) while a worker claiming at age 70 receives 124 percent of PIA. Delaying claiming is actuarially advantageous for many workers and has become more so over time due to falling mortality and declining real interest rates (Shoven and Slavov, 2014). In practice, those with lower mortality are more likely to delay claiming, contributing to inequalities in lifetime benefit payouts (Dushi et al., 2021).

Workers who claim benefits prior to the FRA and continue working are subject to a retirement earnings test (RET), but there is no RET after the FRA.[3] Benefits are subject to income taxation for higher-income beneficiaries.[4] Dependent and surviving spouses and children of covered workers are eligible for benefits, as are disabled workers and their dependents.[5] Over 96 percent of the population age 60 and above is receiving or will eventually receive Social

[3] In 2023, for workers below the FRA, $1 in benefits is withheld for each $2 of earnings above $21,240; for workers reaching the FRA in 2023 (turning 67), $1 in benefits is withheld for each $3 in earnings above $56,520. Once workers reach the FRA, withheld benefits are treated as months of claiming delay and the monthly benefit amount is adjusted accordingly.

[4] Up to 85 percent of benefits are subject to taxation if one half of Social Security income plus other income exceeds $25,000 (for singles) or $32,000 (for couples). In 2015, around half of beneficiaries paid income tax on some of their benefits; this value has risen over time because exempt thresholds are fixed in nominal terms (Purcell, 2015).

[5] A dependent spouse or child is eligible for 50 percent of PIA, while a surviving spouse is eligible for 100 percent of PIA and a surviving child is eligible for 75 percent of PIA, up to a family maximum (150 to 180 percent of PIA).

Security benefits (ORES, 2021). Benefits are financed by a payroll tax of 12.4% of earnings up to a taxable maximum ($160,200 in 2023), shared equally among employers and employees.

The Social Security Amendments of 1983 were adopted in response to a near-term funding shortfall and long-run actuarial deficit. They included numerous provisions intended to improve the system's finances, including accelerating scheduled payroll tax increases, taxing benefits, and including government workers in the system (Svahn and Ross, 1983).[6] The two provisions most relevant to work incentives at older ages, changes to the FRA and DRC, were phased in gradually over a long period of time. The FRA increased gradually over 22 years – it was age 65 for those born through 1937, rose by 2 months a year for those born in 1938 through 1942, plateaued at age 66 for those born in 1943 through 1954, rose by 2 months a year for those born in 1955 though 1959, and reached age 67 for those born in 1960 and later. The DRC was 3 percent per year of delay for those born in 1924 and earlier, rising by 0.5 percent for every other cohort (in ten steps) until reaching 8 percent per year for workers born in 1943 and later. There was also a tweak to the adjustment for early claiming to accompany the FRA increase. To cap the benefit reduction for claiming at age 62 at 30 percent, the adjustment was lowered from 6.67 percent per year of early claiming to 5 percent per year at ages 62 and 63 (only).

A notable change to the RET arose from the Senior Citizens Freedom to Work Act of 2000. Prior to the law's passage, workers below the FRA who claimed benefits had their benefits withheld at a rate of $1 per $2 of earnings beyond some exempt amount ($9,600 in 1999; SSA, 2022). For workers above the FRA, benefits were withheld at a rate of $1 per $3 of earnings beyond a higher exempt amount ($15,500 in 1999). The 2000 law left the RET intact for workers

[6] All federal workers hired since 1987 are covered by Social Security. State and local workers may participate in Social Security if there is a Section 218 agreement in place; currently, nearly three-quarters of state and local workers are covered (IRS, 2014).

below the FRA, but eliminated it for workers above the FRA. Although withheld benefits are treated as months of claiming delay and the monthly benefit amount is later increased accordingly, there is evidence that many workers perceive it as a tax, as the RET leads to bunching near the exempt earnings limit and reduces employment (Gelber et al., 2020, 2022).

In sum, there are three relevant changes to Social Security that could have affected the incentive to work at older ages in our sample period. These include: an increase in the FRA from age 65 to age 67, an increase in the DRC from 3 to 8 percent, and the removal of the RET after the FRA starting in 2000. All of these changes affected the incentive to work at or beyond the FRA. In the subsequent sections, we describe the calculation of the ITAX measure and the HRS data before showing the effect of these reforms on ITAX for our sample.

II. The ITAX Measure, Data, and Empirical Strategy

The ITAX Measure

The central measure of the incentive to work at older ages used throughout this volume is the implicit tax rate (ITAX). ITAX is defined as the change in the net present discounted value of SSW associated with working one year longer relative to earnings. One appealing feature of ITAX is that it captures the net effect of work on wealth, which can encompass multiple effects working in opposite directions. Second, ITAX can be easily compared to other tax rates, such as the marginal income tax rate and the implicit tax rate arising from the clawback of means-tested programs (Auerbach et al., 2017), and added to other tax rates to estimate the total tax on work.

The calculation of ITAX is methodologically straightforward but involves several steps. The first step is to calculate the worker's PIA at each possible future retirement age, from age 55 through age 70. This step uses the worker's earnings history and projects future earnings to be

constant in real terms. The second step is to use the PIA to calculate the SSW associated with each retirement age. As SSW is a household measure, the calculation for married couples incorporates the spouse's retired worker and dependent benefits and accounts for all possibilities of one or both spouses being alive in the future.[7] Future benefits are discounted for both mortality risk and time preference.[8] This step incorporates Social Security payroll tax contributions, with incidence of both employer and employee shares assumed to fall on the worker. The third step is to calculate the accrual, or the difference between SSW if the worker retires next year and SSW if the worker retires today. The ITAX is the negative of the accrual scaled by earnings, so a positive ITAX value indicates that Social Security program provisions effectively create a tax on work at older ages, while a negative ITAX value indicates a subsidy.

As noted briefly above, additional work can have four different effects on SSW. First, the additional year of earnings can replace a zero or lower earnings year in the calculation of AIME, raising the PIA. Second, once the worker reaches the EEA, working one year longer implies a delay in claiming (under the assumption that workers claim when they retire), which raises the monthly benefit amount through the actuarial adjustment. Third, working longer means giving up one year of benefits (under the same assumption), which is a loss of SSW. Fourth, working longer means making another year of payroll tax contributions, which also reduces SSW. The net effect of work on SSW can therefore be positive or negative. The importance of these different effects will vary across workers depending on the Social Security rules they face as well as their earnings history, current earnings, marital status and spousal earnings history, and mortality risk.

[7] Spouses receive their own retired worker benefit plus a "top up" to the amount of the dependent spouse or survivor benefit, if larger. The calculation assumes that the spouse's retirement age is fixed at 62 to ensure that ITAX values reflect the change in SSW arising from additional work by the focal spouse only. Actuarial adjustments for early or delayed claiming are applied as relevant to all retired worker, dependent spouse, and survivor benefits.

[8] Calculations assume a 3 percent discount rate and use cohort mortality probabilities based on data from the 2012 OASDI Trustees Report.

The assumption that workers retire and claim synonymously merits scrutiny. Waldron (2020) finds that among workers from the 1937 through 1944 birth cohorts who claimed at any point during age 62, fewer than 10 percent were working at age 63.[9] Shoven et al. (2017) find that among retired workers, one quarter of the sample reports claiming and stopping work in the same month and one half reports stopping work between two years before and two years after claiming; the distribution of differences between the age of claiming and the age of stopping work is symmetric, with an average difference of 0.5 months. These studies suggest that using an assumption of synonymous retirement and claiming in these calculations is not unreasonable.

Importantly, ITAX calculations are made under the Social Security rules that apply for each birth cohort. This refers specifically to the FRA and DRC. The RET is not formally incorporated into ITAX, which is consistent with the assumption of simultaneous retirement and claiming. To the extent that the RET acts as a forced claiming delay (in that lost benefits result in a later benefit adjustment) and that the actuarial adjustment for delayed claiming is roughly fair, the RET should have little effect on SSW. However, workers' misperception of the RET as a tax means that it could affect retirement behavior. The RET literature generally finds more evidence of an intensive margin response – earnings bunching below the RET threshold – than of an extensive margin response. An exception is Gelber et al. (2022), who estimate that the RET lowers the employment rate at ages 63 and 64 by at least 1.2 percentage points. They note that the literature which uses a difference-in-differences framework to study to effect of the elimination of the RET above the FRA in 2000 largely finds little or no labor supply effect. It is beyond the scope of this project to examine the effect of the RET on labor supply, given that changes in the RET essentially have no impact on ITAX, the main incentive measure used here.

[9] Waldron (2020) reports that these age 62 claimants make up 41% of males and 49% of females in the 1944 cohort, down from 54% of males and 61% of females in the 1937 cohort.

Data and Empirical Strategy

The data for the analysis comes from the Health and Retirement Study (HRS), the premier longitudinal study of aging and health in the U.S. Launched in 1992, the HRS interviews participants every two years and adds a new cohort every six years to maintain a representative sample of about 20,000 individuals ages 50 and above. The study collects a wealth of information on health and disability, employment, income and wealth, and family structure and can be linked many other data sources. Most relevant for this analysis, Social Security earnings history data is available on a restricted basis (for respondents who have given permission, roughly two-thirds of the sample), allowing for the accurate calculation of retirement incentives.

Starting with the full sample of over 40,000 individuals who have ever participated in the HRS, we drop those with missing Social Security earnings data and those born before 1923 (or with a spouse born before 1923), who are subject to different benefit rules. Respondents contribute one observation to our person-year sample for each year between 1992 and 2015 that they are age 55 to 69 and working at the beginning of the year. We use the individual's self-reported date of retirement to identify when a retirement transition has occurred. We follow individuals until their first report of being retired (that occurs at or after age 55) and do not analyze labor force re-entry or subsequent labor force exits. The sample size is 58,000 person-year observations from the 1924 through 1960 birth cohorts.

We estimate regression models that examine the relationship between ITAX and the retirement transition:

$$retire_{iat} = \beta_0 + \beta_1 ITAX_{iat} + \beta_2 SSW_{iat} + \beta_3 X_i + \gamma_a + \gamma_t + \varepsilon_{iat}$$

where: *retire* is an indicator variable for individual *i* of age *a* in year *t* making a transition from employment to retirement; *ITAX* and *SSW* are incentive measures; *X* is a vector of individual

characteristics including indicators for marital status, having a working spouse, education, occupation, and health status, as well as total assets; and γ_a and γ_t are age dummy variables and year fixed effects. Standard errors are clustered at the household level.

The identifying assumption is that, conditional on covariates, β_1 is measuring the effect of having a stronger financial incentive to retire – a higher ITAX value – on the probability of retiring. Relative to earlier analyses such as Coile and Gruber (2004), this analysis benefits from extending the data to 2016, as the cohorts in the sample span the full implementation of the FRA and DRC increases. This longer time period provides useful policy variation for identifying the effect of interest.

III. Empirical Results

We begin with a comparison of the ITAX values computed using the HRS sample to the ITAX values in Coile (2021). The earlier analysis aimed to isolate the effect of Social Security reforms on the return to work at older ages over time by holding worker characteristics fixed. ITAX was calculated for 12 stylized sample workers who varied in gender, earnings level (low, medium, or high), and marital status and then these values were combined into a single weighted ITAX measure using weights based on the share of each worker type in the population.

Figure 3 displays the weighted ITAX measure for this composite stylized worker. In the 1980s, the ITAX for a worker age 62 to 64 was 5 to 10 percent, reflecting that the benefit of replacing a low earnings year in the AIME calculation partially offset the payroll tax contribution (12.4 percent). Once the increase in the FRA began to be phased in, the ITAX at age 62 and 63 rose, as the reduced actuarial adjustment (5 percent per year of delay rather than 6.67 percent) was insufficient to compensate for giving up a year of benefit receipt. Changes over time in the

ITAX for workers age 65 through 69 were more dramatic – ITAX values at these ages started out in the range of 25 to 30 percent and subsequently fell to 10 to 15 percent as a result of the increases in the DRC, with the 10 step changes clearly evident on the graph.

Figure 4 provides median ITAX values for the HRS sample. These calculations differ from those in Figure 3 in a number of ways. First, the stylized calculations use the same earnings and mortality probability data over time and use non-US data for these items, for greater comparability to other analyses in Börsch-Supan and Coile (2021). Second, the stylized workers are assumed to work continuously beginning at age 16, 20, or 25 (depending on whether they are a low, medium, or high earner), whereas real workers may have earnings gaps and trajectories that do not follow a smooth age-earnings profile. Real workers have greater heterogeneity in family circumstances, including spouse's age and earnings history. The relative composition of different worker types (high and low earners, married and single workers) in the population also may be changing over time; this was held fixed in the stylized calculation.

Considering the differences in the construction of the two sets of estimates, Figure 4 bears remarkable similarities to Figure 3. The ITAX at ages 62 through 64 is in the range of 10 to 20 percent and increases over time, showing the effects of the FRA increase. The ITAX values for workers ages 65 to 69 are, once again, much higher than those for workers ages 62 to 64 and show a strong downwards trajectory over time. There is a difference in scale between the two graphs, with the median ITAX rate for workers age 67, for example, falling from 60 percent to 20 percent in Figure 4 vs. from 28 percent to 9 percent in Figure 3. The most likely reason for the difference is the scaling by earnings – the age-earnings profile used in the Figure 3 calculations likely generates higher predicted earnings, especially at older ages, then the method of projecting

constant real earnings from the last observed value (e.g., using earnings observed at age 66, if available, to calculate the incentive to work at age 67), resulting in lower ITAX values.

We now turn to estimating the retirement regressions. In this analysis, we cap extreme ITAX values at 1 or -1, as values outside the range of -1 to 1 are primarily driven by very low earnings, which can generate high tax rates (in absolute value) even when the change in SSW is quite modest in dollar terms.[10] Our primary specification is a probit model, but we also show results using a linear probability model with and without fixed effects and for a probit model where we drop observations with extreme values rather than capping values at 1 or -1.

Results are shown in Table 1. The coefficient on ITAX is expected to be positive, indicating that workers who face a larger implicit tax on continued work at older ages due to Social Security program provisions and their interaction with the worker's characteristics should be more likely to retire. In Column 1, we report that a 100 percent increase in ITAX is associated with a 6.3 percentage point increase in the probability of retirement. Correspondingly, a 10 percent increase in ITAX – a change more in line with the magnitude of policy-driven changes over time as reported in Figure 3 – raises the retirement probability by 0.63 percentage points, or 7.8 percent relative to the mean annual retirement rate in the sample of 8.1 percent. Estimates on Table 1 from the other models range from 0.60 to 1.53 percentage points (for a 10 percent increase in ITAX), the largest representing an 18.9 percent effect relative to the mean.

For SSW, a positive coefficient is expected, since a worker with higher household SSW may retire earlier due to wealth effects. SSW coefficients are positive and statistically

[10] A high negative ITAX value – denoting a large subsidy to work – can arise under the circumstance that working an additional year allows the individual to reach 40 quarters and gain eligibility for Social Security benefits; however, there are few individuals reaching this benchmark after age 55 and anyone who is already eligible as a dependent spouse will not see the same spike in SSW when they reach 40 quarters. A high positive ITAX value can arise for those ages 65 and above with modest (but not ultra low) earnings if they are members of the early birth cohorts who had a low DRC, such as 3 percent, that was much less than actuarially fair.

significant, except in the model with fixed effects. The coefficient in the main probit model indicates that an additional $100,000 of SSW is associated with a 0.5 percentage point increase in the probability of retirement, or 6.2 percent relative to the mean retirement rate.

Table 2 reports results of regressions estimated separately for various subgroups within the sample. The estimated regression coefficients are significantly larger for women than men, 0.84 vs. 0.44 percentage points (for a 10 percent change in ITAX), and significantly larger for single people than married people, 1.08 vs. 0.55 percentage points. Patterns by education are less clear, with the largest effects for high school graduates; differences across education groups are not statistically significant.

In sum, we find that workers who face a stronger disincentive to continue working at older ages – as measured by ITAX – retire earlier than other workers. This finding is in line with earlier analyses in this series, such as Coile and Gruber (2004), which consistently find a relationship between retirement incentives and retirement behavior.

IV. Counterfactual Policy Simulations

Finally, we turn to the main question motivating this analysis: what share of the increase in work at older ages over the past few decades can be attributed to changes in Social Security policy? To answer this, we conduct counterfactual simulations, proceeding in several steps.

First, we use the probit estimates from Table 1 to generate a predicted retirement probability for each individual in the sample and aggregate these to obtain average predicted retirement probabilities by age and year. Next, we simulate an employment survival curve by starting with a hypothetical group of age 55 workers and applying the average predicted retirement probabilities to calculate the share who remain employed through age 69. This is done

for the first and last years of the sample, 1992 and 2015. The difference between these two baseline survival curves is the change in employment over time to be explained.

To estimate what employment would have been under an alternative scenario of no Social Security reforms, we recompute ITAX and SSW for all workers using pre-reform Social Security program parameters – a FRA of 65 and DRC of 3 percent. We generate a new predicted retirement probability for each individual using the probit estimates and these new incentive measures, aggregate them to obtain new average predicted retirement probabilities, and use these to simulate a new employment survival curve. Finally, we examine how this counterfactual survival curve compares to the baseline curves.

Figure 5 shows the predicted retirement probabilities for workers ages 65 to 69 that are generated by this process. While both the baseline retirement probabilities and counterfactual no-reform retirement probabilities trend downwards over time, the decline is smaller for the counterfactual probabilities. This occurs because, in the absence of changes to the FRA and DRC, ITAX values are higher which makes the probability of retirement higher.

The retirement survival curves are shown in Figure 6. The 2015 baseline and 2015 counterfactual curves are virtually identical through age 64, reflecting the fact that the underlying average predicted retirement probabilities at younger ages are very similar in the two scenarios since the FRA and DRC reforms had little effect on ITAX below age 65. For ages 65 through 69, the employment survival curve under the counterfactual scenario of no reforms is lower than the survival curve in the baseline scenario, consistent with the higher retirement probabilities in the counterfactual scenario shown in Figure 5. Finally, the share of increased employment since 1992 for individuals age 65 to 69 that can be attributed to reforms is calculated as the difference between the 2015 baseline and 2015 counterfactual curves relative to the difference between the

1992 and 2015 baseline curves. This share is about 20 percent, indicating a role for Social Security reforms that is meaningful but ultimately modest relative to the overall magnitude of employment changes at ages 65 to 69.

One potential limitation of the approach used in this study is that it only captures the effect of Social Security reforms that operate through changes in ITAX. If there were a strong social norm to retire at the FRA despite the lack of a financial incentive to do so, for example, then changes to the FRA could change behavior through a social norm channel that would not be captured in this analysis. The finding of persistent "stickiness" at the old FRA of 65 (Deshpande et al., 2021) provides some reassurance that the empirical importance of this social norm channel may be limited.

V. Conclusion

The question of how Social Security reforms have affected retirement behavior is part of an ongoing conversation about the causes and consequences of working longer in the U.S. (Berkman and Truesdale, 2022; Bronshtein et al., 2019; Coile, 2019; Munnell and Sass, 2008; Rutledge et al., 2015). As noted by Munnell (2022) and others, the factors most frequently cited as contributors to the working longer trend in the U.S. include: changes to Social Security; a shift among employer-sponsored pension plans from defined benefit plans (which often feature strong incentives to retire at particular ages) to defined contribution plans (which lack such incentives); the decline in employer-sponsored retiree health insurance (which had permitted some workers to retire before reaching Medicare eligibility at age 65); increases in education and a shift to less physically demanding jobs; improvements in health and longevity; and rising labor force

participation among women at all ages (which may induce men to work longer due to couples' preference to retire together).

This study aims to provide new evidence as to the importance of Social Security policy changes as a driver of longer work lives in the U.S. This research complements earlier studies that have gauged Social Security's role by comparing the behavior of cohorts experiencing different program provisions (e.g., Deshpande et al., 2020; Duggan et al., 2021). The approach taken here involves reporting how reforms have affected the incentive to work at older ages, estimating retirement regressions relating retirement incentives to retirement behavior, and using the regression estimates to project retirement behavior under an alternative regime without Social Security reforms.

The paper's key findings are that increases in the FRA and DRC have reduced the implicit tax on work at older ages over time, that retirement behavior is responsive to the implicit tax rate, and that the changes in the implicit tax rate that have resulted from from Social Security reforms can explain about one-fifth of the increase in work at ages 65 to 69 that has occurred since 1992. By contrast, Social Security reforms are not projected to have contributed to increases in labor force participation at ages 60 to 64, in that reforms have largely not affected the incentive to work at these ages.

These findings imply that changes in Social Security have played a meaningful role in the working longer trend, but that other factors are collectively responsible for most of the increase in work at older ages. This conclusion differs from the results for many of the other countries surveyed in this volume, but is consistent with the modest nature of Social Security reforms in the U.S.

One of the most intriguing questions going forward is whether the working longer trend in the U.S. has now largely played itself out, as suggested by Munnell (2022). As she notes, past Social Security reforms have been fully phased in, so their effect is now incorporated in current behavior. Future reforms to respond to long-term fiscal challenges could have their own effect on employment at older ages, depending on how they affect the incentive to work at older ages.

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Figure 1: US Male Labor Force Participation Rate by Age, 1990-2019

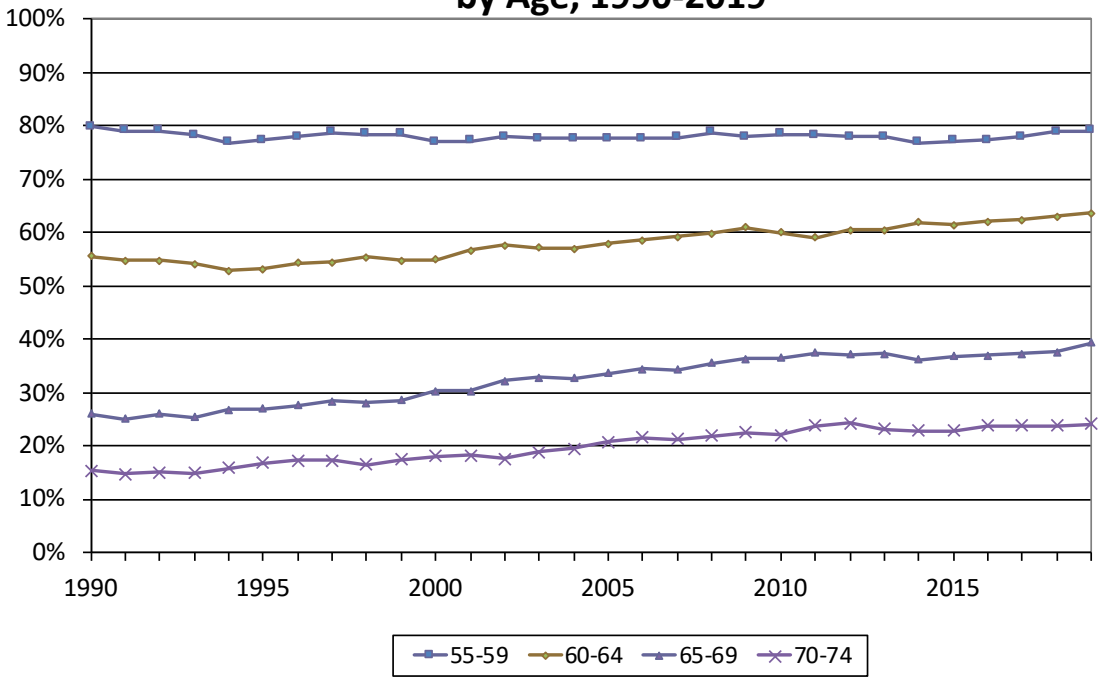
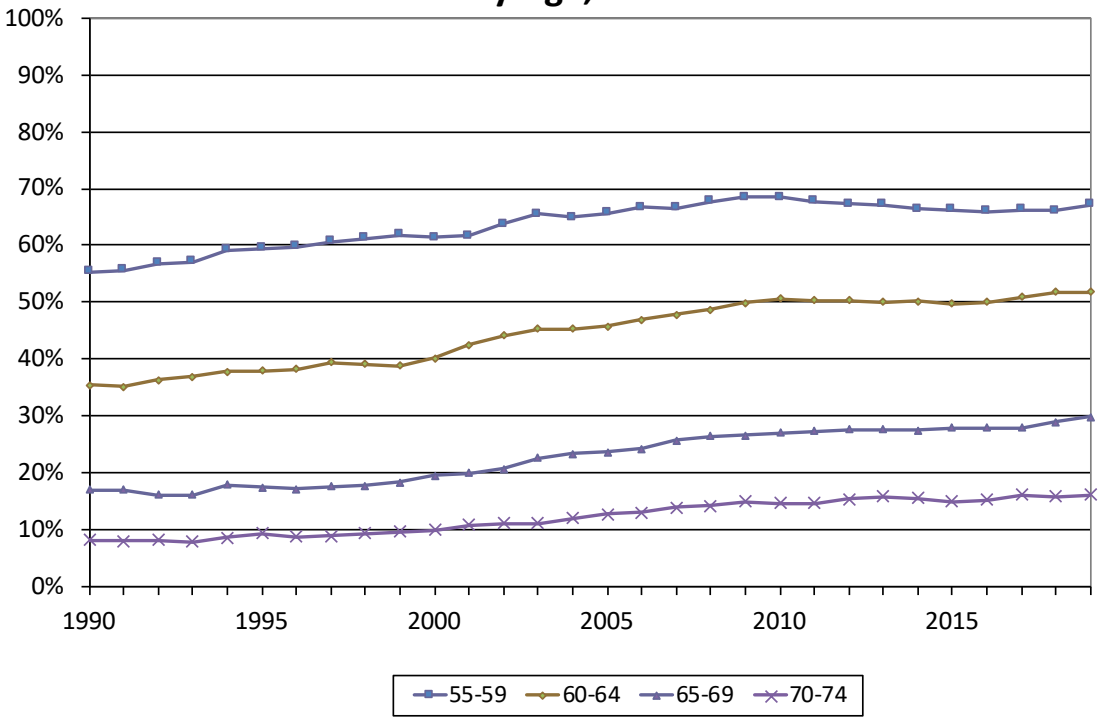
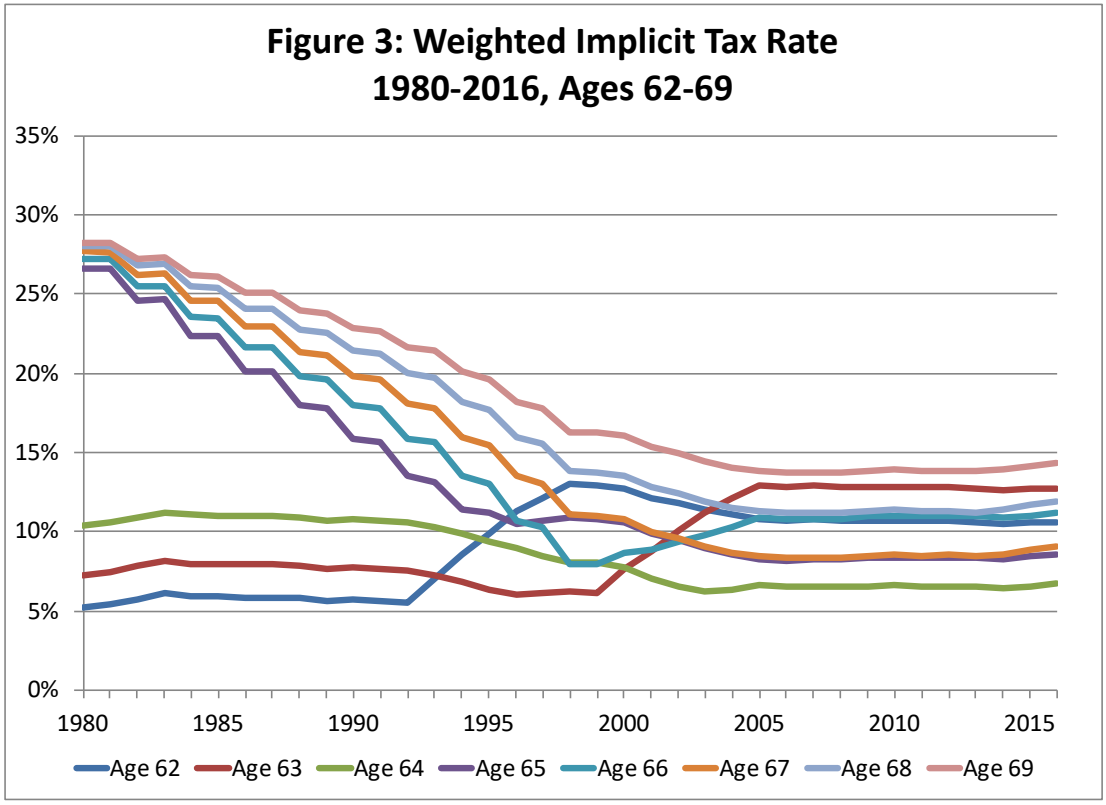


Figure 2: US Female Labor Force Participation Rate by Age, 1990-2019





Source: Coile (2021)

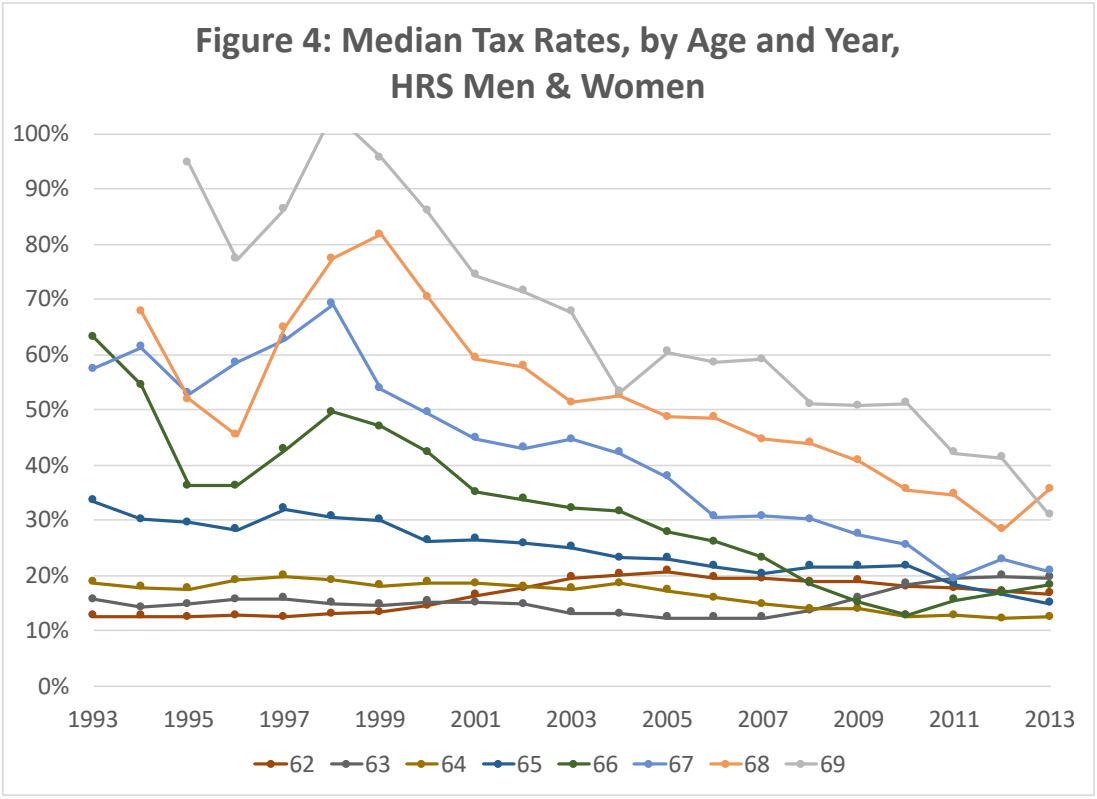


**Figure 5: Probability of Retirement at Ages 65-69,
By Year, Predicted vs. Counterfactual**

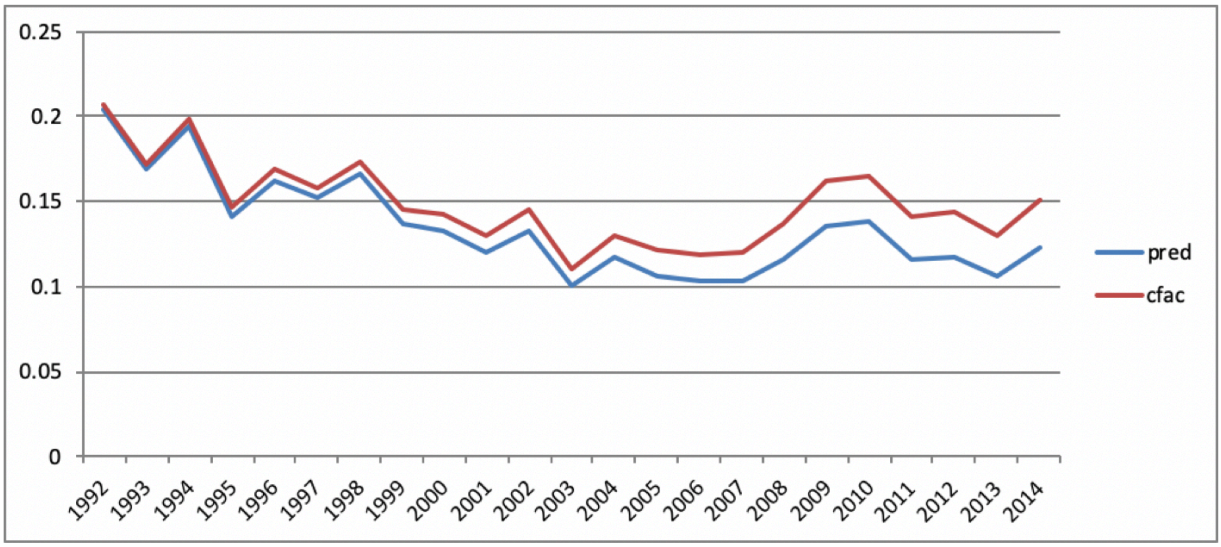


**Figure 6: Employment Survival Curves
Predicted 1992 and 2015 and Counterfactual 2015**

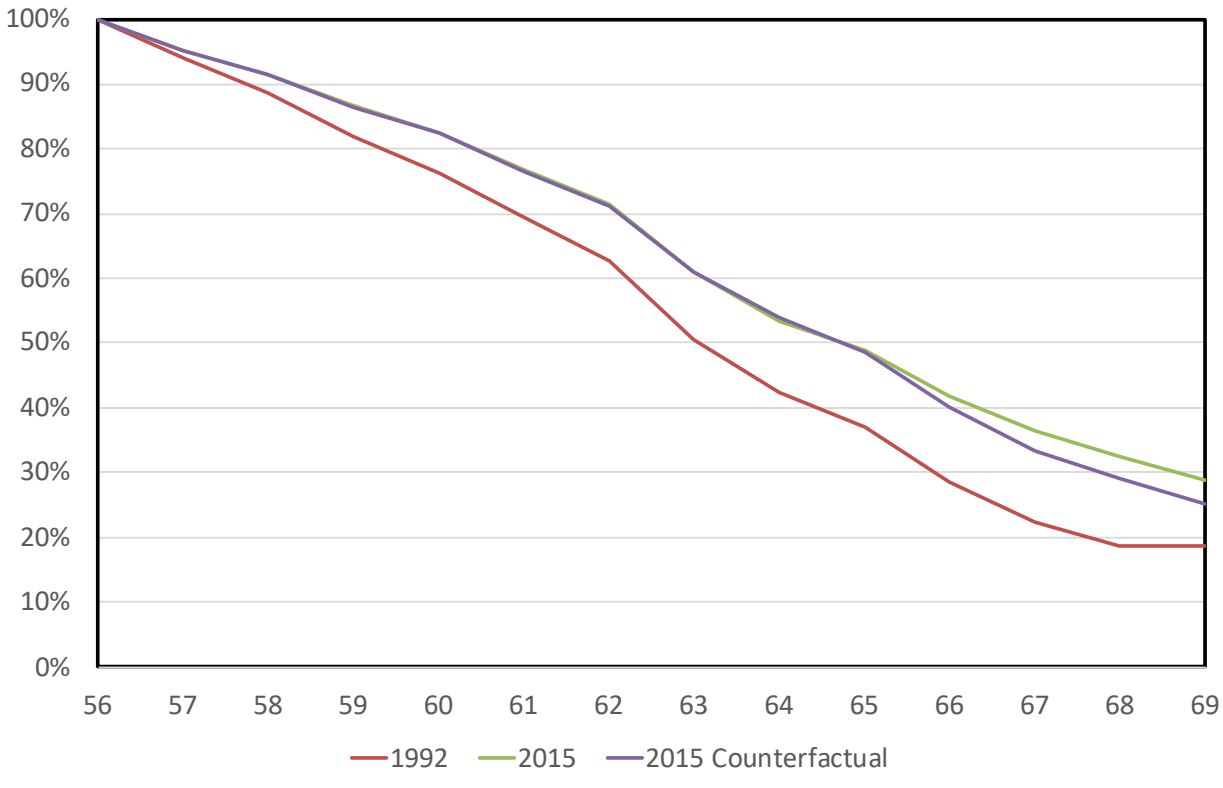


Table 1: Retirement Regressions				
	Full Sample (Men and Women)			
	Probit	Probit	LPM	LPM
		Drop Outliers		with FE
	(1)	(2)	(3)	(4)
Tax	0.063	0.060	0.093	0.153
	(0.005)	(0.007)	(0.008)	(0.007)
PDV ($100K)	0.005	0.006	0.005	-0.004
	(0.001)	(0.001)	(0.001)	(0.004)
Age Dummies	X	X	X	X
Health Dummies	X	X	X	X
Other Xs	X	X	X	X
Year Dummies	X	X	X	X
Mean of Y	0.081	0.081	0.081	0.081
# of Obs	57,996	55,358	57,996	57,996

Notes: All specifications cap tax at plus/minus 1, except the drop outlier specificationm, which drops these observations instead. Health dummies are indicators for self-reported health. Other Xs include: female, married, spouse working, assets, occupation dummies, and education dummies.

Table 2: Retirement Regressions, by Group					
	Group				
	All	Men	Women	Single	Married
Tax	0.063	0.044	0.084	0.108	0.055
	(0.005)	(0.007)	(0.007)	(0.014)	(0.006)
	All	Single Men	Single Women	Married Men	Married Women
Tax	0.063	0.103	0.112	0.038	0.079
	(0.005)	(0.025)	(0.017)	(0.008)	(0.008)
	All	<HS	HS Grad	Some College	College
Tax	0.063	0.043	0.076	0.069	0.050
	(0.005)	(0.015)	(0.009)	(0.011)	(0.008)
Note: Results are from a probit model with the same covariates as in Table 1					