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ABSTRACT

Employment rates of older men and women in the U.S. have been rising for the past several decades. Over the same period, there have been significant changes in Social Security and private pensions, which may have contributed to this trend. In this study, we examine how the financial incentive to work at older ages has evolved since 1980 as a result of changes in Social Security and private pensions. We find that the implicit tax on work after age 65 has dropped by about 15 percentage points for a typical worker as a result of Social Security reforms; incorporating the change in private pensions, the decline is larger. We provide suggestive evidence that the evolution of retirement incentives has affected retirement behavior.

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When the Social Security Act was last amended in 1983, the labor force participation rate of older men in the U.S. was at a historic low, having fallen throughout the preceding century (Costa, 1998). Primarily intended to put the Social Security system on firmer financial footing, the 1983 Amendments included several provisions that altered the financial incentives to work and delay Social Security benefit claiming at older ages. A subsequent law, the Senior Citizens' Freedom to Work Act of 2000, made changes to the Social Security retirement earnings test, also affecting these incentives.

A second striking change to the retirement landscape since 1980 has been the shift in employer-provided pensions from defined benefit (DB) to defined contribution (DC) plans. By one estimate, the share of workers with a DB plan fell from 83 percent in 1980 to 39 percent in 2004 (Munnell and Perun, 2006). The incentives for continued work at older ages are quite different in the two types of plans, as DB plans typically grow in value – sometimes quite significantly – until the worker reaches the plan's early or normal retirement age and decline thereafter, while DC balances continues to grow with additional work at any age.

In the three and a half decades since the passage of the 1983 Amendments, employment rates for men and women in their 60s have risen dramatically, as seen in Figures 1 and 2. While the changes in Social Security and private pensions since the early 1980s present one potential explanation for this trend towards longer work lives, there are alternative hypotheses as well. As mortality rates decline, people may be healthier and more able to work at older ages, or see a need to retire later in order to finance a longer expected retirement. As the education level of the population rises, increases in work at older ages may follow, as those with more education tend to retire later (Rutledge, 2018).

As women's engagement in the labor force grows, husbands may choose to work longer due to the complementarity of leisure between spouses (Schirle, 2008). Identifying the contribution of each of these factors to the trend of longer work lives presents a significant challenge (Coile, 2018).

In order to assess how changes to Social Security and private pensions have contributed to the rising employment of older men and women over the past several decades, it is useful to document how the financial incentive to work at older ages has been affected by these changes. The goal of this study is to examine the evolution of retirement incentives from 1980 to the present and to begin to explore the possible connection between changes in incentives and employment trends over this period.

To isolate the effect of Social Security reforms on the return to work at older ages, we focus first on a median earner male and female worker, holding their earnings histories fixed over time but incorporating changing Social Security rules in order to create a time series of retirement incentives. We examine how incentives differ for high or low earners and by marital status, and also show how the addition of private pensions alters retirement incentives. The key incentive measure is the implicit tax rate on work (ITAX), which measures the change in the net present discounted value of social security wealth (SSW) associated with working an additional year, relative to earnings.

We have several findings. First, at a given point in time, the implicit tax on work varies by age in ways that correspond to Social Security program provisions. Second, Social Security reforms have reduced the implicit tax on work after age 65 by about 15 percentage points since 1980, while leaving the tax rate at other ages relatively unchanged. Results are fairly similar across earnings type and marital status. Third, incorporating DB

pensions can result in significantly higher implicit tax rates after age 65. Therefore, the shift from DB to DC pensions has also served to reduce the implicit tax on work after age 65. Finally, there is suggestive evidence that changes in retirement incentives may be associated with changes in employment, although further research is needed to more definitively establish this relationship.

I. Background

Social Security and Private Pension Provisions

When President Reagan signed the Social Security Amendments of 1983 into law, the Old-Age, Survivors, and Disability Insurance (OASDI) program was three months away from not being able to pay full cash benefits on time and faced an estimated deficit of 1.8 percent of taxable payroll over the next seventy-five years (Svahn and Ross, 1983). The urgent need to shore up the system's finances motivated the 98th Congress to pass the amendments just three months after receiving recommendations from a national reform commission.

While financial concerns were of primary importance, a desire to increase the incentive to work at older ages was a secondary motivation for at least some players. In announcing the administration's reform proposals in 1981, secretary of Health and Human Services Richard Schweiker declared that the reforms would "keep the system from going broke, protect the basic benefit structure, and reduce the tax burden of American workers" (Svahn and Ross, 1983). Although the final law differed from the administration's proposal in numerous ways, it included multiple provisions that affected the incentive to work at older ages.

A brief (and necessarily incomplete) overview of Social Security rules as of 1983 is useful before explaining the changes brought about by the 1983 Amendments. Individuals who have 10 years (or more precisely, 40 quarters) of earnings in covered employment are eligible for Social Security retired worker benefits. The benefit amount is based on the worker's highest 35 years of earnings, where past earnings are adjusted by a wage index; average earnings are translated into a basic monthly benefit, the Primary Insurance Amount (PIA), by applying a progressive, non-linear formula. Workers who claim at the Full Retirement Age (FRA), traditionally age 65, receive a monthly benefit equal to the PIA. The benefit may be claimed starting at age 62, but is reduced by 6.67 percent for each year of receipt prior to the FRA. Claiming after the FRA raises the benefit through the delayed retirement credit (DRC), traditionally by 3 percent per year of delay. A dependent or surviving spouse of a retired worker receives a benefit of 50 and 100 percent, respectively, of the worker's PIA, subject to actuarial adjustment for early claiming. An individual who is dually entitled to retired worker and spouse or survivor benefits receives her or his own benefit plus a top up to the amount of the other benefit (if larger), not the sum of the two. For consistency with other papers in this volume, we note that FRA is equivalent to the term Statutory Eligibility Age (SEA) used elsewhere.

One important change brought about by the 1983 Amendments was an increase in the DRC. As shown in Table 1, the increase was phased in over time in increments of 0.5 percent every two years, rising from 3 percent per year of delay (for those born by 1924) to 8 percent (for those born in or after 1943). This change significantly increases the return to delaying claiming past the FRA (Shoven and Slavov, 2014). While an individual could obtain the benefit of delayed claiming without changing his or her retirement behavior, in

practice most people claim at or shortly after retirement (Coile et al, 2002), even if they have financial resources that would allow them to delay claiming (Goda et al, 2018).

A second change was an increase in the FRA from 65 to 67. This change is being phased in over a longer period of time, rising in increment of 2 months per year from 65 (for those born by 1937) to 66 (for those born by 1943) and later from 66 to 67. As the FRA rose, the actuarial adjustment was tweaked such that the benefit would be reduced by 6.67 percent per year for the first 3 years of early claiming and by 5 percent per year beyond this (e.g., for a total reduction of 30 percent, not 33.3 percent, for claiming at 62 with a FRA of 67). The effects of this change on the incentive to continue working are discussed below. Finally, the 1983 Amendments accelerated a scheduled increase in the payroll tax; it rose from 6.7 percent of earnings (up to a taxable maximum) on both employer and employee in 1983 to 7.65 percent each (or 15.3 percent total) by 1990.

Social Security benefits are subject to an earnings test. Traditionally, benefits have been reduced by \$1 for each \$2 of earnings above a threshold amount, with a higher threshold above the FRA than below it. Starting in 1990, the reduction of benefits was changed to \$1 for each \$3 of earnings above the FRA, and then in 2000, the earnings test above the FRA was eliminated by the Senior Citizens' Freedom to Work Act of 2000. Although benefits lost to the earnings test are treated as additional months of claiming delay and the monthly benefit amount is subsequently recalculated to reflect this, this provision appears to be poorly understood (Liebman and Luttmer, 2012). The changes in the earnings test thus reduced the perceived (if not actual) tax on work after the FRA.

While Social Security is the dominant retirement income program in the U.S., with 84 percent of households with members ages 65 and above receiving benefits, employer-

provided pensions are also quite important, with 44 percent of older households receiving non-Social Security retirement benefits (Social Security Administration, 2016). Workers who participate in a pension plan must consider how continued work at older ages affects their entitlement to future pension as well as Social Security benefits.

Pension plans are established by firms operating within government guidelines, and thus plan provisions vary by employer. In a DB plan, key features include the vesting period (years of service required for future benefit eligibility), retirement eligibility provisions (age and/or years of service required to initiate benefit receipt), and benefit formula (often a function of average earnings over the final or highest few earnings years) (Mitchell, 1999). Plans may include an early and/or normal retirement age and often feature higher pension accruals in the years before attaining these ages and lower accruals thereafter. This pattern can create strong financial incentives to stay with the firm until attaining these ages and to leave the firm thereafter (Stock and Wise, 1990). In a DC plan, key provisions include the employer contributions to the retirement account and whether they are made automatically or only as a match to employee contributions, as well as the withdrawal options when the employee leaves the job. Critically, DC plans lack strong incentives to work to or retire at particular ages that are present in many DB plans.

Over the past thirty-five years, there has been a dramatic shift in private pension plan coverage, as shown in Figures 3 and 4.¹ While the share of private-sector workers participating in any employer-sponsored pension plan (DB only, DC only, or DB and DC) has remained roughly constant at 45 to 50 percent, the share with only a DB plan

¹ Data on private pensions is from the Employee Benefit Research Institute (<https://www.ebri.org/publications/benfaq/index.cfm?fa=retfaq14fig1>). The data they report is for all private sector workers and is not age- or sex-specific, so the same pension data is used for Figures 3 and 4.

plummeted from 28 percent in 1980 to 2 percent in 2014. Meanwhile, the share with only a DC plan rose from 9 percent to 34 percent and the share with both a DB and DC plan remained roughly constant. Thus, the share with any DB plan (DB only or DB and DC) fell from 39 percent of private-sector workers in 1980 to 13 percent in 2014.² Due to DC plans' lack of strong age-based incentive, the shift over time from DB to DC plans in the private sector workforce has the potential to significantly affect the incentive to work at older ages.

Figures 3 and 4 also illustrate what programs workers turn to for retirement income when they exit the labor force, which we term pathways to retirement.³ The share of workers who exit via the Disability Insurance (DI) pathway has risen over time, from 8 to 16 percent for men and from 11 to 17 percent for women. As already noted, nearly half of private sector workers have a pension of some kind, typically in addition to Social Security. Thus the share of male and female workers who exit the labor force and receive Social Security but do not have access to pension income or assets is estimated to be 36 and 38 percent, respectively. This share has declined over time due to the increased use of DI.

Employment Trends

Before exploring how the changes in Social Security and pension provisions have affected the financial incentive for work at older ages, it is useful to take a closer look at trends in employment for older men and women, as illustrated in Figures 1 and 2. For

² The public sector has not experienced a similar change, as the vast majority of its employees continue to have a DB plan (Munnell et al., 2014).

³ Data on Disability Insurance (DI) is from the Social Security *Annual Statistical Supplement, 2017* (Table 6.B.5, disability conversions). Figures 3 and 4 assume that all workers receive Social Security (SS), although a small percentage of individuals (an estimated 4% in 2010) will never receive SS, usually because they are late-arriving immigrants or infrequent workers (Whitman et al., 2011). For simplicity, Figures 3 and 4 also assume that DI recipients do not receive pensions.

older men, employment at ages 60 to 64 and 65 to 69 exhibits a distinct U-shape over time, with declining employment initially but rising employment beginning in the mid-1990s for the younger group and in the mid-1980s for the older group.⁴ Employment has risen by 10 or more percentage points in both of these groups between the trough and 2016, from 50 to 60 percent in the case of men ages 60 to 64 and from 24 to 36 percent in the case of men ages 65 to 69. Any effects of the recent Great Recession are not apparent in these two series. For men ages 55 to 69, the trend is quite different, as employment declined during the first half of this period and has been more or less steady since, with a noticeable impact of the Recession and gradual recovery. The divergent pattern for this group is mostly likely related to other factors that are affecting the labor market for prime age men in the U.S. (CEA, 2016), rather than a reflection of the effect of changing retirement incentives.

The trend over time for women does not exhibit a U-shape. Rather, women's employment rates have risen more or less continuously, with an increase among women ages 55 to 59 evident beginning in the early 1980s and an increase among women 60 to 64 and 65 to 69 evident beginning in the late 1980s. The magnitude of the increase for women is substantially larger than that for men, with employment rising by 20 points for women ages 55 to 59 and by 18 and 16 points, respectively, in the 60 to 64 and 65 to 69 age groups. The trend appears to have slowed or stalled since the Great Recession for the two younger groups, perhaps reflecting the impact of that event. Some of the steady rise over time in employment at older ages reflects cohort effects, as successive cohorts of younger

⁴ While sampling variation makes it difficult to be certain from Figure 1 that the increase for the older group began in the mid-1980s, labor force participation rates from the Bureau of Labor Statistics (series LNU01300190) confirm that the trough occurred in 1985.

women increased their labor force participation for various reasons, and women who work more when they are young also work more when they are older (Goldin and Katz, 2018).

In sum, over the past thirty-five years, there have been numerous changes to Social Security and private pensions that have affected the return to work at older ages. The employment rates of older men and women have climbed steadily over much of the same period. Ascertaining how much of the latter trend can be explained by the former is the ultimate objective of this paper and the larger research agenda of which it is a part.

II. Methodology

To begin to explore the connection between these trends, we aim to calculate a time series of retirement incentives from 1980 to the present. We make these calculations for a small number of sample worker types – first, for a married male worker with median earnings and a married female worker with median earnings, and then for high and low earners and for single individuals, to show how incentives vary with earnings history and marital status. As explained more below, the three earner types correspond to high, medium, and low education individuals.

As our goal is to show how changes in Social Security policy and employer-provided pensions have affected retirement incentives, we initially make these calculations holding the earnings history fixed over time. In so doing, we distinguish the effect of policy and pension changes on incentives, as separate from any changes in incentives that may arise from other trends such as rising income inequality or changing mortality. This shows, in the case of Social Security, the direct effect of reforms, which may be undone or magnified by future reforms.

For comparability with the other studies in this volume, we first make the calculations using a common synthetic earnings profile. More specifically, we use a common age-earnings profile that is scaled to one at age 50 and apply it to U.S. median earnings at age 50 to generate the U.S. version of the common earnings profile.⁵ This is done so that the level of earnings is appropriate for each country, but differences across countries in retirement incentives will otherwise reflect differences in public pension provisions rather than in age-earnings profiles. This process is repeated for the three earner types and two sex groups; positive earnings begin at ages 16, 20, and 25 for the low, median, and high earner types, respectively, corresponding to the ages at which they are assumed to have completed their education and entered the labor force. Appendix Figures 1 and 2 show the earnings profiles for the low, median, and high earning male and female worker types, contrasting the common earnings profile with one based only on U.S. data.

The central incentive measure for this paper is the implicit tax rate, denoted ITAX. Calculating this measure is methodologically straightforward but involves several steps. The first step is to calculate the Social Security benefit that the individual is entitled to at each possible retirement age from age 55 to age 69 using the Social Security benefit formula. As the basic benefit entitlement (PIA) is based on the best 35 years of indexed earnings, additional work may increase the benefit by replacing a zero or low earnings year in the calculation.

⁵ As explained in more detail in the appendix to the introductory chapter in this volume, the synthetic earnings profile is calculated using data for the U.S., Germany, and Italy. As the age-earnings profiles in the three countries are fairly similar by age, we use the simple average of these profiles, smoothed to prevent artificial spikes at older ages. Earnings are kept flat at higher ages when selection effects dominate the data. The median U.S. earnings at age 50 used to create the U.S. version of the common synthetic earnings profile are \$48,200 for men and \$39,400 for women.

The second step is to calculate the net present discounted value of Social Security Wealth (SSW) associated with each possible retirement age. The individual is assumed to claim Social Security benefits when he or she retires, or at age 62 if retiring before that age. We use a discount rate of 3 percent. We use common (rather than U.S.) survival probabilities to purge the cross-country comparisons that are made elsewhere in this volume of the effect of mortality differences across countries.⁶ For a married individual type, we assume that he or she is married to another individual of the same education level (or earner type), where the wife is three years younger. For the purpose of calculating the individual's own incentives, we treat the spouse's retirement behavior as fixed and assume that the spouse retires at age 62, to ensure that calculations reflect the effect of the change in the worker's own retirement behavior and not that of the spouse (as could be the case if we assumed joint retirement, for example). SSW is net of Social Security payroll tax contributions and we assume full incidence of payroll taxes (employer and employee share) on the worker.

Working another year has multiple effects on SSW. First, the individual pays an additional year of payroll taxes. Second, the Social Security monthly benefit amount may increase, as discussed above. Third, the individual forgoes one year of benefit receipt for an additional year of work beyond age 62. Fourth, the monthly benefit amount increases due to the actuarial adjustment (pre-FRA) or to the DRC (post-FRA). The net effect of additional work on SSW thus may be positive or negative, depending on the relative

⁶ The survival probabilities are provided by Eurostat and refer to the EU29 countries. The rates are adjusted to generate a life expectancy that is 3 years higher (lower) to reflect differences in life expectancy across the three education groups. This adjustment is a mixture of a proportional increase (decrease) of survival rates and a shift of the survival curve to the right (left). These values are used to calculate the conditional probability that a 55-year-old will be alive at every future age from age 56 to age 100.

importance of these different factors. The accrual refers to the change in SSW that results from working one additional year. It is computed for each age, 55 to 69.

Finally, the ITAX is calculated as the negative of the accrual, scaled by earnings. A positive ITAX indicates that Social Security taxes work at older ages – any increase in the benefit amount that results from additional work is not enough to compensate for extra payroll taxes and the loss of a year of benefits, so the system effectively penalizes work at older ages. A negative ITAX indicates the reverse, that SSW is rising with additional work. The scaling by earnings is done so that ITAX is a tax rate, comparable, for example, to the marginal income tax rate. ITAX is also calculated for each age, 55 to 69.

This calculation is done under a given set of Social Security rules, say those in effect in 1980. We then repeat the calculation using the rules in effect in 1981, 1982, etc. through 2016 to generate a time series of retirement incentives, where the variation in ITAX comes only from changes in the Social Security rules. This calculation is repeated for the twelve sample worker types: male/female, low/median/high earner, and single/married.

The first set of calculations is done without pensions, so that they reflect the retirement incentives for an individual who either does not have a pension or has a DC pension.⁷ However, it is also important to calculate incentives for workers with a DB pension, since as noted above the decline in DB pensions is an important change in the retirement landscape since 1980.

To do so, we calculate incentives using a sample DB pension plan. Naturally, a calculation using a single sample plan will not be able to capture the diversity of retirement

⁷ In excluding DC pensions from the retirement incentive calculation, we are effectively treating employer contributions (whether automatic or matching) to a DC plan as similar to receiving a higher wage. While DC pension contributions from employers clearly affect the employee's welfare, they do not change the dynamic incentives to retire at particular ages, which are the focus of this paper.

incentives facing the population of workers, given that DB plan provisions vary by employer. Indeed, calculating incentive measures using workers' heterogeneous earning histories and heterogeneous DB plan provisions and then examining the effect of the actual (not simulated) incentives on behavior in a large sample is an important task left for future research. However, by calculating incentives using a sample plan with features that are common to many DB plans, this exercise will capture the essence of the incentives facing many (if not all) workers.

The assumptions for our sample DB pension plan are as follows, informed by typical plan parameters of this era (Bureau of Labor Statistics, 1993). The basic benefit amount is based on the average earnings during the last five years of service (YOS) – more specifically, it is equal to 2 percent times YOS times average earnings. This plan has an early retirement age of 55 (meaning benefits are first available then) and a normal retirement age of 65, with an actuarial reduction of 4.8 percent per year of receipt before the normal retirement age; delay beyond 65 does not result in an actuarial adjustment, although the benefit amount may still rise if wages are rising. A worker with 30 YOS, then, would have a benefit equal to 60 percent of her average earnings in the final five years of work if she retires at (or after) age 65, but only 36 percent of average earnings if she retires at age 60. While the ITAX calculation is needed to see the exact tax or subsidy at different ages, it is evident from this overview of the plan rules that the incentive (or disincentive) for work in a plan such as this will vary substantially by age.

III. Results

Retirement Incentives by Age, Worker Type, and Pension Status

We now turn to the results, beginning with a married male median earner who is subject to the Social Security rules in place in 1980 and does not have a DB pension. In Figure 5, we report the benefit accrual by age for this worker, prior to incorporating payroll tax contributions. This figure shows the effect of having another year of earnings incorporated in the calculation of the PIA (relevant at all ages) as well as the effect of delayed claiming (relevant starting at age 62). As noted above, delayed claiming has an ambiguous effect on SSW since the worker forgoes one year of benefits now but receives a higher benefit for the rest of his life through the actuarial adjustment or DRC.

For a worker of this type, working at age 55 results in an increase in SSW of approximately \$2,000 (ignoring additional payroll taxes). This is the total effect of the higher PIA in present discounted value terms – that is, by retiring at age 56 instead of at age 55, this worker will have a slightly benefit when he or she claims at age 62, and will continue to receive this higher amount for the rest of his or her life. This positive accrual declines with age, since as the worker’s earnings history gets longer, there are fewer zeroes or low earnings years left to replace with a current earnings year. In fact, for this median earner, the value of replacing a low earnings year quickly approaches zero.

At age 62, the benefit accrual rises to about \$4,500, reflecting the value of delayed claiming. The benefit accrual declines just a bit at ages 63 and 64, since the adjustment factor is constant but mortality increases slightly at each age. However, the benefit accrual turns sharply negative at age 65, as the DRC of 3 percent per year in place in 1980 is insufficient to compensate the worker for the certain loss of a year of benefits at age 65 (unlike the more generous adjustment of 6.67 percent at ages 62 to 64). By working at ages 65 to 69, the median male worker is losing \$6,000 to \$7,500 of SSW per year of work.

In Figure 6, we incorporate payroll tax contributions and report the ITAX rather than the benefit accrual. With a payroll tax rate being (roughly) 10 percent in 1980, the implicit tax on work reaches 10 percent by age 57, drops to 0 percent at age 62, and then jumps to 20 percent at age 65 and rises slowly thereafter. In short, the Social Security system in place in 1980 is roughly actuarially fair at age 62 for a typical male worker (using our mortality and discount rate assumptions), but imposes a tax rate of over 20 percent on work by that individual beyond the FRA.

Figure 7 reports the results for low, median, and high earner married males, reflecting sample workers with different levels of education. For the median and high earner types, the tax rate prior to age 62 is very slightly lower than that for low earners, as median and high earners began their careers later and have steeper age-earnings profiles, and thus have more to gain from replacing a zero or low earnings year in the benefit calculation; however, the magnitude of the difference in ITAX is quite small. Starting at age 65, however, the implicit tax on work is about 6 percentage points lower for the high earner as compared to the low earner. This difference arises primarily because of their different survival probabilities, which makes the DRC of 3 percent somewhat less unfair for the high earner type, though it remains less than actuarially fair for all three types.

Figure 8 augments the previous figure by adding the results for married women of all earner types to those for married men. Up through age 61, tax rates are similar across both sex groups. At ages 62 to 64, however, the tax rates for married women are higher than those for married men – at age 62, for example, the tax rate is about 12 percent for a married female median earner vs. near 0 percent for a married male median earner.

To understand why this is the case, it is useful to turn to Figure 9, which displays results for the six female types, who vary by marital status and earner type. The tax rates for single women are very similar to those of married men (seen on Figures 6, 7, and 8). However, switching women from single to married raises the implicit tax rate. By construction, the single and married women of a given earner type differ only in their marital status, that is, only in their access to dependent spouse and survivor benefits through their husband. In fact, it is precisely because married women have access to these benefits that they have less to gain from delaying claiming beyond 62, and thus they face higher tax rates. Returning to Figure 8, the women also face higher implicit tax rates at ages 65 and above as compared to the men.

Figure 10 shows the implicit tax rate calculated using the U.S. earnings histories vs. the common earnings profile, for married men of all earner types. As the results are extremely similar across the two earnings history calculations, we focus on the common earnings results for the remainder of the paper.

The results presented thus far reflect Social Security incentives only. In Figure 11, we show the incentives inherent in a typical DB pension plan, focusing on a married male median earner. We first examine the incentives of the pension plan on its own before combining the pension incentives with those from Social Security. At ages prior to age 65, the pension plan's normal retirement age (NRA), there is a large subsidy to continued work. At age 55, for example, the increase in pension wealth resulting from an additional year of work is equivalent to a subsidy of over 25 percent of earnings. The large subsidy arises because the actuarial adjustment for delaying retirement and claiming before the NRA is more than sufficient to compensate for the loss of a year of benefits. The subsidy

falls slowly with age, since the actuarial adjustment factor is age-invariant but the worker has less to gain from receiving a higher future benefit for the rest of his life when he is older and his remaining life expectancy is shorter. Even so, for our sample plan and worker, the subsidy remains positive through age 64.

At age 65, the plan's NRA, the small implicit subsidy is replaced by a large implicit tax of about 25 percent. The reason for the jump in ITAX is that there is no further actuarial adjustment for delayed claiming beyond age 65. While the worker may benefit slightly from a higher average wage in the benefit formula if his wages are still rising with age, this is far from sufficient to compensate for the certain loss of a year of benefits. Incorporating the incentives from both Social Security and pensions, this worker faces a subsidy that declines from about 17 percent to near 0 over ages 55 to 64, and then jumps to a tax of 45 to 50 percent at ages 65 and above. When one considers that this worker is also subject to federal and state income taxes, the total marginal tax rate on work past age 65 is extremely high.

Changes in Retirement Incentives Over Time

While the preceding discussion helps to clarify how Social Security and private pension provisions translate into implicit taxes or subsidies for workers of various types at a given moment in time, they do not shed any light on how incentives are changing over time. It is this question we turn to next. In Figures 12-15, we show how the implicit tax rate by age has varied over time. These figures reflect Social Security incentives only.

Rather than focus on one worker type, we show the implicit tax rate weighted across the twelve sample worker types using population weights.⁸

Figure 12 shows the weighted implicit tax rate for the years 1980 through 1989. This is the time period during which the increases in the DRC began to be phased in. The various ITAX series are visible for only 5 of the 10 years, since the DRC was increased by 0.5 percentage points every other year; by construction, the ITAX is unchanged unless Social Security program provisions are changing, so the values for adjacent years (e.g., two years with the same DRC value) are the same. The first four DRC increases (from 3 to 5 percent) lowered the implicit tax on work at age 65 by 9 percentage points, from 27 to 18 percent, and reduced the tax on work at age 66 to 69 as well.

Figure 13 shows the change in the weighted implicit tax rate during the 1990s. The additional increases in the DRC are again clearly reflected in reduction in tax rates after age 65. The unusual pattern around age 62 is driven by the increase in the FRA from 65 to 66. Due to the decrease in the actuarial adjustment from 6.67 percent per year to 5 percent per year for early claiming beyond 36 months (see discussion above), there is a rising tax on work at age 62, as each 2-month increase in the FRA results in more of the age-62 delay being credited at only 5 percent instead of the previous 6.67 percent. Over the decade, the implicit tax on work at age 62 rises by 7 percentage points. Figure 14 shows the weighted ITAX for the 2000s. There are modest additional changes as the FRA increase continues to be phased in. Finally, Figure 15 shows the weighted ITAX for the years 2010 through 2016. As there were no further Social Security program changes, the incentives are the same in every year.

⁸ Population weights are time-invariant, so that changes over time in ITAX are driven only by changes in Social Security provisions.

Figure 16 presents this information in a different format, reporting the implicit tax rate at ages 62 through 69 by year. Between 1980 and 2016, the implicit tax on work fell by nearly 20 percentage points at age 65 and by 14 to 16 points at ages 66 to 69. This represents a substantial decline in the tax on work after age 65, and it is due to the increase in the DRC from 3 to 8 percent. By contrast, there was essentially no change in the tax on work at ages 55 to 61 (not shown on graph), and a modest increase in the tax on work at ages 62 and 63 due to the increase in the FRA. While the changes in the retirement earnings test are not incorporated in these incentive measures due to our assumption that people retire and claim simultaneously (making the test irrelevant), to the extent that people consider this a tax, the actual decline in the (perceived) tax on work beyond the FRA may be even greater than measured here.

Figure 17 shows the change in incentives over time when we incorporate pensions, again weighting across the twelve sample worker types. The results appear similar to those in Figure 16, although the decreases in the implicit tax rate after age 65 are somewhat larger. The relatively small difference between the results with and without pensions is expected. The share of the population with a DB pension has declined by about 25 percentage points since 1980. As seen in Figure 11, DB pensions add an extra tax of 22 percent (for the male median earner type) at age 65. Thus having one-quarter of the population lose access to a DB pension would be expected to reduce the weighted implicit tax rate at age 65 for the population as a whole by 4 to 5 percentage points (one quarter of 22 points). Naturally, for any individual, the difference between having a DB pension and not is still the 22-point difference in the ITAX.

Incentives vs. Employment

Finally, we turn to the question of whether changes in the implicit tax rate on work resulting from Social Security reforms and the shift from DB to DC pensions have contributed to the rise in older men and women's employment over the past several decades. It seems highly unlikely that changes in incentives explain changes in employment at ages 55 to 59. In the case of men, employment has declined during this period, likely due to economy-wide factors that have little to do with retirement income programs. For women, employment has risen dramatically at ages 55 to 59 since 1980. Incentives, however, are essentially unchanged in this age range, suggesting that they are not a factor in the increase.

At ages 60 to 64, employment has risen for both men and women. However, the implicit tax on work has not fallen but rather has risen modestly at ages 62 and 63 as result of changes to the actuarial adjustment around the FRA increase. Changing Social Security incentives – as captured by the ITAX measure – thus do not seem to have affected work at these ages, except insofar as a reduction in the tax on work after age 65 could potentially encourage an individual to keep working during his or her early 60s as well. On the pension side, a decline in DB pensions has, for some workers, eliminated the subsidy to work until the pension plan's NRA (age 65 in our sample plan). This might be expected to reduce, not increase, work at older ages under standard assumptions about labor supply behavior. On the other hand, the loss of a pension creates a negative wealth effect that could lead the individual to work longer. We need to look beyond the ITAX measure to the changes retirement wealth in order to explore this possibility.

So what of the possibility that the reduction in the implicit tax on work after age 65 may have contributed to the increase in work after age 65? We provide a preliminary means of assessing this in Figures 18 and 19, which plot data on employment rates at ages 65 to 69 against the sum of the weighted ITAX at ages 65 to 69 for each year 1980 to 2016, separately for men and women.⁹ The ITAX summary measure reflects the loss in SSW relative to earnings that would occur from working between age 65 and age 69. For men, this value falls from about 140 percent (1.4 years of earnings) in 1980 to less than 60 percent in 2010. Whether changes in ITAX are driving changes in employment is somewhat difficult to discern from this graph, as the ITAX is falling both during periods when employment is declining or relatively flat and during periods when employment is rising rapidly. For women, there is a clearer negative association between falling ITAX values and rising employment rates, though it is not clear if this is due to a stronger causal effect of ITAX for women or is simply due to the fact that women's employment rates are rising more continuously over this period.

IV. Discussion

Over the past several decades, older men and women's employment rates have risen substantially during the same period when numerous changes to Social Security and private pensions were implemented. This naturally raises the question: how much of the increase in employment at older ages can be explained by changing retirement incentives?

A first step in answering this question is to provide a careful examination of how retirement incentives have changed over the past several decades due to Social Security

⁹ The weighted ITAX measure in this case is weighted across the 6 sample worker types for each sex.

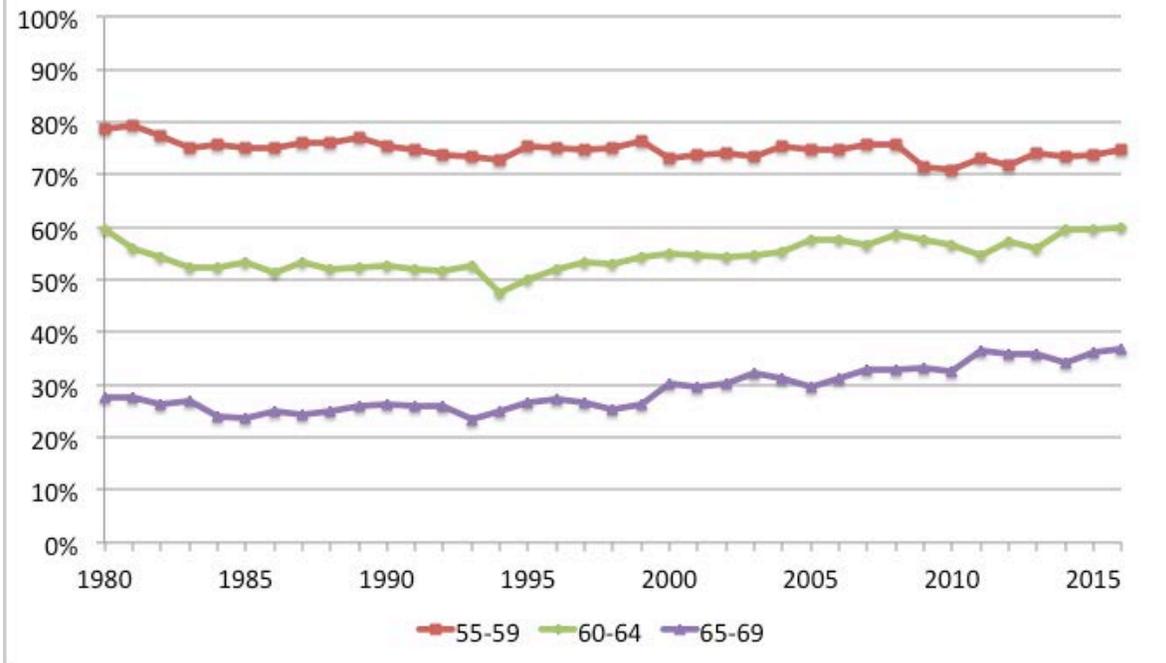
reforms and changes in employer-provided pensions. This paper finds that changes to Social Security have reduced the implicit tax on work at ages 65 to 69 by about 15 percentage points, while the tax rate on work at younger ages was either less affected or unaffected by these reforms. We also find that DB pensions add an additional 20 to 25 percent to the implicit tax after age 65 for the sample pension plan we explore. Given that the share of workers with DB pensions has fallen by about one-quarter since 1980, the effect of the shift from DB to DC plans on the average retirement incentive is to reduce the implicit tax on work by an additional 5 or so percentage points, for a total decrease in the tax rate on work at these ages of about 20 percentage points once Social Security and pension incentives are incorporated.

One must proceed cautiously when exploring the possible link between changing incentives and changing employment using the highly aggregated data analyzed here. There is little apparent connection between changes in employment and in the ITAX measure at ages 55 to 59 or 60 to 64, though a large enough change in ITAX after age 65 could theoretically affect work at these younger ages also. The DB to DC shift could affect work at these ages through a wealth effect, a possibility we raise but do not explore here. The effect of the earnings test changes is also not explored here. There is suggestive evidence that declines in ITAX at ages 65 to 69 that are driven by the DRC increase and the DB to DC shift line up with employment increases, particularly for women, but this is far from conclusive. Future research that employs micro data to capture the heterogeneity in retirement incentives and controls for retirement wealth as well as other factors that have changed over time is needed in order to draw a stronger conclusion about the link between Social Security reforms and retirement.

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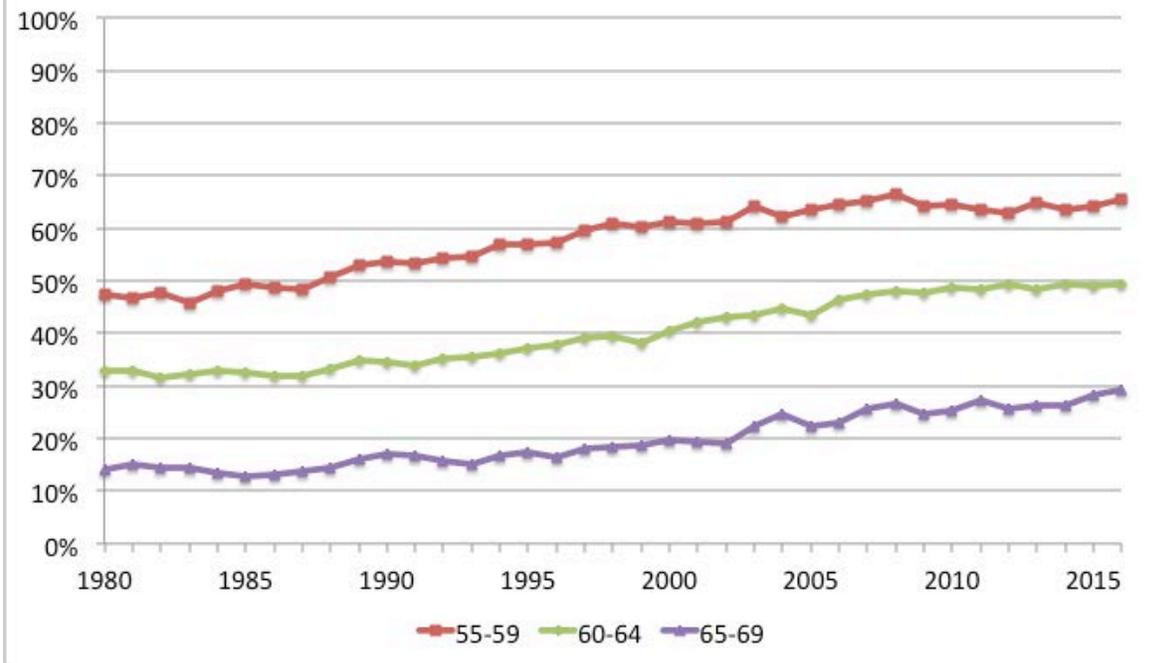
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Figure 1: Male Employment Rate by Age, 1980-2016

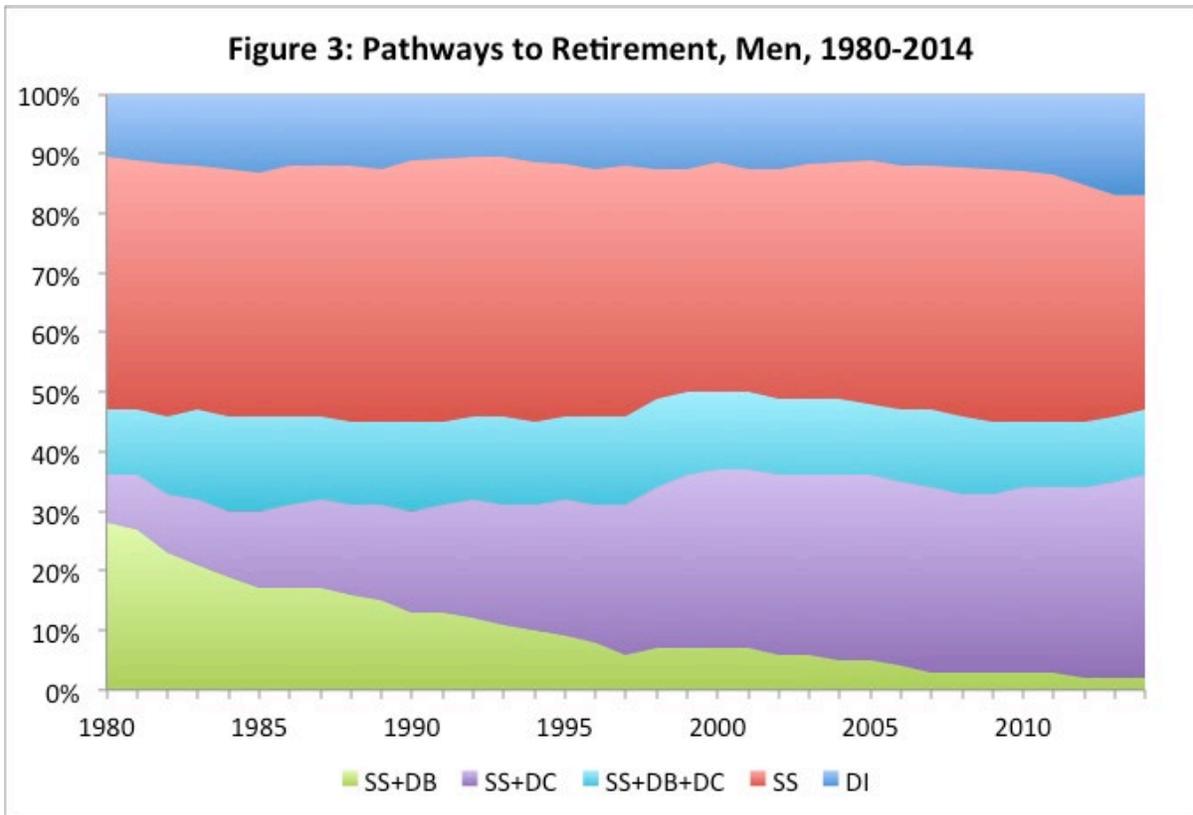


Source: author's calculation from March Current Population Survey.

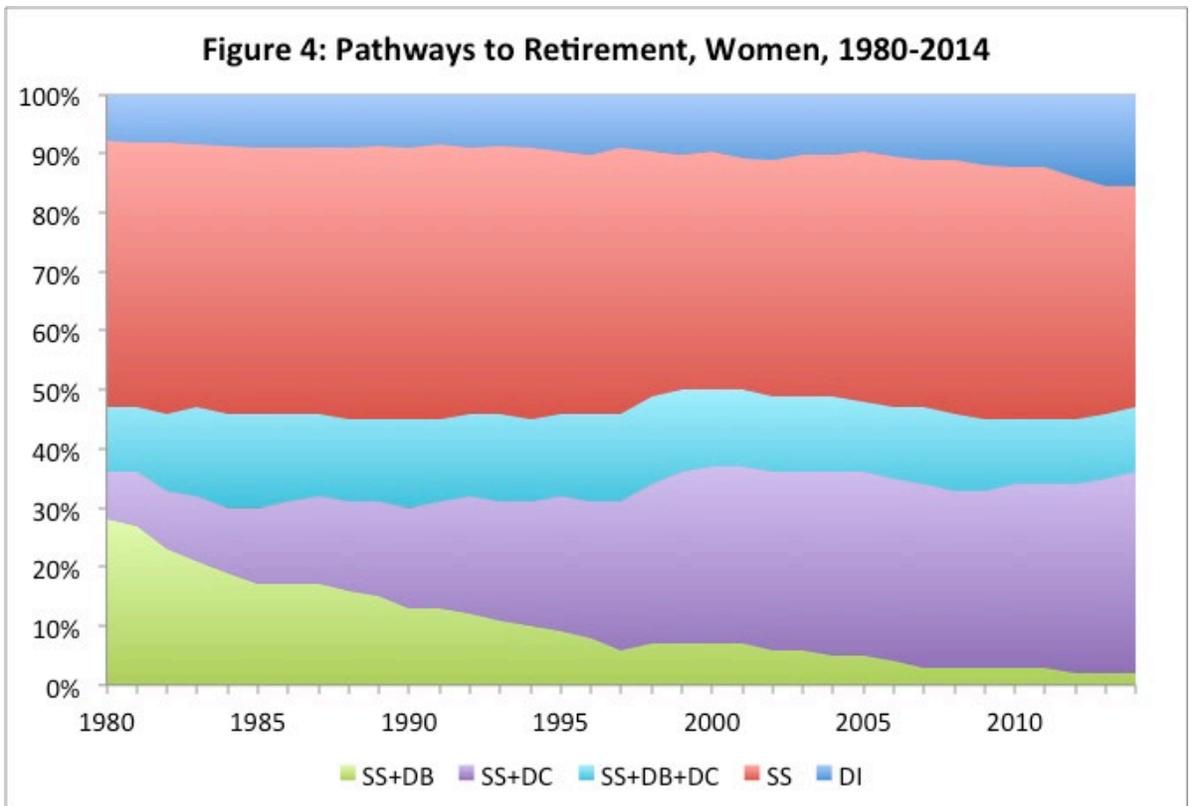
Figure 2: Female Employment Rate by Age, 1980-2016



Source: author's calculation from March Current Population Survey.



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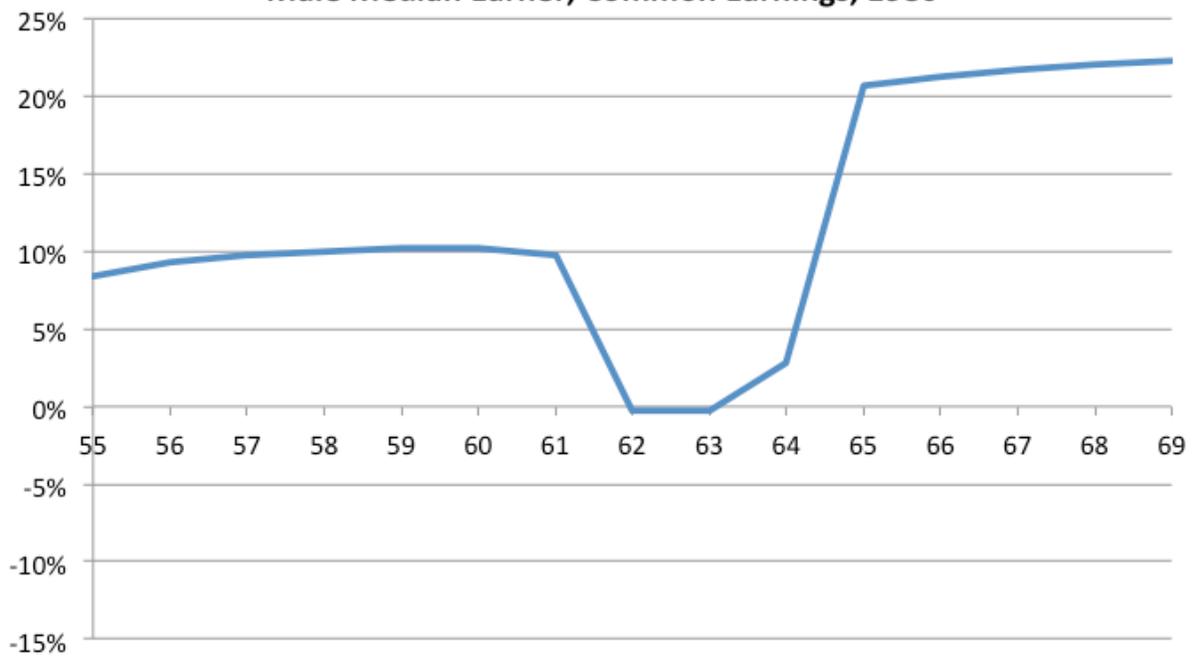


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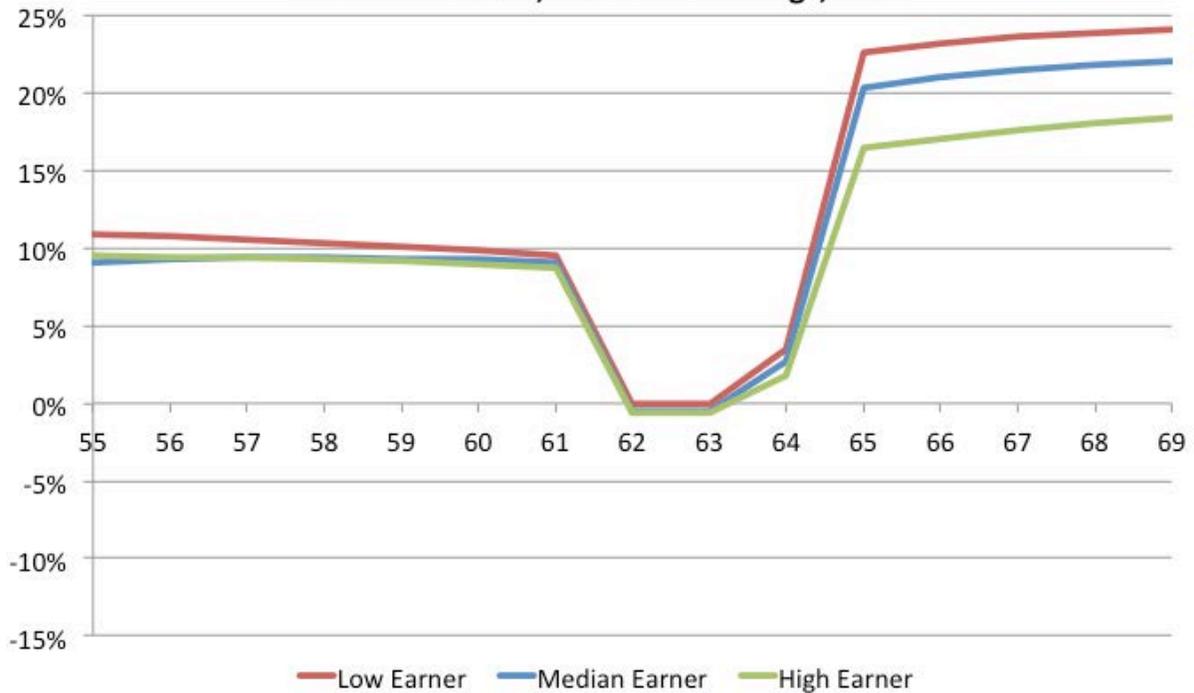
**Figure 5: SS Accrual (without SS Taxes) by Age
Male Median Earner, Common Earnings, 1980**



**Figure 6: Implicit Tax Rate (with SS Taxes) by Age
Male Median Earner, Common Earnings, 1980**



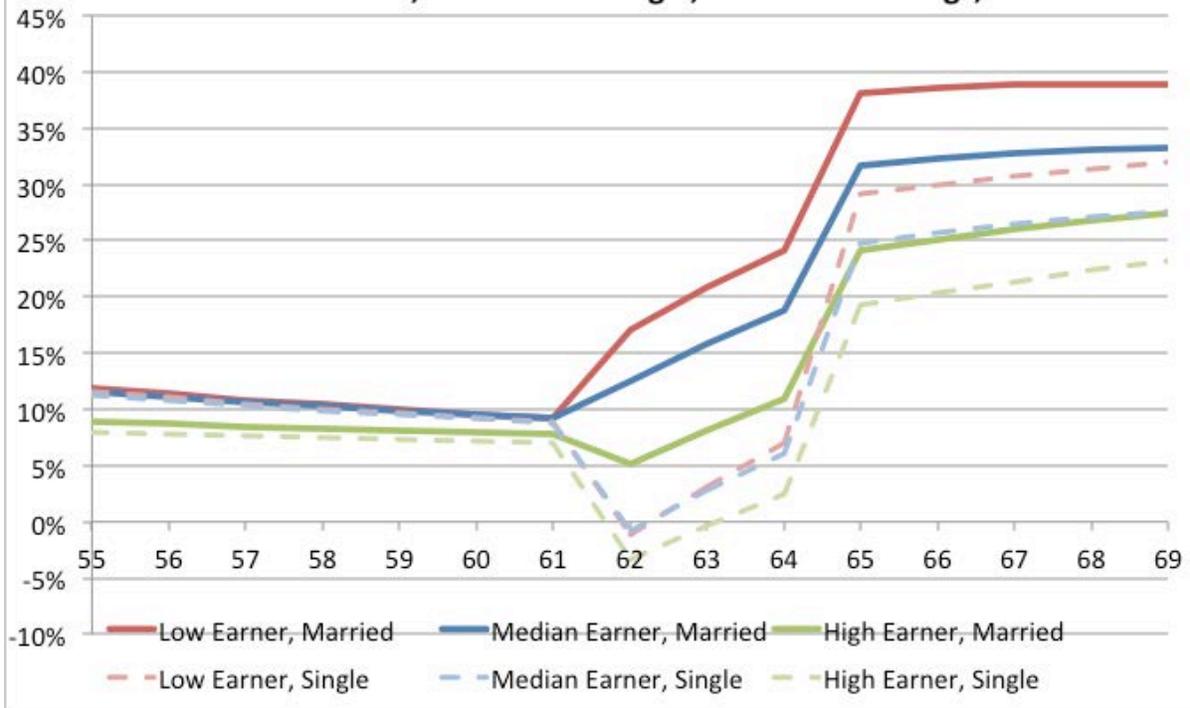
**Figure 7: Implicit Tax Rate (with SS Taxes) by Age
All Male Earners, Common Earnings, 1980**



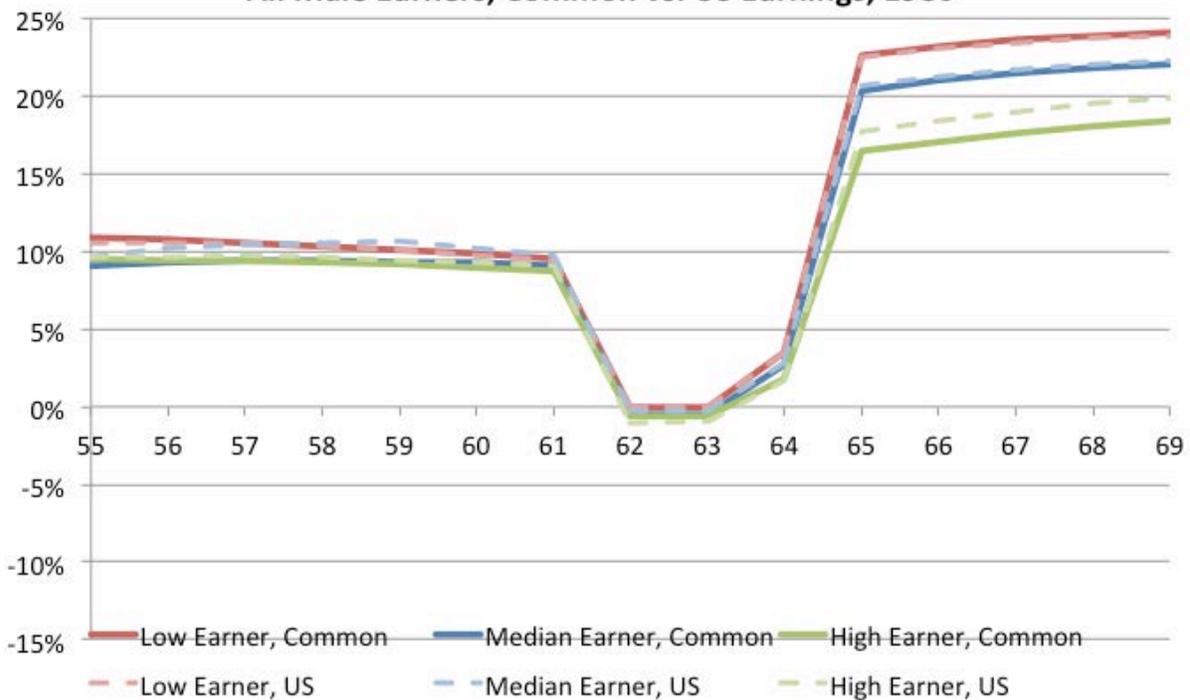
**Figure 8: Implicit Tax Rate (with SS Taxes) by Age
All Married Earners, Female vs. Male, Common Earnings, 1980**



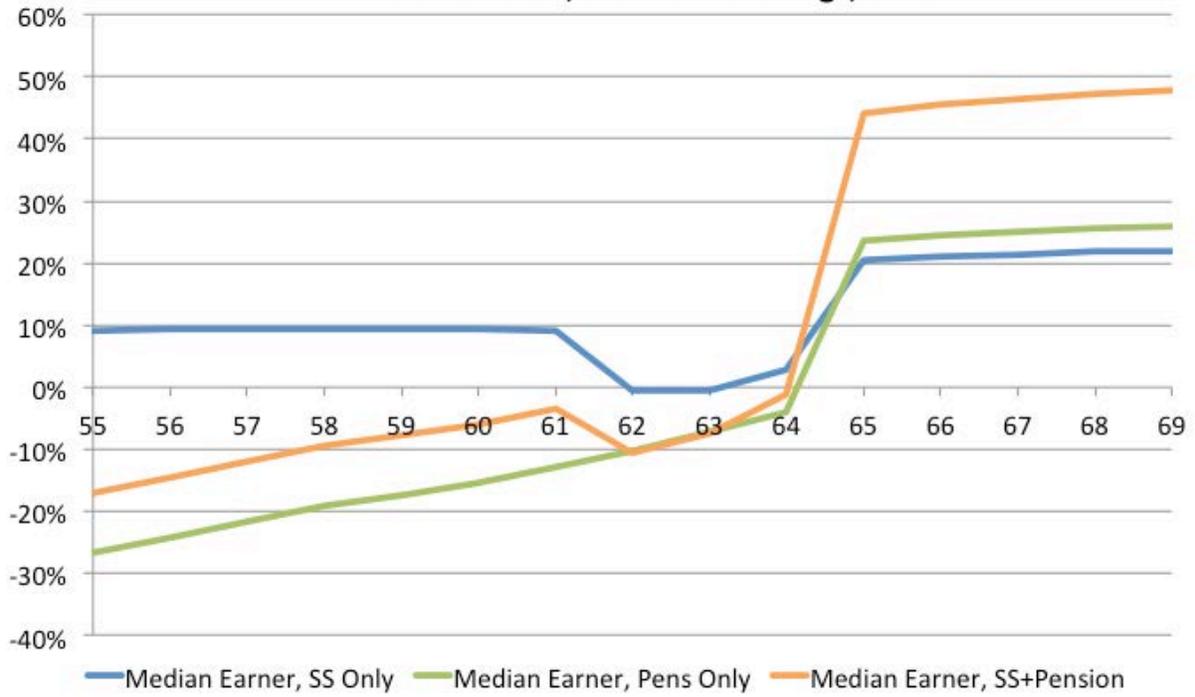
**Figure 9: Implicit Tax Rate (with SS Taxes) by Age
All Female Earners, Married vs. Single, Common Earnings, 1980**

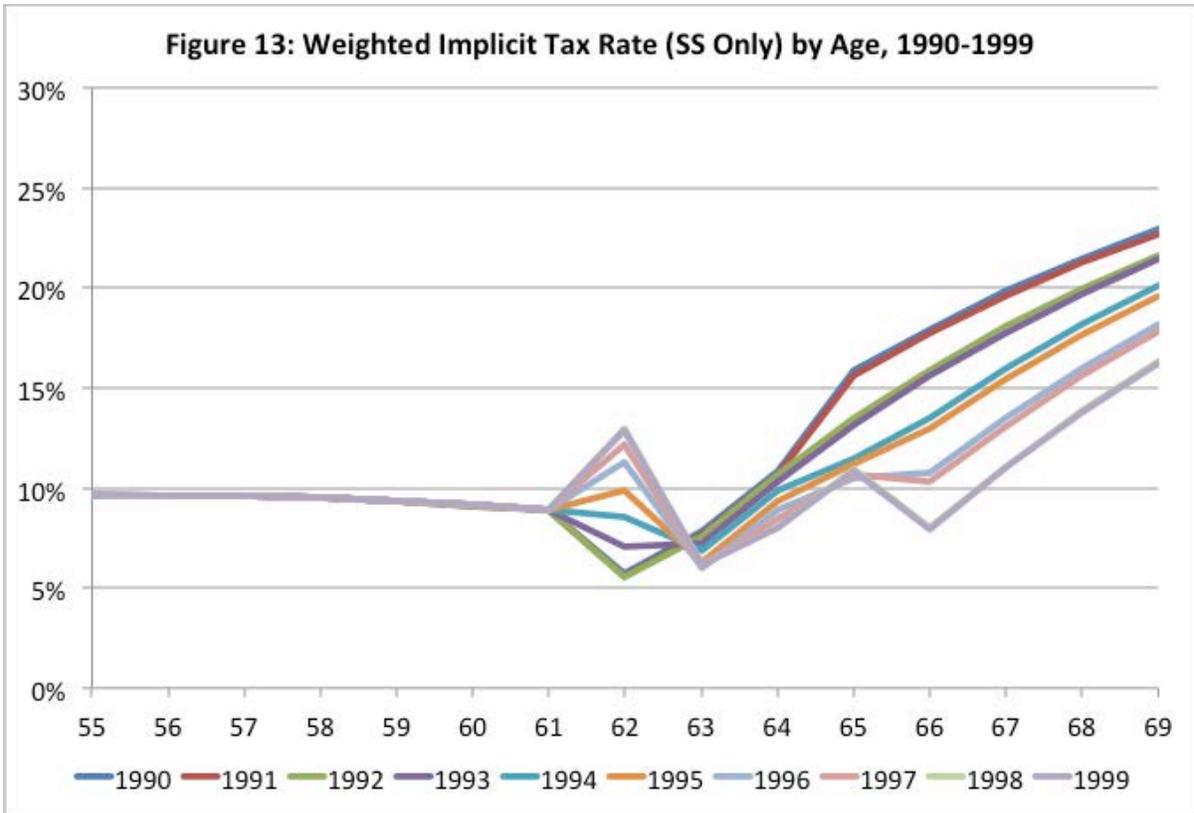
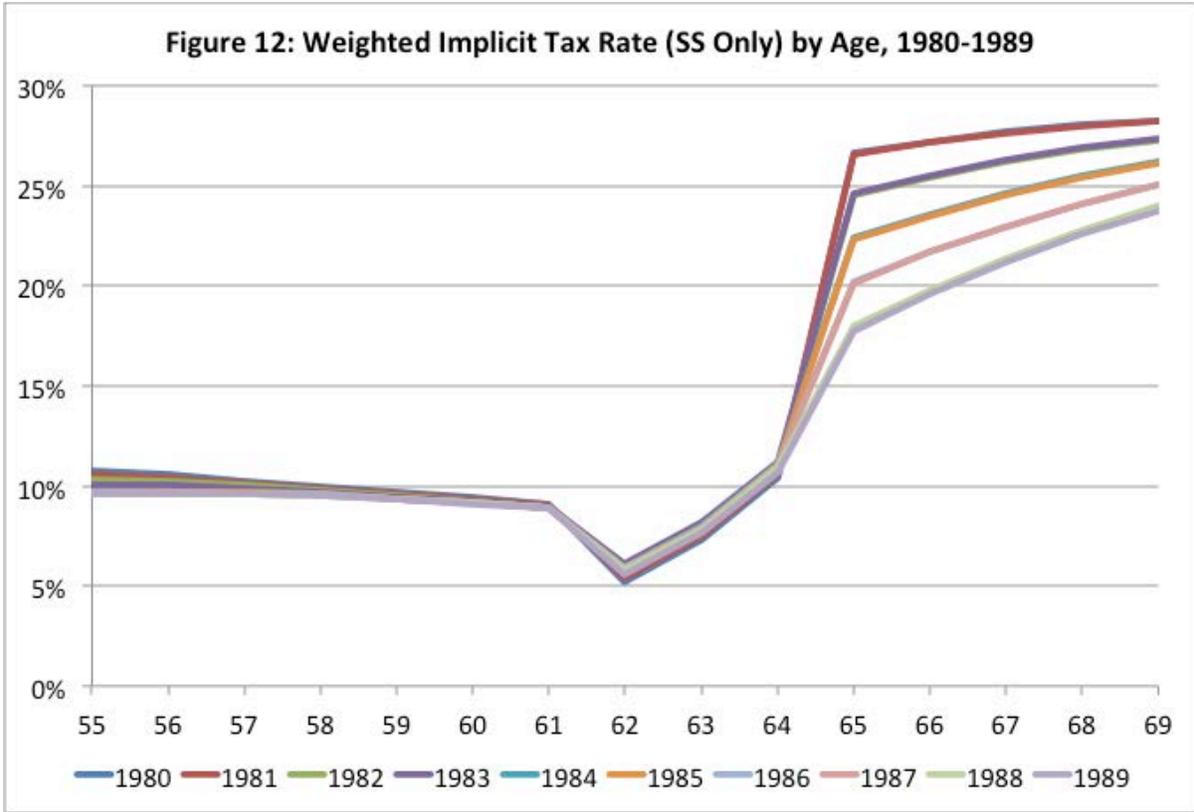


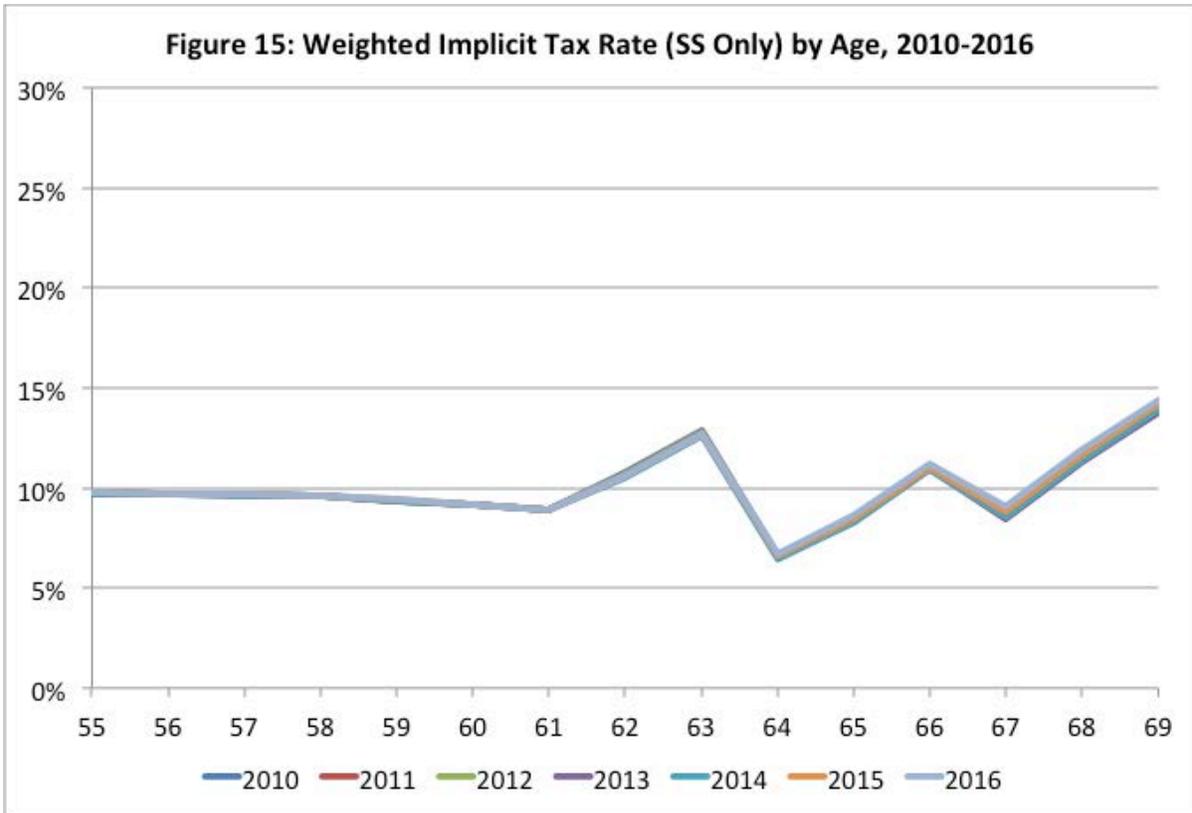
**Figure 10: Implicit Tax Rate (with SS Taxes) by Age
All Male Earners, Common vs. US Earnings, 1980**



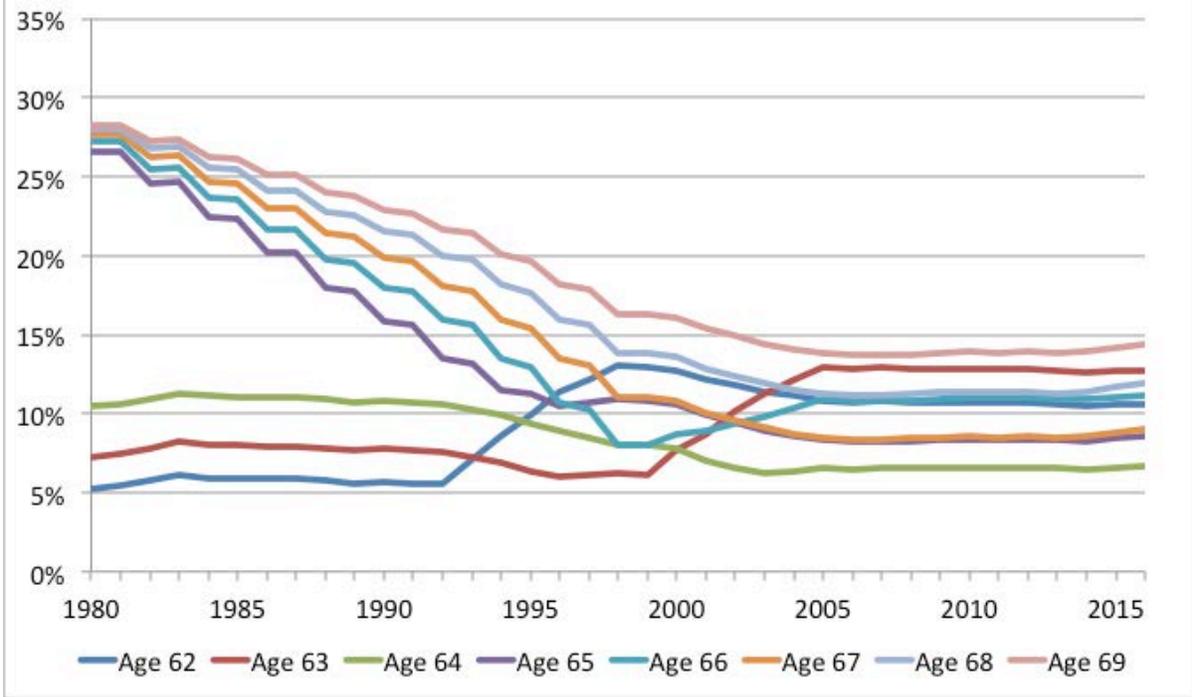
**Figure 11: Implicit Tax Rate with SS Taxes and Pensions by Age
Male Median Earner, Common Earnings, 1980**



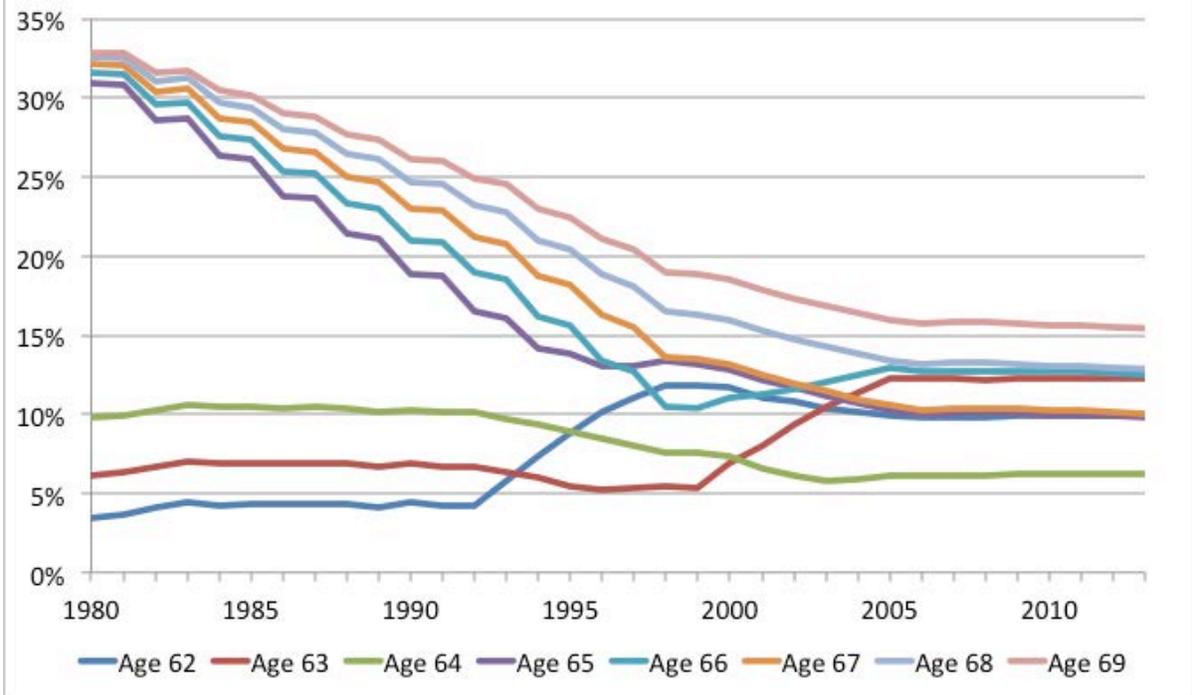




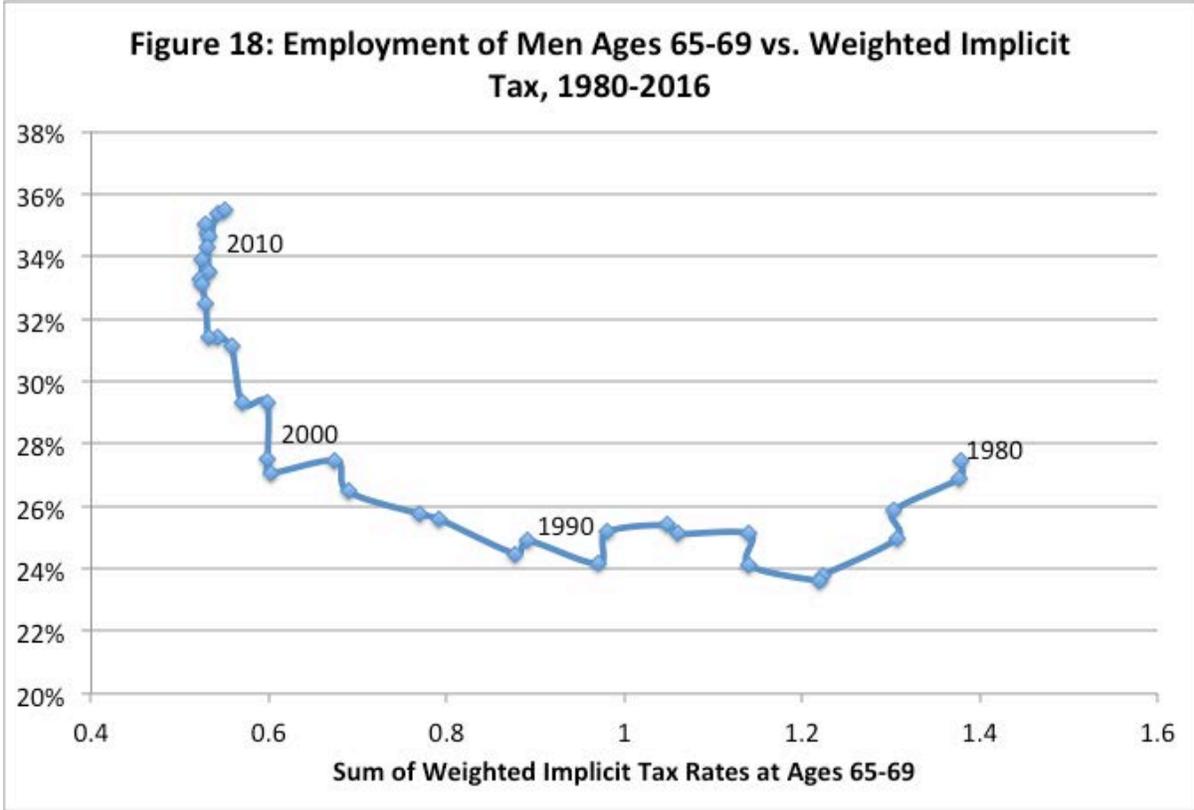
**Figure 16: Weighted Implicit Tax Rate (SS Only),
1980-2016, Ages 62-69**



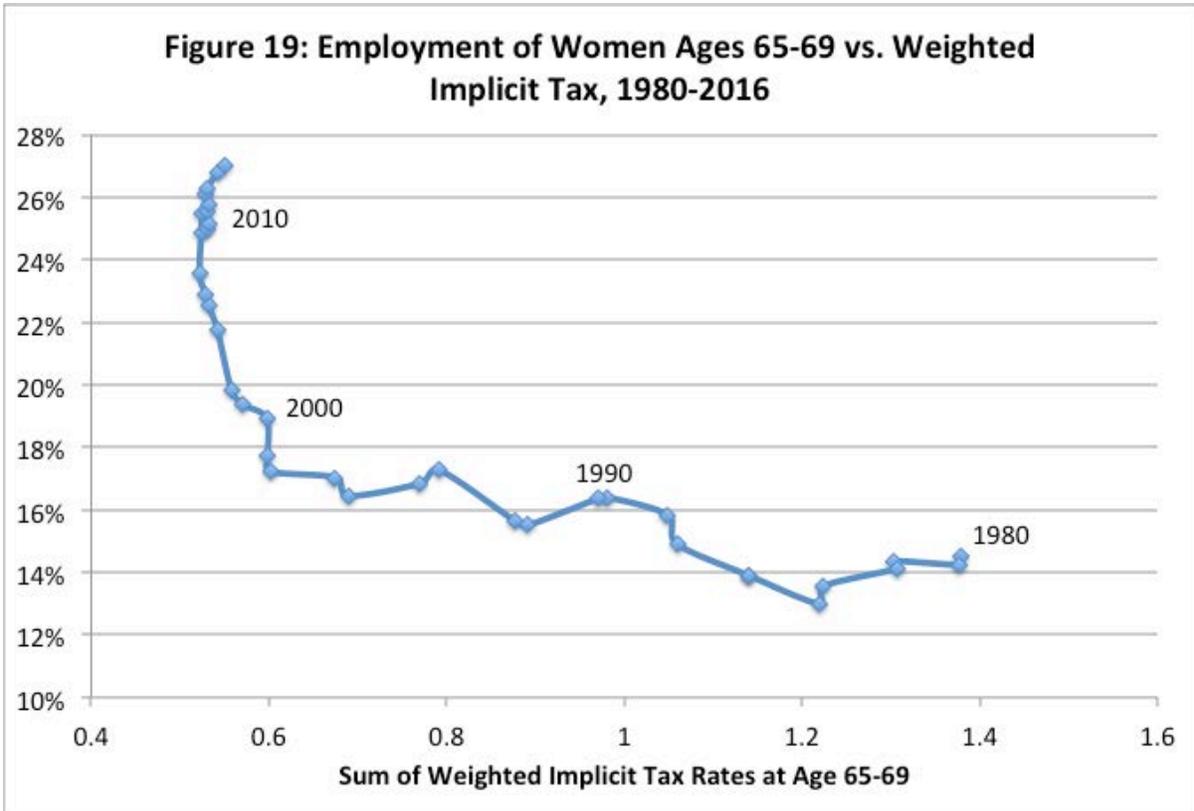
**Figure 17: Weighted Implicit Tax Rate with Pensions,
1980-2013, Ages 62-69**



Note: Figure ends in 2013 due to lack of data on share of workers with pensions in most recent years.



Note: employment data is from stats.OECD.org (data from U.S. Bureau of Labor Statistics)

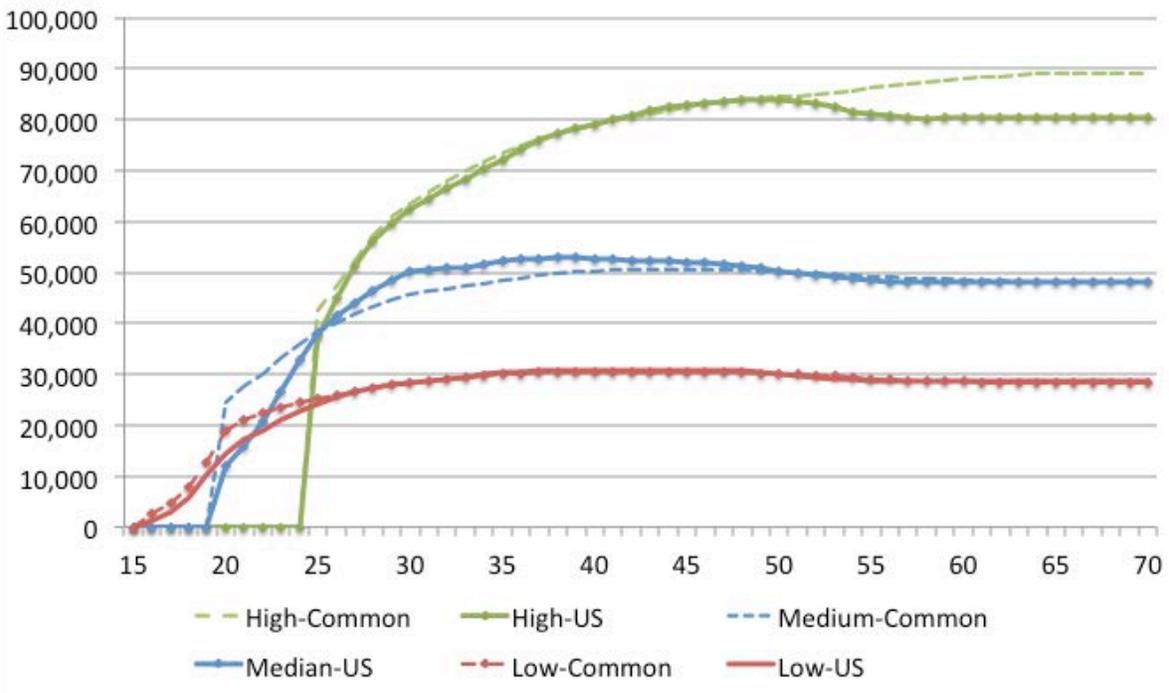


Note: employment data is from stats.OECD.org (data from U.S. Bureau of Labor Statistics)

Table 1: Social Security Provisions by Cohort

Birth Cohort	Delayed Retirement Credit	Full Retirement Age
up to 1924	3.0%	65
1925	3.5%	65
1926	3.5%	65
1927	4.0%	65
1928	4.0%	65
1929	4.5%	65
1930	4.5%	65
1931	5.0%	65
1932	5.0%	65
1933	5.5%	65
1934	5.5%	65
1935	6.0%	65
1936	6.0%	65
1937	6.5%	65
1938	6.5%	65+2 months
1939	7.0%	65+4 months
1940	7.0%	65+6 months
1941	7.5%	65+8 months
1942	7.5%	65+10 months
1943	8.0%	66
1944-1954	8.0%	66
1955	8.0%	66+2 months
1956	8.0%	66+4 months
1957	8.0%	66+6 months
1958	8.0%	66+8 months
1959	8.0%	66+10 months
1960 on	8.0%	67

Appendix Figure 1: Common vs. US Age-Earnings Profile for Men, by Education



Appendix Figure 2: Common vs. US Age-Earnings Profile for Women, by Education

