

**SUPPLY-SIDE CONSEQUENCES OF SOCIAL SECURITY
REFORM: IMPACTS ON SAVING AND EMPLOYMENT**

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Supply-Side Consequences of Social Security Reform: Impacts on Saving and Employment

by

BARRY BOSWORTH AND GARY BURTLESS

Abstract

Pension reform can potentially increase saving and improve incentives for labor force participation later in life. We investigate whether these effects are likely to occur and the potential size of the effects on private and total saving and on employment past age 55. Our survey of existing evidence and new empirical analysis focus on three issues: The possible reduction in other government saving if more assets are accumulated in a public retirement program; the reduction in non-pension private saving if assets are accumulated in new private retirement accounts; and the increase in old-age labor supply that could occur if Social Security benefits are reduced.

We find mixed evidence that faster accumulation of assets in public or private retirement funds would produce higher public and private saving. Using the most optimistic estimates of the public saving response to faster accumulation in public retirement funds, we find advance funding will cause a big increase in aggregate saving and future national income. However, international evidence suggests governments are likely to offset a large percentage of public pension fund accumulation by reducing saving in other government accounts. The evidence on private saving suggests that savers tend to offset faster accumulation of assets in pension accounts with lower saving in non-pension accounts. Most empirical estimates of the labor supply response to Social Security reductions imply the response will be small. Even using unrealistically high estimates of responsiveness, we find that a one-third cut in benefits will add less than 3 percent to the future labor force.

Supply-Side Consequences of Social Security Reform: Impacts on Saving and Employment

The Social Security system has been remarkably successful in lifting relative incomes and alleviating poverty among the nation's elderly. But the population of the United States, like that of other industrialized countries, is growing older. Between 1950 and 2000 the percentage of Americans past age 65 increased by half, rising from 8.1 percent to 12.4 percent of the total population. People who are at least 65 years old will constitute more than one-fifth of the U.S. population by 2050. The increasing share of the aged in the population will place strains on the government budget because the elderly finance much of their consumption with transfers financed by taxpayers. The actuaries of the Social Security and Medicare programs make regular forecasts of the long-term spending needs of the two programs. Their mid-range forecasts published in 2001 suggest that combined outlays on the Social Security and Medicare programs will climb inexorably over the next 50 years, increasing from 5.5 percent of GDP in 2000 to 11.4 percent of GDP in 2050.

Most people knowledgeable about the U.S. retirement system recognize it will eventually have to be reformed to restrain the growth of future costs. Individual retirement accounts are a common feature in many proposals to reform Social Security. For example, in December 2001 President Bush's Commission to Strengthen Social Security issued a report containing three reform proposals. A crucial element in all three plans was the introduction of new individual defined-contribution pension accounts. Although a principal goal of reform is to restore or preserve the long-term solvency of the national pension system, proponents of individual accounts also argue that replacing traditional defined-benefit pensions with individual investment accounts can have two other advantages for a nation's economy. First, the accumulation of investments in millions of individual retirement accounts will add to private and national saving, improving the rate of domestic capital formation or the accumulation of a nation's overseas assets.

Second, the structure of defined-contribution pensions provides better incentives for older workers to remain in the labor force, at least in comparison with the incentives embedded in traditional defined-benefit pensions. Unlike a traditional pension, which can discourage workers from continuing to work after the early or normal retirement age, a defined-contribution pension is more neutral with regard to encouraging retirement at specific ages. Under these circumstances, many advocates of defined-contribution pensions believe that reform of the traditional pension system can improve labor market incentives and encourage Americans to work later in life. This in turn will reduce the burden of population aging, because fewer old people will be retired and drawing support from active workers; more old people will be working and contributing to the national pension system.

In sum, partial replacement of the traditional unfunded pension system with a new system of private investment accounts can potentially increase saving and improve incentives for labor force participation later in life. Both of these responses would lead to higher levels of future incomes. In this paper we investigate whether these effects are likely to occur and the potential size of the effects on private and total saving and on employment past age 55. The remainder of the paper is divided into four sections. In the next section we evaluate evidence on the likely effects of higher fund accumulation within a public pension program. We consider whether such accumulation will be offset by greater dissaving in other government accounts and then assess the net impact on overall public saving. The following section evaluates the overall private saving response to extra saving in private pension accounts. In both these sections we provide estimates of the impact of faster fund accumulation on overall saving, the capital stock, and future national income. The third section weighs evidence on the past effect of the Social Security system on labor force participation among the elderly. In this section we develop new estimates of the potential impact of Social Security reform on future labor supply. The paper ends with a brief summary of conclusions.

Advance funding and saving in the public sector

An advance funded pension program potentially offers several advantages over a pay-as-you-go (PAYGO) system.¹ An important one is the possibility that increased funding would lead to a rise in national saving and capital formation unless it is offset by reduced public or private

¹ The arguments for and against a funded public program are evaluated more fully in Hemming (1999).

saving outside of the pension system. Advocates of advance funding disagree about whether the reserves of a funded system should be publicly or privately managed. If funds are accumulated in a single government-managed fund, officials must decide how to allocate assets across a variety of investment options. If instead funds are accumulated in millions of individual investment accounts, decision making over asset allocation is left up to individual workers. Public and private plans involve much different approaches to managing investment risks. In a national defined-benefit plan, the investment risks can be spread among millions of active and retired workers and across multiple generations. Unexpectedly poor returns on contributions can lead to adjustments in contributions as well as benefits. In private defined-contribution accounts, financial risks are largely or entirely borne by individual contributors.

The focus of this and the following sections is on the potential of pension funding to increase aggregate saving. Many who advocate a shift toward advance funding assume the growing surpluses of a new or reformed pension fund will lead to increased national saving. This assumption is crucial if funding is to reduce the burden of population aging on future workers, because unless it induces an increase in saving, reform will have little effect on the size of the future capital stock or national income. While the impact of pensions on saving is a much studied topic, most of the historical debate has centered around the question of whether the *creation* of public PAYGO systems has reduced national saving.² Here we consider whether a *shift* from PAYGO toward advance funding will alter national saving.

Our analysis examines two alternative approaches to increased pension funding: (1) Increased funding that takes place in the existing public pension system by bringing forward the tax increases that will be required to maintain future solvency; and (2) Creation of a new system of mandatory individual retirement accounts owned and managed in the private sector. Under the latter reform, funds accumulated in the individual accounts would finance future private pensions that offset some or all of the anticipated Social Security benefit cuts needed to maintain solvency of the public PAYGO system. In each case, it is important to consider both the budget reaction within the government sector and the saving response of private individuals to determine the impact of the pension reform on aggregate saving. The remainder of this section considers the public saving response to greater advance funding in the public pension system. The next section examines private savers' response to funding in a new private pension program.

² This literature is reviewed and summarized in CBO (1998) and Atkinson (1987).

Public sector funding. If a legislature decides to increase pension funding within the existing public program by accelerating future tax increases, there will be no change in the level of promised future benefits. It is the size of the credible benefit promise – the future liabilities of the system – that should influence private saving, not the amount of saving within the fund. Unless the funding of future liabilities makes future benefit promises more credible, greater advance funding in the public pension system should have little impact on private saving.

Thus, the critical issue for national saving involves the response of saving within the government sector itself. The public saving response to advance funding depends to some extent on whether the pension system represents a function distinct from the rest of the public budget. If the public pension program is seen as just one among many similar government transfer programs, there may be no reason to separate this spending commitment from other government activities. Hence, the pension system's revenues will be regarded as part of total revenues when the legislature struggles to allocate scarce resources among competing claims. From this perspective, a larger pension fund surplus is likely to be offset within the government budget as a whole, either by a reduction in non-pension taxes or an increase in non-pension spending.

There is another possibility, of course. The revenues and obligations of the public pension system may be regarded as quite independent and distinct from other government revenues and functions. Several OECD countries have an explicit goal of funding a portion of their public pension obligations.³ State and local governments in the United States attempt to fund their employee pension obligations outside their operating fund accounts. A commitment to differentiate between the retirement accounts and other budget accounts is not sufficient, however, to automatically produce higher public saving when a government consciously increases its funding of future pension obligations. The government must also avoid the temptation to borrow the surplus of the pension system to finance spending in its other budget accounts. That is, the funding balance of the non-retirement accounts must be determined independently of the balance of the pension fund.⁴ Otherwise, an increase in the pension account

³ The experiences of Canada, Japan, and Sweden are reviewed in Munnell and Ernsberger (1989).

⁴ It is uncommon for the states to directly transfer funds from the pension system to the general budget, but it is possible for them to change the actuarial assumptions used to compute future liabilities, thereby reducing required contributions to the fund (Munnell and Sundén, 2001).

surplus would not produce an increase net public saving, and governments would have simply used their pension payroll tax to finance current activities.

In an earlier paper, we explored the empirical evidence regarding public-sector saving by performing two statistical analyses (Bosworth and Burtless, 2003). In one analysis we examined the response of U.S. state governments to the accumulation of reserves in their funded employee pension programs. In the second, we used data compiled under the international system of national accounts (SNA) to examine the relationship between saving within national governments' social insurance accounts and the non-retirement budget accounts of twelve OECD countries.

The two empirical analyses produced conflicting conclusions about the capacity of governments to add to their overall saving when they built up larger reserves in their public retirement systems. Whereas the U.S. states appear to have successfully funded their pension obligations and isolated this funding from the remainder of state budgets, the international experience and that of the U.S. federal government suggest that increased accumulations in public retirement funds are largely offset by bigger deficits or smaller surpluses in non-pension accounts.

Evidence from state pension systems. Our analysis of U.S. state experience was based on Census Bureau data covering budgets, assets, and debts of 48 states over the period from 1977 to 1999. Data from a companion survey provided information on the finances of the public employee retirement programs. The combined data make it straightforward to tabulate accurately the revenues and spending of the retirement and non-retirement accounts of American state governments.

State and local government employee pension plans are far from trivial, either in scope or asset holdings. These plans covered 13.9 million active workers and made pension payments to 6.3 million beneficiaries in 2000.⁵ At the end of that year the market value of the assets held by state and local government employee pension funds amounted to \$2.3 trillion, or about half the total held in U.S. private employer-provided pension funds. A mid-2001 survey of state and local pension plans covering 9.3 million workers found that the actuarial value of the plans'

⁵ Current U.S. law compels private employers, but not state and local government employers, to participate in the Social Security system. However, most state and local governments voluntarily participate in the federal Social Security program.

accrued liabilities was \$1.5 trillion while the plans' financial reserves amounted to \$1.6 trillion, implying an average funding ratio of 104 percent of discounted liabilities (Harris, 2002).

States' total contributions to their pension accounts, measured as a share of U.S. national income, have been stable over the past quarter century. Essentially all of the growth in pension fund assets has come from the investment income earned on the funds' reserve portfolios. That income consists of interest, dividends, and realized capital gains, but it excludes unrealized capital gains. Expenditures, which include benefit payments and administrative expenses, grew from 0.4 percent of national income in 1977 to 0.9 percent by 1999. During the same period, the annual net accumulation – or annual saving – in the funds increased from 0.5 percent to 1.8 percent of national income.

In our earlier paper we estimated a straightforward model of the relationship between the fiscal balance of a state's non-retirement accounts, B , and the net saving that occurs within the state's pension program, PEN . Annual changes in state personal income were included to adjust for cyclical fluctuations in the state economy:⁶

$$(1) \quad B_{it} = \alpha_i + \beta_i PEN_{it} + \delta_i \Delta Y_{it},$$

where

B_{it} = Balance in the non-retirement budget accounts of the i th state in year t ;

PEN = Net accumulation within the state's pension account; and

ΔY = Percentage change in real personal income.

The net accumulation of the pension fund was measured as total contributions to the fund, plus investment income, less total expenditures. The measure of investment income included realized capital gains or losses on asset sales, interest, and dividends. The annual balance in a state's non-retirement account was computed by excluding investment income of the pension account from revenues, and redefining state expenditures to exclude pension benefits and include state contributions to the pension fund. Since state contributions to the pension fund represent payments for accruing new liabilities, they reflect a component of current employee compensation (like wages or sickness pay) and should be treated as a current expense of government.

⁶ The personal income data were deflated by the price index for national gross domestic product.

The coefficient on pension accumulation in equation 1, β , measures the extent to which changes in the pension account are offset by associated changes in net state spending in other budget accounts. Since any potential offset need not be contemporaneous, our specification also allowed for lagged effects of pension fund accumulations. Current and lagged percentage changes in real state aggregate income were included to control for business-cycle effects on state-level non-pension spending. Equation 1 was estimated using a fixed-effects model that allows for a shift in the constant term, α_i , for each state. With allowance for the degrees of freedom used up to measure lags, we had 1,056 annual observations covering 48 states over the period from 1978 through 1999.

The critical coefficients for assessing the impact of state pension accumulation on overall state budgetary balances are those on contemporaneous and lagged pension saving. In our basic specification, the coefficients imply a small and statistically insignificant offset of about 8 percent of the accumulation over a two-year period. In other words, when an average state pension fund accumulates an additional \$100 in extra reserves, the deficit in the state's non-pension budget accounts eventually increases about \$8. The estimates thus indicate that the additional accumulation of funds in states' pension accounts has almost no impact on the net balance of the rest of state budgets. A higher accumulation in state pension funds is almost fully reflected as higher state saving.

Our basic finding was robust across a variety of statistical specifications. For example, the coefficient estimate was unaffected by inclusion or exclusion of procedures to control for error autocorrelation. Nor was the coefficient affected by statistical controls to distinguish between states with strong and weak versions of a balanced budget rule in their constitutions. In short, the results using a variety of specifications suggest that there is virtually no impact of incremental accumulations in state pension funds on the fiscal stance of the remainder of state budgets. Extra pension accumulations are not offset by higher dissaving in other state budget accounts. It follows that the accumulation of extra savings within a state pension fund translates into additions in state government savings in the aggregate. The political process within state governments does not undermine efforts of states to fund their employee pension obligations with real and sustained additions to state public saving. The result is a substantial contribution of state pension saving to U.S. public saving. Over the past quarter century, saving within state and local government pension funds has averaged more than one percent of U.S. national income,

we corrected for autocorrelation the model yielded a more favorable offset of -0.57, a result that was significantly different from both zero and -1.0 at the 0.1 level. This implies a net positive effect on overall public saving of about 40 percent of the extra pension accumulation. The results were also sensitive to the sample of countries included in the analysis. The coefficient on the social insurance balance varied from -0.8 (when the sample excluded Finland) up to -0.2 (when it excluded Sweden). When the sample of countries was restricted to the five countries that at one time or another had an announced goal of accumulating a large pension reserve, the estimated offset was -0.64, very similar to the autocorrelation-corrected results for the larger sample. In all specifications and for nearly all samples we examined, the cross-national evidence implied sizeable offsets in the form of lower non-social-security public saving when there are additions to public pension fund assets. This verdict is less favorable than the one reached by Munnell and Ernsberger (1989) who concluded that Japan and Sweden had succeeded in isolating their pension funds from the rest of their public budgets.

Reconciling state and cross-national evidence. In our earlier study we considered a variety of possible explanations for the striking discrepancy between the results based on state behavior within the United States and results based on the behavior of nation states, including the U.S. federal government. One explanation is that there is an important difference between the motivations and constraints facing state legislators, on the one hand, and office holders in national governments, on the other. State lawmakers may be keenly aware of the potential burden imposed by pension obligations on future taxpayers. For the most part they have followed a conservative strategy in pre-funding those obligations. This conservatism is driven in part by states' continuing need to borrow funds in U.S. capital markets. States which follow conservative financing principles in their fiscal accounts can obtain favorable borrowing rates in capital markets, reducing the credit cost of public investment projects and helping hold down state's borrowing costs during recessions, when state operating budgets are often in deficit.

Perhaps most crucially, state and local governments within the United States are faced with highly mobile tax-paying populations. They must be concerned that tax-paying residents will move to another jurisdiction if state taxes are not closely aligned to the expected benefits provided by the state government. If a shortfall in current pension reserves causes state legislators to push up tax rates in order to pay for the pensions of already-retired employees, the state's high tax burden will in effect pay for labor services that were rendered in the past. The

requirement for a net addition to saving is that the shift to a funded system must produce a net increase in pension contributions out of current income or a net reduction in pension benefits to current beneficiaries. As we have seen, if pension reform is to add to national saving, it must involve some short-term sacrifice of public or private consumption. The President's commission did not propose a plan that would ensure one of these outcomes since it simply shifted funds from the government to private accounts.

We consider an alternative of introducing a new system of mandatory defined-contribution accounts as an *addition to* the existing system rather than as a partial substitute for it. Such a reform would have a greater likelihood of raising saving, but an important issue is the extent to which individuals would react to new accounts by reducing their accumulation in other retirement or household saving accounts. Many workers in the lower ranks of the income distribution have little or no financial wealth and save very little. For these low-income workers there may be little possibility that mandatory contributions to new pension accounts could be offset by reductions in other forms of saving.¹³ On the other hand, roughly 50 percent of U.S. workers currently participate in private, employer-sponsored pension plans. These workers include most people with large wealth holdings, and they account for an overwhelming percentage of total worker saving. For these individuals, the substitution possibilities are greater. Many workers required to make contributions to a new private account system can easily offset the mandatory contributions by making smaller contributions to their old pension or saving accounts.

The net saving effects of individual retirement accounts and other forms of retirement saving have been explored in a number of U.S. and Canadian studies. Much of this literature focuses on the voluntary response of saving to changes in tax incentives for retirement saving, so its findings may not be directly applicable when thinking about the effects of a new mandatory pension program. The studies are usually based on microeconomic data obtained from household surveys. Researchers who have studied these data reach different conclusions on the extent of substitution between retirement and non-retirement saving, in part because of formidable

¹³ According to the 2001 Survey of Consumer Finances, the median financial assets of families in the lower half of the income distribution was less than \$10 thousand.,000. Of course, homeowners with few financial assets can often boost their current consumption through increased borrowing on their homes. Low-income renters can increase their credit card debt. In general, however, it is probably harder for

statistical issues raised by the extreme heterogeneity of saving behavior at the household level. Households that take advantage of tax-preferred saving options may have a much greater propensity to save. Two surveys of the research on tax-preferred saving show the extent of disagreement within the economics profession. Poterba, Venti, and Wise (1998) conclude that the huge flow of funds into new retirement accounts largely represents net new saving, that is, household saving that would not have occurred in the absence of more generous tax preferences. In contrast, Engen, Gale and Scholz (1996) argue that the dominant effect of the tax preferences has been to induce substitution of new for old forms of saving, yielding little net impact so far on overall household saving (also see Gale, 1998, and Gustman and Steinmeier, 1999).

International evidence on the private saving response to pension reform is no more conclusive than the U.S. microeconomic evidence. Among the OECD countries, Great Britain has been most active in promoting a shift out of the public system in favor of funded private pensions. Granville and Mallick (2002) argue that the increase in occupational pension saving was totally offset by a decrease in other forms of British household saving. Slightly more optimistic results are obtained by Attanasio and Rohwedder (2003) who use microeconomic household data. Bailliu and Reisen (2000) report a weak positive correlation between the buildup of private pension assets relative to GDP and private saving for a sample consisting of six OECD and three non-OECD countries. However, the correlation was negative when they limited their sample to OECD countries. Samwick (2000) found a lower rate of saving in countries with extensive PAYGO systems, but he was unable to find consistent evidence of higher saving rates after reform.

In our earlier paper we supplemented the existing literature with a statistical examination of cross-national saving patterns at the aggregate level (Bosworth and Burtless, 2003). We used data from the national accounts and the flow of (financial) funds accounts to create estimates of private saving that are divided into three components: corporate saving (retained earnings), saving within formal retirement accounts, and non-retirement saving. We were able to make appropriate calculations of pension and non-pension private saving for seven OECD countries

people without financial assets to offset the consumption effects of a payroll tax increase than it is for people who have already accumulated substantial savings.

covering the period from 1971 to 2000 and four other OECD countries for a smaller number of years.¹⁴

There is wide variation across the countries in both the level of private saving and the relative importance of institutional retirement saving.¹⁵ Formal retirement saving accounts have modest significance in Japan and Germany, but they are a principal component of private saving in several other countries. Retirement saving is especially important in the United States where it now dominates household saving. In spite of the growth of private retirement saving, particularly during the 1980s, the United States experienced a large and sustained slump in private saving after the mid-1980s. If the faster accumulation of funds in U.S. pension accounts actually represented net new saving, as claimed by Poterba, Venti, and Wise (1998), some unrelated development which caused massive reductions in other forms of household saving must have occurred after 1985. The United States was not alone in experiencing lower private saving. Our tabulations showed a marked decline in private saving rates in most of the OECD countries, with the decline concentrated in non-pension saving. By 2000 non-pension household saving was negative in several of the countries, including the United States.

In the prior paper we obtained a rough measure of the influence of pension and life insurance accumulations on overall private saving by estimating the private-sector equivalent of equation 1:

$$(2) \quad PS_{it} = \alpha_i + \theta_i LIPF_{it} + \delta_i \Delta Y_{it} + \lambda t,$$

where

PS_{it} = Private-sector saving rate of the i th country in year t ;

$LIPF$ = Net accumulation within life insurance and pension funds, averaged over two years and scaled by national income; and

ΔY = Percentage change in real GDP.

¹⁴ The countries with complete data were Australia, Canada, France, Germany, Japan, the United Kingdom, and the United States. Data for a smaller number of years were obtained for Denmark, Italy, the Netherlands, and Sweden.

¹⁵ We usually defined retirement saving as accumulation within life insurance and pension funds. For Canada and the United States pension saving includes accumulations in individual retirement accounts (IRAs). The U.S. data are also detailed enough to permit us to exclude the non-pension fund investments of life insurance companies.

For technical reasons, the structure of this equation is a bit different from that of equation 1.¹⁶ Given the difference in specifications, we now expect the coefficient on retirement account saving, Θ , to vary between zero (indicating that added pension saving is completely offset by reductions in other forms of private saving) and unity (indicating no offset). Our estimated model included a trend term and country-specific measures of the unemployment rate and aged dependency ratio to reflect other important influences on private saving. The model also included country fixed effects.

Our basic results suggest the coefficient on life insurance and pension fund saving, Θ , is 0.123. This implies that faster fund accumulation in private pension accounts is almost completely offset by reductions in other forms of private saving. The coefficient was different from unity (indicating no offset) at the 0.01 level of significance, and it was not significantly different from zero (indicating higher pension saving is completely offset). Statistical correction for autocorrelation produced an even smaller estimate of Θ . Thus, the international macroeconomic evidence suggests that increased contributions to formal pension accounts mainly represent a substitute for older forms of saving rather than a net addition to private saving. This inference was not particularly sensitive to the inclusion or exclusion of individual countries in the sample, although it was sensitive to the time period used in the analysis. In the period up through 1990 there is a positive association of between the inflow of funds into retirement accounts and total saving, but this pattern disappears when data from the 1990s are included in the estimation.

The reaction of overall private saving to saving within a voluntary employer-provided pension system does not necessarily provide a reliable guide to the response of household saving to a new system of mandatory private accounts. Our finding nonetheless suggests that the potential for private saving substitution is quite large. Moreover, many social security reform

¹⁶ We could not directly estimate the relationship between private retirement saving, on the one hand, and non-retirement private saving, on the other. Our estimates of total private saving and the accumulations in retirement accounts were derived from different (and not necessarily consistent) data sources. The estimate of net accumulation within life insurance and pension funds was derived from national flow-of-funds accounts, while our estimate of total private saving was obtained from the national accounts. Thus, measurement error in the residual – non-retirement saving – is inversely correlated with the error in the estimate of saving within the retirement accounts, biasing the estimate of the substitution between the two forms of saving. The estimation problem is avoided by using the national accounts' measure of total private saving as the dependent variable, but this changes the interpretation of the coefficients.

participation rates. Statistics for all years show a strong pattern of labor market withdrawal as men grow older. The crucial difference between earlier and later years in the century is that in later years the fall-off in labor force participation begins at a younger age and proceeds at a faster pace.

The decline in male participation was neither smooth nor uniform over the century. The top panel of Figure 1 shows percentage-rate declines in male labor force participation in three different periods: 1910-1940, 1940-1970, and 1970-2002. Between 1910 and 1940, for example, the participation rate of 74-year-old men fell 16 percentage points to 31 percent, and in the next 30 years it fell an additional 13 points. The biggest absolute and proportionate declines in participation occurred among men past the age of 64. In 2002, for example, the participation rate among 72-year-olds was only one third the equivalent rate in 1910. The time profile of the fall-off in participation rates is shown in the top panel of figure 1. Between 1910 and 1940, the reductions in participation rates were substantial only for men aged 64 and over. The drop accelerated between 1940 and 1970, but still only for workers beyond age 61. After 1970, the declines were no longer limited to the oldest workers, bigger declines occurred among men younger than 62. Since the mid-1980s, participation rates among men older than 62 have stabilized and even begun to climb slowly.

The story for older American women is different. We lack information on women's participation rates before 1940. Older women's participation rates in the post-World-War-II era have reflected two partially offsetting phenomena – the early retirement trend among career workers and the increasing labor force participation of married women. As a result of the latter, the participation rates of older women did not exhibit the dramatic post-war declines seen among men. Instead, as shown in lower panel of Figure 1, age-specific labor force participation rates generally increased among women. Between 1940 and 2002, the female participation rate rose 50 percentage points at age 55, 36 points at age 60, 13 points at age 65, and 7 points at age 70.

Even though long-term trends in older women's participation differ enormously from those among men, there is a striking similarity in the age pattern of male and female labor force withdrawal. The similarity can be seen when we calculate withdrawal rates at successive ages for a particular birth cohort. Suppose that the percentage of people in a birth cohort who are in the labor force between ages 50 and 54 is used to gauge the fraction of the cohort that is classified as "full career workers." Among men born in 1913, for example, the labor force

Starting at age 62 social security has a different kind of effect on the retirement decision. When a worker delays claiming retirement benefits by working another year after the earliest age of eligibility, two things happen. The worker passes up an immediate opportunity to collect a social security check. On the other hand, future retirement benefits will be higher because average lifetime earnings are recalculated and because the monthly pension check is increased for every month of delay in claiming benefits. Between the ages of 62 and 64 the social security formula offers average workers a fair compensation for giving up a year's benefits. Note, however, that a benefit formula that is age-neutral for the average worker can still provide strong financial incentives to retire for workers who have below-average life expectancy. These workers may not expect to live long enough for the future benefit increase to make up for the benefits given up by delaying retirement for one more year. After age 65 social security has historically been much less generous toward delayed retirement. Postponement of retirement after that age is not fairly compensated by increases in the monthly pension. In essence, the social security formula forces workers who delay retirement after 65 to accept a cut in the lifetime value of their social security payments. This is a clear inducement to retire no later than age 65.

The social security formula and eligibility rules have been changed in a number of ways that affect the attractiveness of retirement. Until 1956 workers had to wait until they were 65 to claim a social security old-age pension. In that year Congress permitted women reaching age 62 to claim an actuarially reduced pension. Five years later this reform was extended to men. In the early 1970s Congress modified the adjustment in benefits for workers who delayed claiming benefits past age 65. At first the delayed retirement credit was very small, just 1 percent for every year a worker delayed collecting pensions past 65. Starting in 1983 Congress began to phase in a gradual rise in the delayed retirement credit. so that workers who postpone receiving a social security pension after the normal retirement age will soon be fairly compensated for the delay. A third important change was also enacted in 1983. For the first time Congress scheduled an increase in the normal retirement age, raising the earliest age when workers can claim an unreduced pension from 65 to 67. Workers can still claim an early retirement pension at age 62, but the benefit at that age will gradually fall to just 70 percent of full social security pension. For workers who reached age 62 before 2000, the early retirement benefit was 80 percent of a full pension. Finally, some people receiving social security benefits were deterred from working by

the retirement earnings test, which imposes heavy (though temporary) pension reductions on workers who receive labor earnings above a specified level. Congress has gradually raised the earnings limit and reduced the income penalty associated with the retirement earnings test. In 2000 the earnings test was eliminated for pensioners who have attained the normal retirement age.

One measure of the generosity of social security is the replacement rate it provides workers who retire at some standard age, say 65. Figure 5 shows the net replacement rate provided to new retirees who began collecting old-age pensions between 1950 and 2001. The net replacement rate is the ratio of average social security benefits and the average after-tax wage. To approximate the benefit workers would receive if they retired at a standard age, we took the Social Security Administration's estimate of the average "Primary Insurance Amount" (or PIA) of workers filing new claims for old-age benefits.¹⁹ The PIA is simply the full social security pension for a single worker who claims benefits at the normal retirement age, or age 65. Actual benefits are lower than this for workers retiring before age 65; they are higher for workers retiring later. The Social Security Administration provides estimates of the average PIA separately for men and women who claim retired worker benefits.

We approximated the average wage using two methods. The Census Bureau publishes estimates of median annual earnings separately for men and women. One problem with this estimate is that it includes the very low earnings of a varying number of teenagers. For years after 1966 we can use income reports in the March Current Population Survey to calculate average earnings of workers who are closer to retirement. In Figure 5 we use average earnings of employed 55-59 year-olds, separately for both men and women, to approximate the earnings that older workers of each sex would have to give up if they left employment. Before calculating the ratio of benefits to earnings we subtracted payroll tax withholdings from the worker's wage. The worker's portion of the payroll tax increased from 1 percent to 7.65 percent of wages between 1950 and 2001, so the tax has a noticeable effect on the replacement rate.

Using either measure of net wages, the replacement has trended upward over time for both men and women. Not surprisingly, the replacement rate is lower if earnings among 55-59

¹⁹ Because benefit levels were often increased during the middle of a calendar year, we always used average PIA amounts for the part of the year that includes December. For workers who retired earlier in the year, the December pension amount would reflect all cost-of-living adjustments applied up through the end of the year.

year-olds are used as a benchmark for potential earnings. Median earnings of all active workers are lower than the mean earnings of 55-59 year-olds, so the replacement is lower when the latter benchmark is used. Until recently, women's replacement rates were higher than those of men, regardless of the wage benchmark used. This is a logical result of the social security benefit formula, which offers higher replacement rates to workers with lower lifetime earnings. Because women earn lower average wages than men, they historically benefited from the redistributive tilt in the formula when claiming retired worker pensions. Beginning in the early 1980s, however, the replacement rate of newly retired male and female workers has been more nearly equal, a consequence of much faster wage growth among women than among men. If we use mean earnings of 55-59 year-olds as a benchmark for potential earnings, the average male and female retired-worker replacement rate has been very similar since 1983.

The chart shows a sharp increase in pension replacement rates for men at the beginning of the 1950s, and again during the 1970s. These increases are linked to sharp improvements in pensions enacted by Congress in 1950, 1969, 1972, and 1974. The male replacement rate trended slowly upward after the mid-1980s, even though benefit generosity was curtailed by amendments passed in 1977 and 1983. Part of the explanation is the poor relative performance of male earnings, especially among men earning average and below-average wages. A growing percentage of male retirees thus benefited from the redistributive tilt of the pension formula, improving the ratio of new pensions to current male wages.

Surprisingly, the statistics show a decline after 1981 in replacement rates provided to newly retired women. Part of the drop is due to the 1977 amendments, which cut benefit growth among workers who retire after the early entitlement age (Myers et al., 1988). It is puzzling, however, that the impact of this formula change on women's retirement benefits was so much bigger than the impact on men's. One factor contributing to lower replacement rates was the rise in women's relative earnings. Median female earnings increased 209 percent between 1980 and 2001 whereas median male earnings rose only 123 percent.

The impact of social security on retirement is obviously affected by the proportion of workers who qualify for benefits. Eligibility for social security rose rapidly in the 1950s and early 1960s as a result of expansions in the percentage of workers covered by the program. These expansions are reflected in sizeable increases in the percentage of men and women who were eligible for or actually receiving a social security retired-worker benefit when they reached

ages 65-69 (see Figure 6). The statistics displayed in Figure 6 do not reflect benefits paid to people who qualify for social security solely as dependents or surviving widows of a covered worker. Many women are eligible for dependent benefits even though they may not have accumulated enough earnings credits to become eligible for retired-worker pensions based on their own employment record. The availability of dependents' and widows' benefits also affects our interpretation of replacement rates available to women. Many women are entitled to a supplement to their own retired-worker pension as a result of their eligibility for a dependent spouse or widow's pension. If this supplement is added to the worker's retired-worker benefit, the social security replacement rate for newly retired women could be substantially higher than implied in Figure 6. The importance of dependent benefits has declined, however, as women's lifetime earnings have increased. A smaller percentage of newly retired women receive a supplement to their own retired-worker benefit as a result of their eligibility for a dependent spouse benefit based on a husband's earnings record. The spousal benefit is quite unimportant for retired men.

The above description of the financial incentives in social security sheds some light on the retirement trends discussed earlier. Social security is now the main source of cash income of households headed by someone 65 or older. The program provides 38 percent of the total cash income received by the aged. Among aged households in the bottom 60 percent of the elderly income distribution, social security provides two-thirds or more of cash income (U.S. Social Security Administration, 2000, pp. 15-16). Until 1941, social security provided no income at all to the aged. According to Social Security Administration calculations, the program now replaces about 42 percent of the final wage earned by full-career single workers who earn the average wage in every year of their work life and claim a pension at the normal retirement age. If a worker has a non-working dependent spouse, the benefit replaces 63 percent of the worker's final wage (U.S. House of Representatives, Committee on Ways and Means, 2000, Table 1-17). Benefits are clearly large enough so they can be economically significant in influencing the choice of retirement age.

Previous estimates of social security effects. The number of studies attempting to measure the effect of social security on retirement is now quite large. Good surveys of the literature have been prepared by Quinn et al. (1990), Hurd (1990), Lumsdaine and Mitchell (1999), and Krueger and Meyer (2002). Our reading of this literature is that, with a few notable

exceptions, most careful studies find rather small effects of social security on older workers' labor force participation. That is, the effects appear to be small compared with the large historical changes in U.S. participation rates documented in Figures 1, 3, and 4.

Krueger and Meyer (2002) distinguish between two broad approaches to estimation. One class of study relies on time series changes in social security incentives to identify the impact of incentives on some measure of aggregate labor supply. A second relies on differences among a cross-section of workers at a particular point in time to disentangle the influence of detailed program incentives on individual workers. A few studies use the combination of both time-series and cross-section variation to determine the effects of social security incentives based on longitudinal data for a representative sample of workers. To this list we should also add cross-national studies of the effects of different retirement systems on aggregate supply.

The aggregate time series evidence for the United States seems to suggest a large effect of the program. As we have seen, participation rates of full-career workers fell after social security became an important source of retirement income. Participation rates fell particularly rapidly during the 1970s when benefits were greatly liberalized. Furthermore, participation rates past age 61 and especially past 65 began to rise after the mid-1980s when work-discouraging features of the program were removed or modified.

There are two problems with this kind of evidence. First, participation rates of older men were declining even before social security benefits began to be paid, suggesting that other factors besides social security lie behind at least some of the trend toward earlier retirement (see the top panel in Figure 1). Second, if workers were induced to earlier retirement by windfall increases in wealth provided by social security, it is surprising that so much of the decline in labor force participation occurred after 1970. As noted by Robert Moffitt (1987), the unexpected windfall gains in lifetime wealth produced by social security were mainly concentrated in the 1950s, not in the 1970s. This implies that the largest labor supply effects of the program should also have been concentrated in the 1950s and early 1960s, and Moffitt finds little evidence for this in the data.

The second kind of analysis focuses on differences between individual workers to identify the effects of detailed social security incentives on labor supply. An advantage of this approach is that incentives can be accurately measured. Another is that other influences on labor supply, including workers' health and other pension entitlements, can also be taken into account.

These studies typically analyze the cross-sectional distribution of retirements within a group of workers who reach old age around the same time. The behavior of workers with a large amount of social security or pension wealth is compared with that of workers with less wealth. The analyst takes account of differences in the rate at which workers can accumulate additional social security and private pension wealth and can earn additional wages.

Most studies of this type find that even big changes in social security cause only modest changes in participation rates. Burtless and Moffitt (1985) predict, for example, that raising the normal retirement age in Social Security from 65 to 68 would add only a little more than 4 months to the full-time working careers of men who are not disabled. In a recent assessment of the impact of social security changes on male labor force participation in the 1970s and 1980s, Anderson, Gustman, and Steinmeier (1999) use cross-sectional evidence from the Retirement History Survey to estimate a sophisticated and forward-looking retirement model based on the experiences of 3,300 men who retired in the late 1960s and 1970s. They obtain behavioral estimates that seem sensible and very precisely estimated. When they use these estimates to simulate the aggregate response to the social security changes over the 1970s and 1980s they find only small predicted changes in male participation rates. Between 1969 and 1989, male participation rates fell 14 percentage points at age 60, 25 points at age 62, and 17 points at age 65. Changing social security incentives can explain only one-seventh of the decline at ages 60 and 62 and none of the participation-rate decline at age 65. In fact, the authors find that social security reforms should have induced a small increase in male participation rates at age 65 (Anderson et al., 1999, p. 777).

Another way to analyze the influence of social security is to examine behavioral differences among people who face different incentives because the program has been altered in an unanticipated way. In 1969 and again in 1972 social security benefits were increased much faster relative to wages than at any time in the recent past. By 1973 benefits were 20 percent higher in inflation-adjusted terms than would have been the case if pensions had grown with wages as they did during the 1950s and 1960s (see Figure 5). In 1977 Congress passed amendments to the Social Security Act that sharply reduced benefits to workers born in 1917 and later years (the “notch” babies) in comparison with benefits payable to workers born before 1917. Burtless (1986) examined the first episode, and Krueger and Pishke (1992) examined the second. In the period analyzed by Burtless, older workers in his sample planned their

retirements when social security was comparatively less generous; younger workers planned their retirements when social security benefits were 20 percent higher. Krueger and Pischke analyzed a period in which younger workers received significantly less generous pensions than those available to older workers. Both studies reached an identical conclusion. Major changes in social security generosity produced small effects on retirement behavior and labor force participation. Burtless estimated, for example, that the 20-percent benefit hike between 1969 and 1973 caused only a 2-month reduction in the work career of men who were fully covered by the more generous formula. This was equivalent to a reduction in the labor force participation rates of 62-year-old and 65-year-old men of less than 2 percentage points. The effects of the 1977 amendments found by Krueger and Pischke were even smaller. Even if their largest estimated effects are accepted, less than one-sixth of the drop in labor force participation during the 1970s can be explained by changes in social security.

Another kind of evidence is based on comparisons of retirement patterns in different countries where pension systems are very different. Gruber and Wise (1999) undertook one of the most meticulous studies of this type. It reaches a very different conclusion from the one based on cross-sectional and panel data from the United States. Gruber and Wise and their expert collaborators examined pension systems and retirement incentives in 11 industrialized countries. Some of these countries allow workers to begin drawing public pensions at age 60 or even earlier, while others do not make old-age benefits available until later. There is also wide variation in the treatment of labor earnings once workers reach the pensionable age. Some countries, like the United States, provide relatively modest public pensions and do not penalize workers for delaying their retirement beyond the early and normal pensionable ages. Other countries, like France and the Netherlands, provide much more generous pensions and impose heavy financial penalties on workers who remain employed after the pensionable age. The Gruber and Wise study reports a strong correlation between national retirement patterns and the labor supply incentives that are embodied in national pension systems. Countries with modest pensions and generous treatment of earned income after the pensionable age have high rates of participation among people between 55 and 70 years old. Countries offering very generous pensions and imposing heavy penalties on earnings after the pensionable age have much lower participation rates at older ages.

These findings imply that the trend in labor force participation at older ages was decisively influenced by incentives in national retirement systems. While all the rich countries have seen major declines in older males' activity rates, the extent of decline has been affected by the details of the national pension system. Compared with the cross-sectional and panel data studies discussed above, the Gruber and Wise (1999) analysis implies a much bigger impact of the social security system on activity rates at older ages.

It is conceivable that the cross-national comparison is uncovering a long-run effect of generous pensions that is impossible to measure in microeconomic studies of people who retire within a few years of one another. In particular, more generous income support programs for the retired may influence the trend in average workers' preferences regarding the desirability of work in old age. More generous pensions encourage earlier retirements among a few workers, and this development may then affect opinions regarding retirement among a much wider class of people. Longer retirement becomes an acceptable, highly desired part of a typical worker's life. This impact of social security and pensions is hard to detect in cross-sectional and panel studies of the kind discussed above. Those studies attempt to find a correlation between workers' choice of retirement age and the financial incentives (or change in incentives) that might motivate workers to retire at one age rather than another. If the average worker's preferences for retirement versus consumption have gradually changed as a result of a social-security-induced shift in preferences, this shift would be missed in cross-sectional and panel studies, although it might be detectable in a cross-national study where the analyst can see the long-term impact of stable differences in the retirement system.

Some evidence suggests that behavior is slow to change in the face of changing financial incentives. It took a number of years after the introduction of early social security pensions before retirement at age 62 became common. The financial incentives that eventually induced men to retire at age 62 were presumably present from the first day early pensions were offered in 1961. It was only in the late 1960s, however, that a sharp fall-off in labor force participation at age 62 became noticeable. By the late 1970s, the fall-off in participation was greater at age 62 than at age 65. This evidence may imply either that workers are slow to recognize the financial implications of a complicated innovation or that their preferences are formed, in part, by indirect effects of the financial incentives facing them.

Simulating labor force response to reform. How big was social security's impact on past labor force participation? Even though conflicting evidence does not provide a definitive answer to the question, it is possible to use some of the evidence to develop reasonable estimates of the range of potential effects of future reform. As noted above, Anderson et al. (1999) used estimates based on a cross-sectional empirical study to infer the effects of the reforms implemented in the 1970s and 1980s. Since their estimates were based on a statistical methodology that typically produces small predictions of social security's effects, it is helpful to contrast them with an alternative technique that suggests a larger impact. This approach can provide an upper-bound – and probably unrealistically high – estimate of the potential effect of reform.

We first estimate a time-series model in which aggregate labor supply in old age is solely determined by social security incentives. This approach probably overstates the impact of social security, because it disregards other influences which have the same general trend as social security benefits. Some of these also encouraged earlier retirement. For example, the private, non-social-security retirement system has grown larger and provided more generous retirement incentives to recent generations of workers. The impact of this expansion will be partly attributed to social security in the approach we follow.²⁰

In the simplest model of social security effects, participation rates at older ages are determined by the net replacement rate provided by the program and by the earliest age at which benefits can be claimed. Higher replacement rates and earlier benefit entitlement should encourage earlier retirement and induce lower labor force participation. Our preferred measure of labor force participation for a given age group measures the group's participation relative to the participation rate of a group that is presumed to be largely unaffected by social security old-age pensions. The oldest age group likely to be unaffected by the retirement incentives of social

²⁰ It is conceivable, of course, that the creation and expansion of social security encouraged the development and expansion of private retirement pensions. In the absence of social security, employers and workers might not have moved to create or enlarge a voluntary fringe benefit that only makes sense if a large number of workers can afford to retire. If this hypothesis is correct, the post-war decline in older workers' participation rates should be attributed to social security rather than to private pensions, because the expansion of the private pension system was itself a by-product of social security and its liberalization.

security consists of people who are between 50 and 54 years old.²¹ Thus, we measure participation rates *relative to* the participation rate of 50-54 year-olds. Because of limitations in the data before 1976, our analysis focuses on relative male and female participation rates in four main age groups (55-59, 60-64, 65-69, and 70-74) and two smaller subgroups (60-61 year-olds and 62-64 year-olds). We take two approaches to measuring a group's relative participation rate in a given year. Under one approach, the relative participation rate of, say, 55-59 year-olds is measured relative to the 50-54 year-old participation rate in the same year, $L_{55-59, t} / L_{50-54, t}$. Under the alternative, it is measured relative to the 50-54 year-old participation rate exactly five years earlier, $L_{55-59, t} / L_{50-54, t-5}$. The short-hand label for latter concept is "lagged relative participation." Although in many ways the second variable is the preferred way to measure relative participation rates, limitations in the Census and CPS data mean it cannot be calculated for as many years.

Our measure of the net replacement rate has already been described. For a given year it is the average PIA for workers claiming a new retired-worker benefit divided by median earnings, with the ratio measured as a percent. Our measure of the duration or wait until entitlement for a retired-worker benefit is the difference between the average age in the group and the earliest entitlement age for retirement benefits, measured in years. For workers who are younger than the earliest entitlement age, this number is positive; for workers older than the earliest entitlement age, it is negative. The only time-series variation in the variable occurs when the early entitlement age changes (in 1956 for women and in 1961 for men). The statistical identification of effect of duration-to-benefit-entitlement is, therefore, very fragile. Data are available to estimate the model separately for men and women. Because we do not have continuous data on the dependent variable, it is impossible to obtain good auto-correlation corrected estimates of the coefficients.

Coefficient estimates for the six age groups are displayed in Table 3, with results for men in the top panel and for women in the lower panel. The model is more successful in explaining the trend in relative participation among men. The effect of the replacement rate on relative

²¹ The labor force participation of 50-54 year olds will be affected by the disincentive of the wage tax and the gain of qualifying for a larger pension. In that respect, our assumption is an oversimplification. However, the stability of the male participation rate over the past century suggests that the effects are small. For women, the spousal benefit of social security should have discouraged

male participation is always found to have the correct sign and is almost always very precisely estimated. Except in the oldest age groups there is also close agreement on the estimated effect of the replacement rate regardless of whether the relative participation rate is measured with the contemporaneous or lagged value of the age 50-54 participation rate. The difference in estimated coefficients between the two sets of regressions is partly due to differences in the estimation period. Particularly in the older age groups, the estimates based on the lagged value of the 50-54 year-old participation rate cover a smaller number of years. A smaller proportion of the observations relate to the 1950s, when replacement rates were low.

The estimated effects of the time-to-benefit-entitlement usually have the correct sign but they are much less precisely estimated than the effects of the replacement rate. Moreover, the estimated effects of the time-to-benefit-entitlement are sensitive to the definition of the dependent variable. This sensitivity should not be surprising in view of the fact that there is no variation in the time-to-benefit-entitlement after the early 1960s. Thus, the estimate of the coefficient will be quite sensitive to number and character of observations included for the 1950s. The pattern of coefficients across age groups makes sense. Men between 62 and 64 years old seem most sensitive to changes in the social security replacement rate, while workers under 60 and older than age 70 are less sensitive.

The model does not do a good job explaining variation in relative participation rates of older women. Coefficients on the net replacement rate implausibly suggest that more generous retired-worker benefits induce women older than 55 to increase their participation rates relative to those of 50-54 year-olds, though many of the estimates are not significantly different from zero. The implausible estimate of the effect of social security replacement rates may be the result of our poor measure of women's replacement rates. We have a good measure of the age-65 benefits women can receive if their pensions consisted solely of retired-worker benefits calculated on their own earnings records. Many retired women receive higher benefits, however, because their own retired-worker pensions are supplemented by a dependent spouse benefit or because they receive a widow's pension instead of their own retired-worker benefit. Given the limitations of the data, it may not be possible to estimate the effects of the social security replacement rate on women's participation at the aggregate level.

labor force participation, and we attribute the observed rise for younger persons to other economic and social factors.

On the other hand, the estimated effects of time-to-benefit-entitlement have the correct sign and are often significantly different from zero. However, these coefficients are very sensitive to the definition of the dependent variable. Because early retirement benefits were offered to women five years earlier than they were to men, there are even fewer available observations to statistically identify the effect of this variable. In fact, when the dependent variable is defined using the lagged participation rate of 50-54 year-olds, it is not possible to identify the effect of time-to-benefit-entitlement on women who are 65-69 years old. For women in this age group there are no observations which represent the situation of women who were not entitled to benefits at age 62.

Effects of reform. The coefficient estimates in Table 3 can be used to predict the future effects of social security reform. We focus on reforms that reduce the age-65 replacement rate or increase the early entitlement age. As noted above, our predictions provide an upper bound estimate of labor supply response because they are based on a model which assumes all past changes in participation rates were the result of changes in social security generosity. We consider three reforms, two that affect the age-65 replacement rate offered by social security and a third that changes both the replacement rate and the early entitlement age. The first reform is an increase in the normal retirement age (NRA) from 65 to 67, a reform passed by Congress in 1983 that is scheduled to take place for workers attaining age 65 between 2003 and 2025. This reform will reduce replacement rates payable to workers claiming age-65 benefits by 6.7 percent in 2010 and by 13.3 percent in 2030. The second reform accelerates the increase in the normal retirement age and ultimately increases the normal retirement age to 70 rather than 67. This reform reduces age-65 replacement rates by 10.6 percent in 2010, by 21.7 percent in 2020, and by 33.3 percent in 2032 and later years.²² The third reform we consider increases the normal retirement age from 65 to 67, as scheduled under current law, and increases the early entitlement age from 62 to 64. This reform has the same impact on replacement rates as the first reform, but it also increases the wait for retired-worker benefits by two years.

²² We increase the NRA by 2 months every calendar year starting with workers attaining age 65 in 2003. The workers who attain age 65 in 2032 must thus wait to age 70 to claim an unreduced pension. Under the Social Security Amendments of 1983, Congress raised the NRA in two-month annual increments to age 66 for workers reaching age 65 between 2003 and 2008 and to age 67 for workers reaching age 65 between 2020 and 2025.

The simulated response to these reforms is displayed in Table 4. The top panel shows results for men; the bottom panel, results for women. The predictions are based on coefficient estimates obtained when the dependent variable was measured relative to the contemporaneous participation rate of the 50-54 year-old age group. The first four columns in Table 4 show predicted labor force changes within the four main age groups we have been examining. To calculate the overall change in the labor force for people between 55 and 74 in column 5, we constructed a baseline based on unpublished population and labor force projections of the Social Security Actuary for the 2003 *OASDI Trustees' Report*. These predictions are also used to calculate the aggregate change in the labor force of men and women age 16 and older in column 6.²³

The pattern of results for men seems plausible. We estimate that the increase in the normal retirement age from 65 to 67 will increase the labor force by 2 percent among 55-59 year-olds and by 9-11 percent among men 60 and older. If the normal retirement age is increased to age 70, the ultimate effects are about 2-½ times larger than an increase in the retirement age to 67. Even though this reform is predicted to increase the size of the 55-74 year-old work force by 15 percent, the impact on the male labor force age 16 and older is less than 3 percent. If an increase in the normal retirement age to 67 is combined with an increase in the early entitlement age to 64, the 55-74 year-old male labor force would increase about 10 percent, but this would add less than 2 percent to the total U.S. work force.

For purposes of comparison, we also calculated the change in labor force that would occur if relative participation rates within older age groups returned to their 1950 ratios. To perform this calculation, we assume that relative participation rates gradually rise from the observed ratios in 2002 to the 1950 ratios by 2040. This assumption implies that the relative participation rate of men between 65 and 74 will double by 2040. Thus, our coefficient estimates suggest that the increase in the NRA to 67 will ultimately eliminate one-tenth of the decline in participation that has occurred among men over 65 and about one-third of the decline that has

²³ The Social Security Actuary's 2003 forecast is based on the assumption that future participation rates among people 55-74 will gradually rise relative to participation rates among people 50-54 years old. Because we want to compare future labor supply to a baseline path in which relative participation rates do not change, we have modified this feature of the Actuary's forecast. In our baseline simulation, we assume that future participation rates of men and women between 55 and 74 do not change relative to those of 50-54 year-olds. This reduces slightly the Actuary's forecast of aggregate labor supply. Participation rates of men and women under age 55 follow the exact path predicted by the Actuary.

occurred among men 55-64. An increase in the retirement age to 70 would eliminate about one-quarter of the decline among 65-74 year-olds and two-thirds of the decline among 55-64 year-olds.

The predictions for women are less plausible. The coefficients reported in Table 3 suggest the reductions in social security replacement rates that would accompany an increase in the NRA will modestly reduce older women's participation rates. On the other hand, the increase in the early entitlement age for retired-worker benefits is predicted to induce substantial increases in participation for women over age 60, especially among women between 65 and 69. The predictions imply that the increase in participation following an increase in the early entitlement age would ultimately eliminate almost one-half of the relative decline in participation that has occurred among women between 65 and 69 and two-thirds of the decline that has occurred among women between 70-74 since 1950. However, the predicted 11 percent increase in the female labor force between 55 and 74 translates into an increase in the total female workforce of less than 2 percent.

An alternative way to predict the future labor supply of older women is to assume that participation rate changes will mirror the more plausible response patterns we estimated for men. If lifetime labor supply among women is gradually converging toward the life cycle pattern observed among men, the participation response functions estimated for men may offer a more reliable guide to potential participation changes among women. Under this assumption, the responses in the top panel of Table 4 provide a better forecast of female responses after an increase in the early retirement age or cut in age-65 benefit levels.

Conclusion

One justification for reforming social security is that reform can improve incentives for saving and labor supply. If valid, this assumption means reforms can increase the future size of the economy and reduce the burden of supporting a bigger elderly population. Proposals to increase advance funding within public or private pensions are often justified by their supposed effects on aggregate saving. In addition, plans to scale back or modify social security are sometimes defended because they improve incentives to supply labor at older ages, increasing the earnings that are available to pay for pensions and reducing the income gap that pensions must fill. In this paper we examined some of the empirical evidence supporting the argument that reform can produce an increase in labor supply or saving. We sought to provide upper

bound estimates of the potential consequences of these responses for aggregate supply. Our analysis focused on three kinds of reform: The accumulation of extra saving in the government within an advance-funded public retirement system; the accumulation of higher saving in private advance-funded pensions; and the postponement of retirement among workers who anticipate smaller pensions.

We find mixed evidence on the ability of governments to increase public saving by accumulating larger reserves in public pension systems. The experience of state-level governments in the United States suggests that faster accumulation of public pension reserves can produce higher government saving on almost a dollar-for-dollar basis. States that accumulate exceptionally large reserves within their pension funds do not act as though the funds are available to finance non-pension state government operations. Nor do states use bigger reserves in their pension funds to provide short-term tax relief to state residents. The cross-national evidence offers a different lesson about the public budget response to pension fund accumulation. This evidence implies that a large part of any accumulation within national social insurance systems is offset for the government sector as a whole by larger budget deficits in other accounts. On average, OECD countries have been able to save only a small part of the extra funds accumulated within their social insurance systems. Between 60 and 100 percent of the saving within pension funds is offset by reductions in government saving elsewhere in the budget.

Obviously the contrasting estimates of public saving responsiveness have very different implications for the desirability of accumulating reserves within a public pension system. Based on state-level evidence, we find that a policy which increases social security taxes in anticipation of large future pension costs can significantly increase U.S. national saving and future national output. These estimates imply that future aggregate saving will increase one-third and future national output will increase 9 percent if payroll taxes are increased immediately to bring the social security program into close actuarial balance. The effects are only one-tenth as large if we base our predictions on the cross-national experience. Whether the optimistic or pessimistic conclusions should serve as a basis for policy depends crucially on how pension fund accumulation is managed within the government. The contrasting empirical results for U.S. states and OECD nation states can be traced to differences in the governance of the pension

systems and the degree of effort that is made to separate the pension funding from other budget activities.

When we examined saving responses within the private sector to fluctuations in private insurance and pension fund accumulation we found considerable evidence that pension saving substitutes for other forms of private saving. Past experience with voluntary private pension programs is not directly applicable in the case of reform in which the government scales back social security and establishes a new system of mandatory pension accounts. Nonetheless, past experience strongly suggests that asset substitution is a significant problem when workers hold their savings in both pension and non-pension accounts. This kind of substitution can severely limit the effects of larger accumulations in private pension accounts. The net impact of extra private pension accumulations on aggregate private saving may therefore be small.

Finally, our brief review of the empirical evidence on old-age labor supply offered abundant evidence of the existence of an effect of social security but only limited evidence that the effect is large. Most good retirement studies based on cross-sectional and panel data suggest the response to social security incentives has been small. That is, most analysts find that the likely impact of social security is small in comparison with the changes in old-age labor supply that have been observed over the past half century. If the cross-sectional and panel estimates are accepted as valid, the nation can anticipate modest changes in aggregate labor supply from reform in the pension system. In contrast, Gruber and Wise (1999) recently offered estimates based on cross-national comparisons of aggregate labor supply. Their new estimates suggest that the long-run response to pension reform can be much bigger than the responses uncovered in most microeconomic studies.

To provide an upper-bound estimate of the potential effects of social security reform on the future U.S. labor supply we estimated a simple model to explain shifts in relative labor force participation rates over the post-war period. Our parsimonious model was intentionally designed to attribute all the long-term decline in old-age participation rates to long-term increases in the social security replacement rate and reductions in the early entitlement age for benefits. Using parameter estimates of this model, we predicted the long-run effects of reforms that noticeably reduce social security generosity. Predictions based on this model suggest that reducing social security benefits by a third might increase labor force participation of 55-74 year-old men by 15 percent. A reform which increases the eligibility age for early social security pensions might

increase female participation in the same age group by 11 or 12 percent. Although these responses seem large, they would add only 2-3 percent to the size of the future U.S. workforce. Moreover, the predictions almost certainly overstate the impact of reform. A more plausible behavioral model would include the effects of rising lifetime wealth and more generous private pensions when measuring the impact of social security on old-age labor supply. If the effects of wealth gains and private pension liberalization were taken into account, the estimated effect of social security on post-war labor supply would be smaller.

Overall, our findings suggest that the ability of pension reform to expand incentives for saving and labor supply may be less than often assumed. Therefore, efforts to offset the future costs of population aging by increasing the future size of the economy may be difficult to achieve. Efforts to raise retirement saving may be offset by the actions of individuals and their elected officials that reduce other forms of saving. Our evaluation of the research on the effects of social security on the labor force participation of older workers also suggests that the effects of reform will be small.

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Table 1. Impact of Increased Social Security Trust Fund Accumulation on Aggregate Savings, National Income, the Real Rate of Return, and Wages under Alternative Estimates of Government Saving Response /a/

Percent change compared with baseline values

Offset: Effect of extra pension saving on other government saving /b/		Year	Savings	GDP	NNP	Consumption	Rate of return	Wage rate
$\beta = 0.0$	2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2010	24.9	1.0	0.4	-1.0	-0.9	1.2	
	2020	45.3	3.2	1.6	-0.2	-4.2	3.8	
	2025	54.3	4.4	2.3	0.2	-6.0	5.2	
	2040	32.0	8.1	4.5	3.3	-11.8	9.6	
	2050	29.5	8.9	5.1	4.2	-12.7	10.4	
$\beta = -0.65$	2000	0.0	0.0	0.0	0.0	0.0	0.0	
	2010	8.1	0.3	0.1	-0.3	-0.3	0.4	
	2020	14.5	1.1	0.6	0.0	-1.5	1.3	
	2025	17.5	1.5	0.8	0.2	-2.1	1.8	
	2040	9.5	2.7	1.7	1.3	-4.2	3.2	
	2050	9.4	3.0	1.9	1.6	-4.6	3.5	
$\beta = -0.90$	2000	0.0	0.0	0.0	0.0	0.0	0.0	
	2010	2.5	0.1	0.0	-0.1	-0.1	0.1	
	2020	4.5	0.3	0.2	0.0	-0.5	0.4	
	2025	5.4	0.5	0.3	0.1	-0.7	0.6	
	2040	1.9	0.8	0.5	0.5	-1.3	1.0	
	2050	3.1	0.9	0.6	0.5	-1.4	1.0	

/a/ Under the assumed policy social security payroll taxes are periodically increased to maintain close actuarial balance over the 75-year planning horizon, yielding a much larger accumulation of trust fund reserves. See text.

/b/ See equation 1 in text.

Source: Authors' tabulations of macro growth simulation model as explained in text.

Table 2. Impact of New Individual Retirement Account Fund Accumulation on Aggregate Savings, National Income, the Real Rate of Return, and Wages under Alternative Estimates of Private Saving Response /a/

Percent change compared with baseline values

Offset: Effect of additional pension saving on total private saving /b/	Year	Savings	GDP	NNP	Consump- tion	Rate of return	Wage rate
$\theta = 1.0$	2000	0.00	0.00	0.00	0.00	0.00	0.00
	2010	20.34	0.81	0.35	-0.79	-0.70	0.97
	2020	31.00	2.51	1.33	0.05	-3.40	2.97
	2025	32.61	3.33	1.84	0.59	-4.70	3.93
	2040	21.37	4.86	2.98	2.20	-7.32	5.68
	2050	22.09	5.51	3.33	2.61	-8.09	6.41
	$\theta = 0.5$	2000	0.00	0.00	0.00	0.00	0.00
$\theta = 0.5$	2010	9.88	0.40	0.17	-0.38	-0.35	0.48
$\theta = 0.5$	2020	14.74	1.23	0.67	0.07	-1.70	1.46
$\theta = 0.5$	2025	15.48	1.64	0.94	0.35	-2.37	1.94
$\theta = 0.5$	2040	11.12	2.49	1.56	1.16	-3.83	2.90
$\theta = 0.5$	2050	10.65	2.87	1.80	1.46	-4.37	3.33
$\theta = 0.1$	2000	0.00	0.00	0.00	0.00	0.00	0.00
	2010	1.93	0.08	0.03	-0.07	-0.07	0.09
	2020	2.83	0.24	0.14	0.02	-0.34	0.29
	2025	2.97	0.32	0.19	0.08	-0.48	0.38
	2040	2.32	0.51	0.33	0.24	-0.79	0.59
	2050	2.27	0.60	0.39	0.31	-0.94	0.69

/a/ Under the assumed policy social security payroll taxes are periodically increased to maintain close actuarial balance over the 75-year planning horizon, yielding a much larger accumulation of trust fund reserves. See text.

/b/ See equation 2 in text.

Source: Authors' tabulations of macro growth simulation model as explained in text.

Table 3. Model Estimates of Labor Force Participation Relative to Participation Rates of 50-54 Year-Olds

Age group:	Age 55-59		Age 60-64		Age 60-61		Age 62-64		Age 65-69		Age 70-74	
Dependent variable:	Current LFP ratio	Lagged LFP ratio	Current LFP ratio	Lagged LFP ratio	Current LFP ratio	Lagged LFP ratio	Current LFP ratio	Lagged LFP ratio	Current LFP ratio	Lagged LFP ratio	Current LFP ratio	Lagged LFP ratio
Men												
Mean of dependent variable	92.5	91.7	71.8	67.2	82.2	79.8	63.8	58.4	37.3	35.2	23.0	19.0
Constant	102.6	97.2	103.9	98.8	106.4	101.4	104.7	100.4	71.3	73.2	44.8	63.9
Net replacement rate	-0.28 (0.01)	-0.26 (0.02)	-0.87 (0.04)	-0.78 (0.05)	-0.62 (0.03)	-0.57 (0.03)	-1.09 (0.05)	-0.97 (0.07)	-0.57 (0.07)	-0.26 (0.10)	-0.37 (0.09)	-0.09 (0.10)
Time to eligibility	0.06 (0.15)	0.80 (0.20)	1.58 (0.42)	2.50 (0.68)	-1.16 (0.27)	0.22 (0.48)	1.15 (0.51)	2.74 (0.88)	2.67 (0.59)	5.64 (0.77)	0.88 (0.64)	3.98 (0.90)
Adjusted R Square	0.920	0.886	0.945	0.916	0.938	0.903	0.943	0.908	0.857	0.886	0.780	0.748
Number of observations	47	47	47	38	47	40	47	37	47	40	47	28
Women												
Mean of dependent variable	86.4	92.1	59.8	66.5	70.4	78.1	51.7	57.8	28.6	30.1	14.8	17.5
Constant	67.3	64.5	37.0	60.2	43.8	51.1	40.7	64.4	44.6	29.3	31.2	114.1
Net replacement rate	0.28 (0.10)	0.15 (0.12)	0.51 (0.15)	0.23 (0.24)	0.46 (0.15)	0.29 (0.22)	0.43 (0.16)	0.26 (0.22)	0.15 (0.09)	0.03 (0.17)	0.03 (0.04)	0.04 (0.14)
Time to eligibility	1.12 (1.35)	4.40 (1.57)	6.67 (2.07)	12.38 (3.26)	3.42 (2.00)	11.54 (3.01)	7.22 (2.18)	13.84 (2.97)	4.50 (0.75)		1.82 (0.22)	9.49 (1.10)
Adjusted R Square	0.153	0.153	0.236	0.323	0.168	0.301	0.211	0.427	0.451	0.001	0.602	0.760
Number of observations	47	47	47	38	47	40	47	37	47	32	47	28

Notes: Standard errors of coefficient estimates in parentheses. Data for "Current LFP ratio" cover 1950 and 1957-2002; a smaller number of years is available for "Lagged LFP ratio."

Table 4. Predicted Change in Labor Force under Alternative Social Security Reforms and Assumptions, 2010-2040

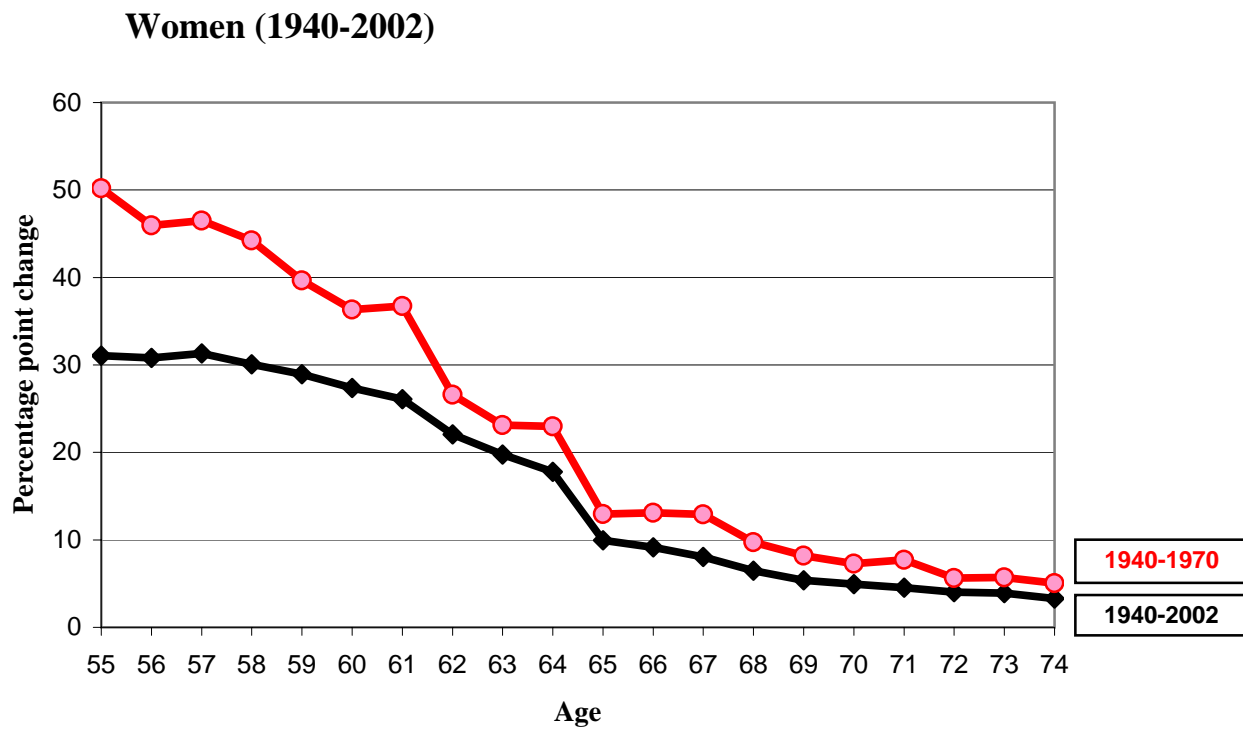
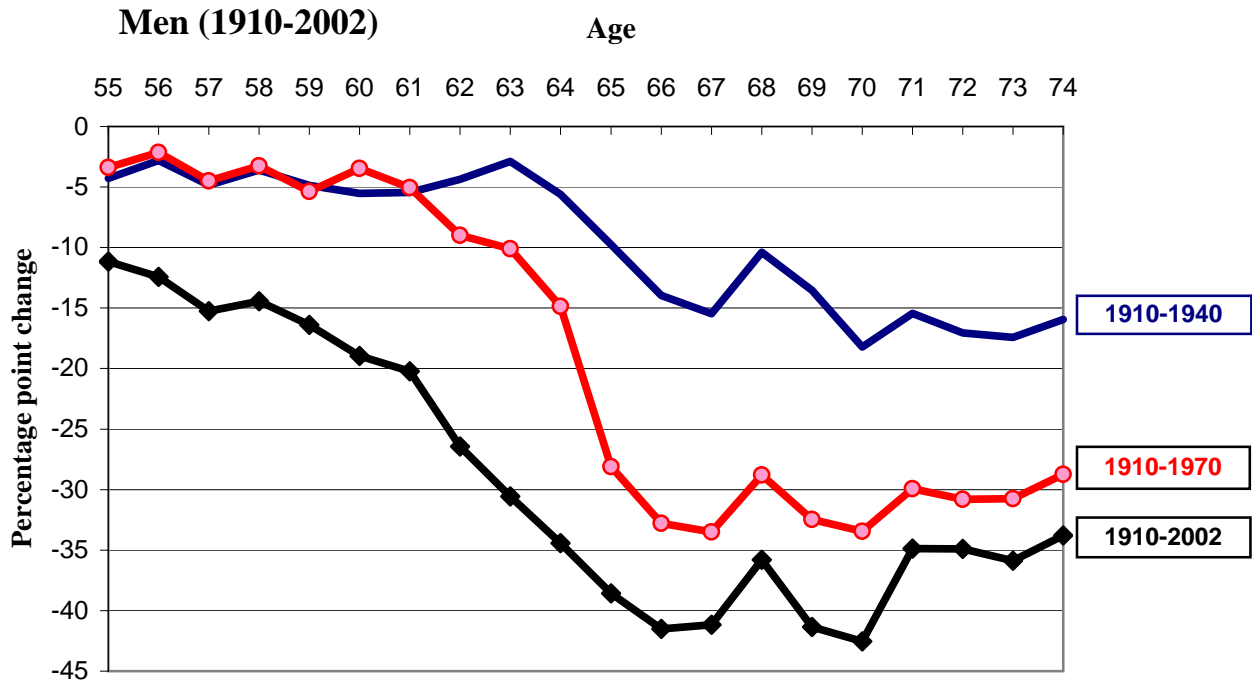
Percent of labor force in baseline

Reform / Year	Age group					
	55-59	60-64	65-69	70-74	55-74	16 and older
Men						
Increase NRA to 67						
2010	1	4	5	2	3	0.4
2020	1	6	5	6	4	0.7
2030	2	9	10	11	6	1.1
2040	2	9	10	11	6	1.1
Increase NRA to 70						
2010	2	7	5	2	4	0.6
2020	3	14	14	12	9	1.7
2030	5	21	22	21	14	2.6
2040	5	21	25	28	15	2.7
Increase NRA to 67 and EEA to 64						
2010	1	7	6	2	4	0.6
2020	2	11	19	11	8	1.5
2030	2	13	24	19	11	2.0
2040	2	13	24	20	10	1.9
Return to 1950 participation ratio						
2010	1	6	17	19	5	0.8
2020	3	15	43	46	14	2.6
2030	5	23	71	74	25	4.4
2040	6	33	100	101	33	5.7
Women						
Increase NRA to 67						
2010	-1	-3	-2	0	-2	-0.3
2020	-1	-4	-2	-1	-2	-0.4
2030	-2	-5	-3	-1	-3	-0.6
2040	-2	-5	-3	-1	-3	-0.5
Increase NRA to 70						
2010	-2	-4	-2	0	-2	-0.4
2020	-3	-9	-5	-1	-5	-0.9
2030	-5	-13	-7	-2	-8	-1.3
2040	-5	-13	-8	-3	-8	-1.4
Increase NRA to 67 and EEA to 64						
2010	2	11	2	0	4	0.7
2020	1	19	30	14	11	2.1
2030	1	17	29	23	12	2.0
2040	1	17	29	23	11	1.9
Return to 1950 participation ratio						
2010	0	2	11	6	2	0.3
2020	-1	6	28	15	6	1.1
2030	-2	9	46	25	11	1.9
2040	-2	12	65	34	14	2.3

Notes: "NRA" is normal retirement age (earliest age for unreduced retired-worker benefits) and "EEA" is early entitlement age (earliest age for an actuarially reduced retired-worker benefit).

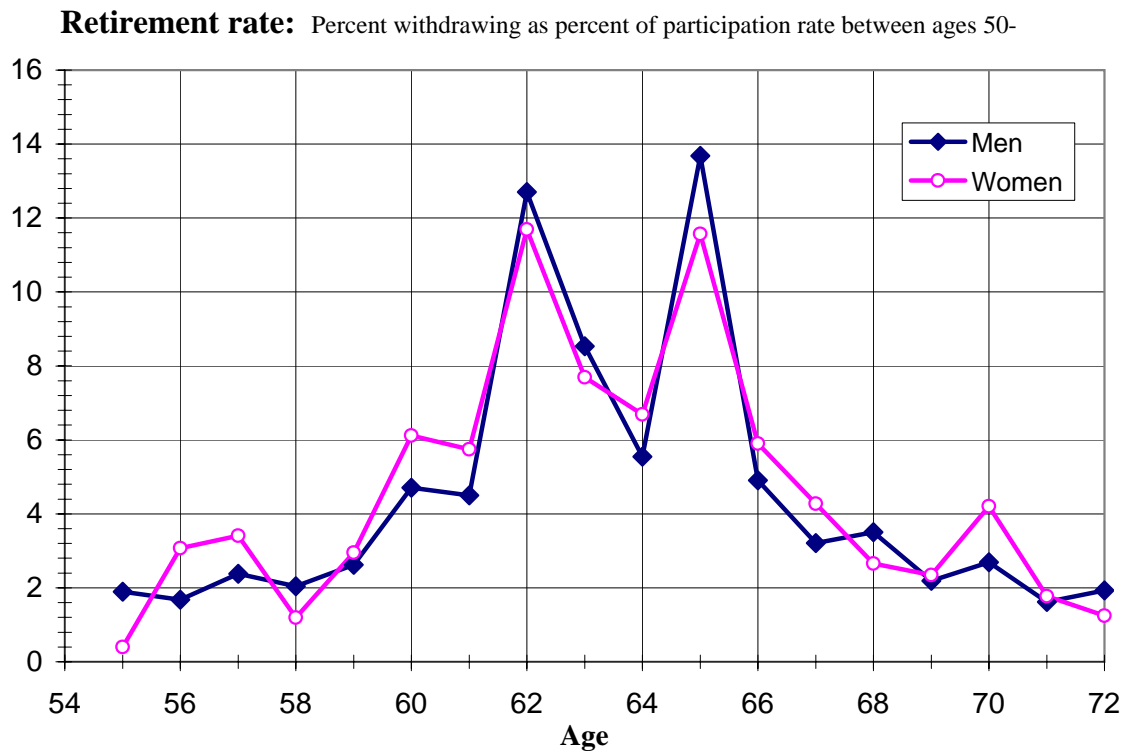
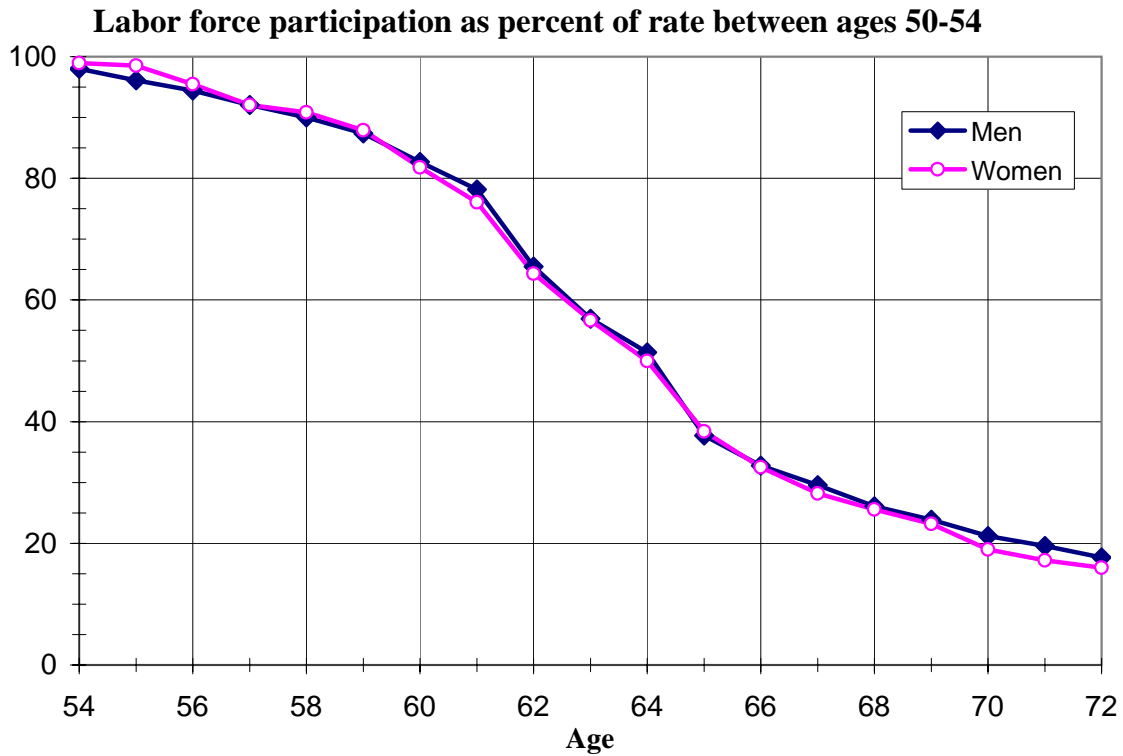
Source: Authors' calculations based on "Current LFP ratio" results in Table 3 and Social Security Actuary's 2003 predictions of 2010-2040 population using intermediate assumptions.

Figure 1. Change in Labor Force Participation Rates, 1910-2002



Source: Authors' tabulations of data from U.S. Bureau of the Census (1910-1970) and CPS files (1970 and 2002).

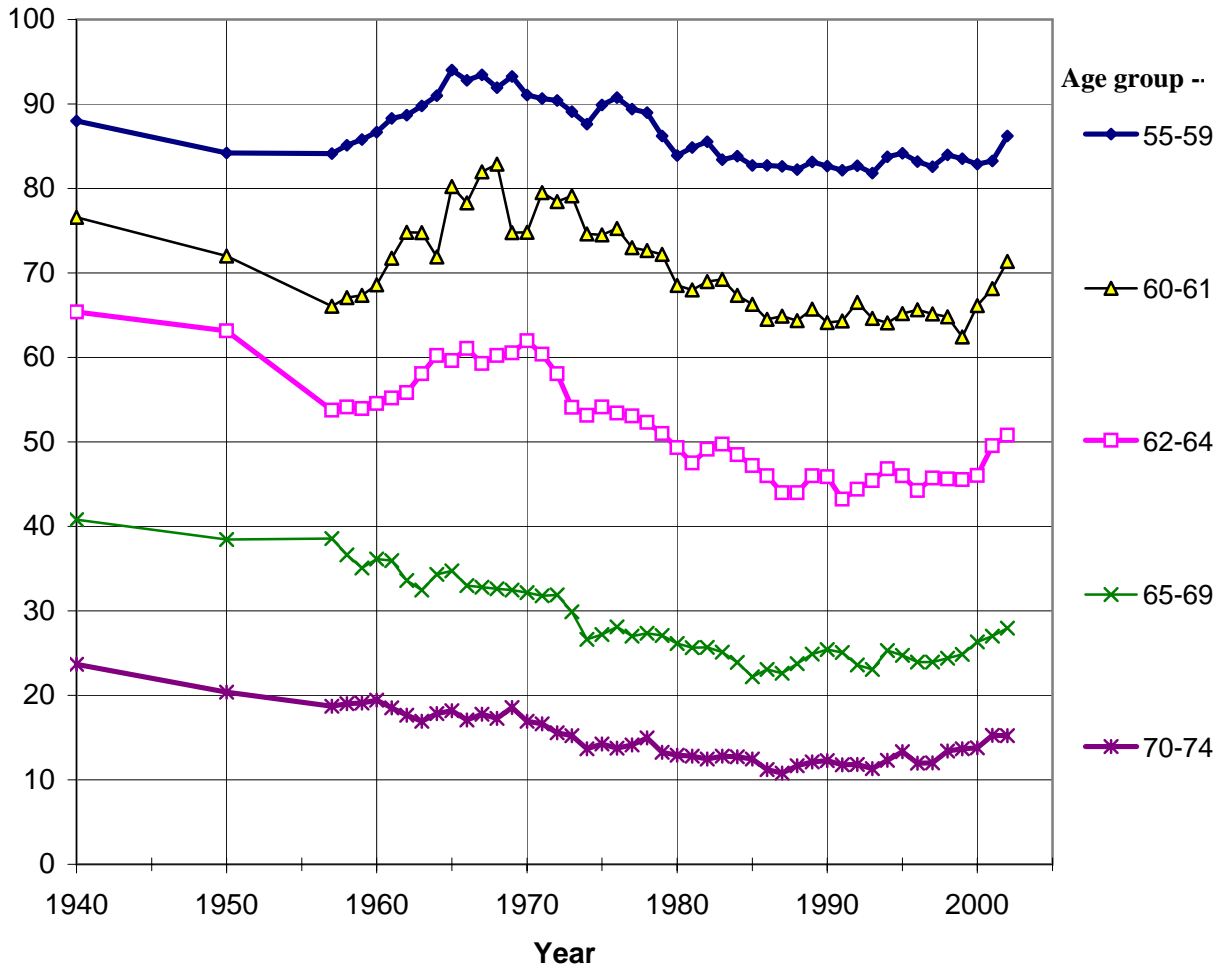
Figure 2. Labor Force Withdrawal among 1906-1930 Birth Cohorts, by Gender



Source: Authors' tabulations of data from March CPS files (1962-1975) and monthly CPS files (1976-2002).

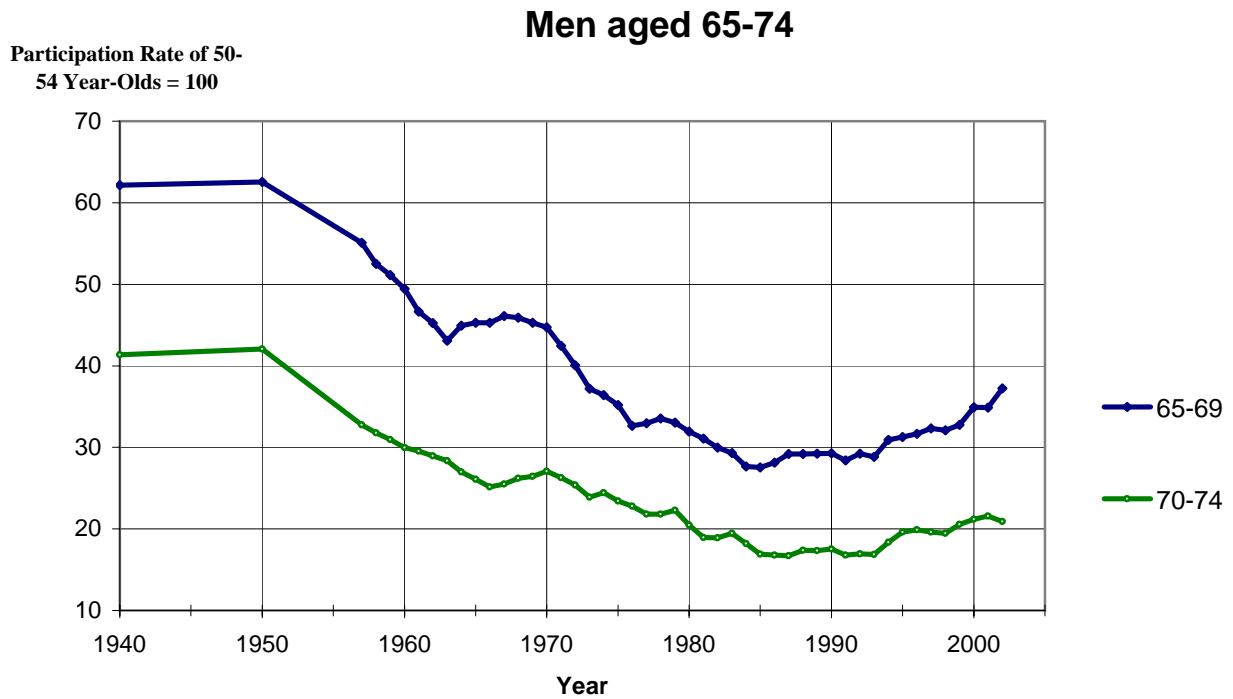
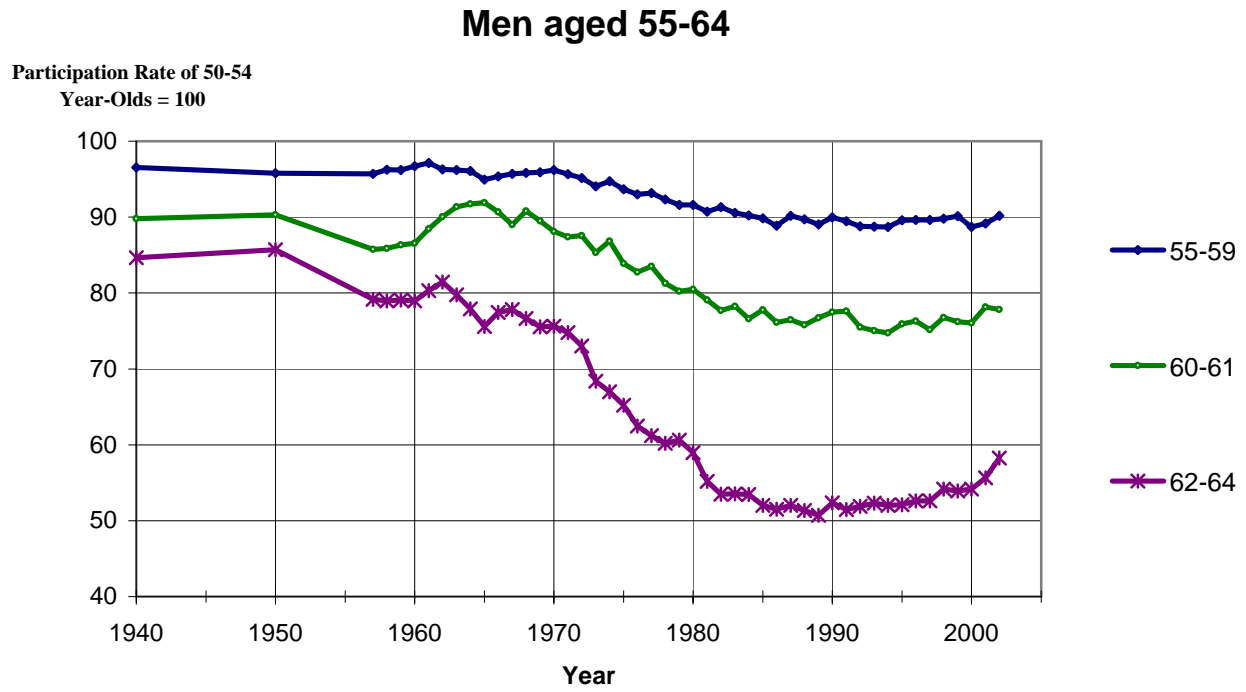
Figure 3. Labor Force Participation Rate as a Fraction of the Participation Rate of 50-54 Year-Old Women

Participation Rate of
50-54 Year-Olds = 100



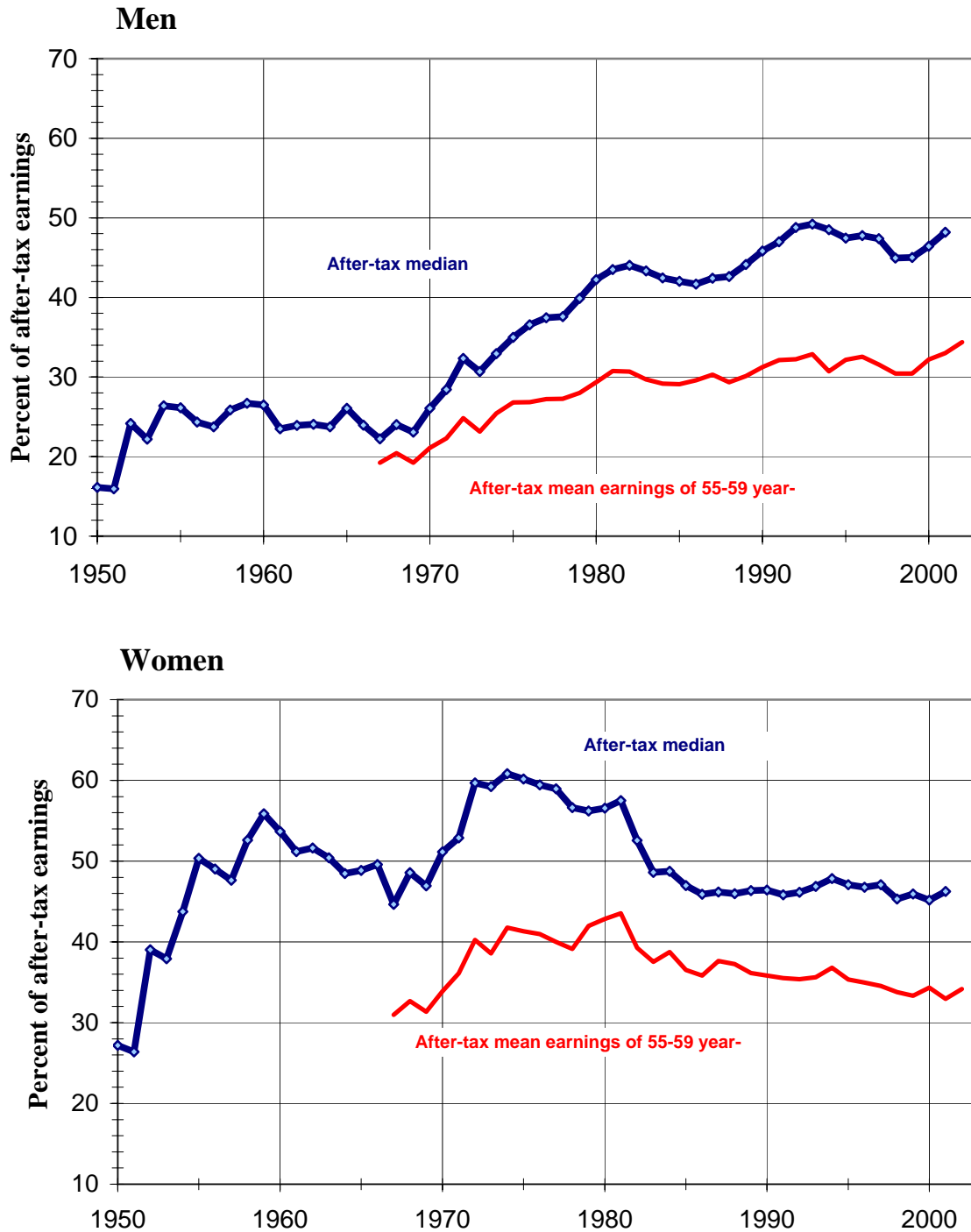
Source: BLS and authors' tabulations of data from U.S. Bureau of the Census (1940-1960) and monthly CPS files (1962-2002)

Figure 4. Labor Force Participation Rate as a Fraction of the Participation Rate of 50-54 Year-Old Men



Source: BLS and authors' tabulations of data from U.S. Bureau of the Census (1940-1960) and monthly CPS files (1962-2002)

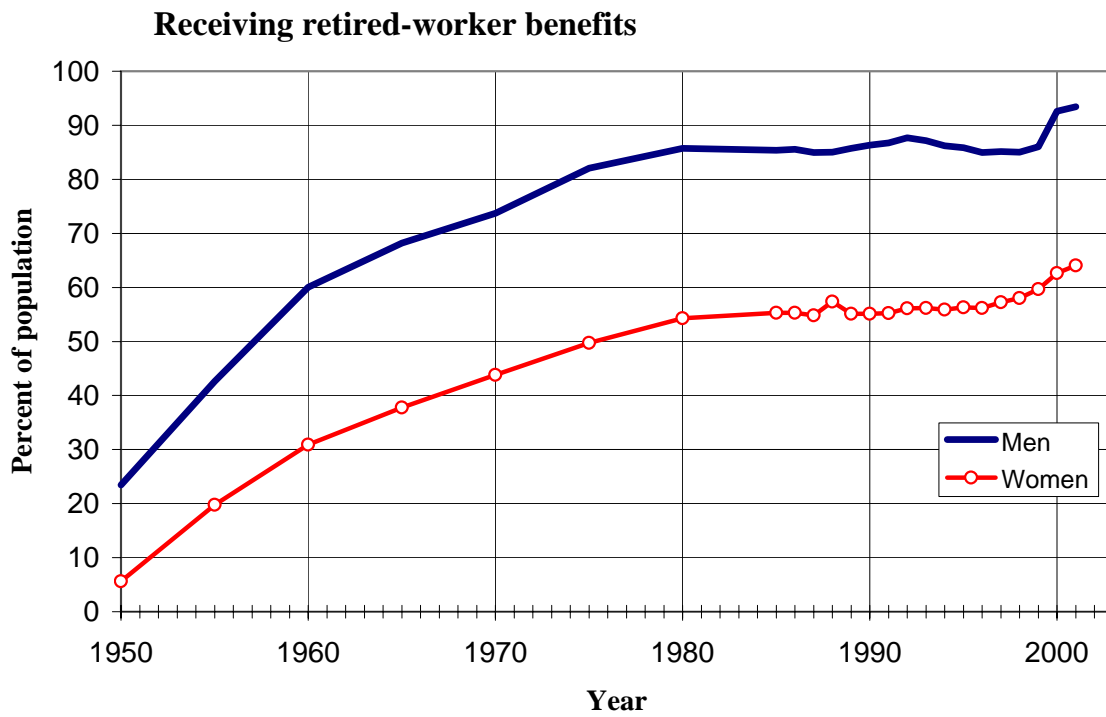
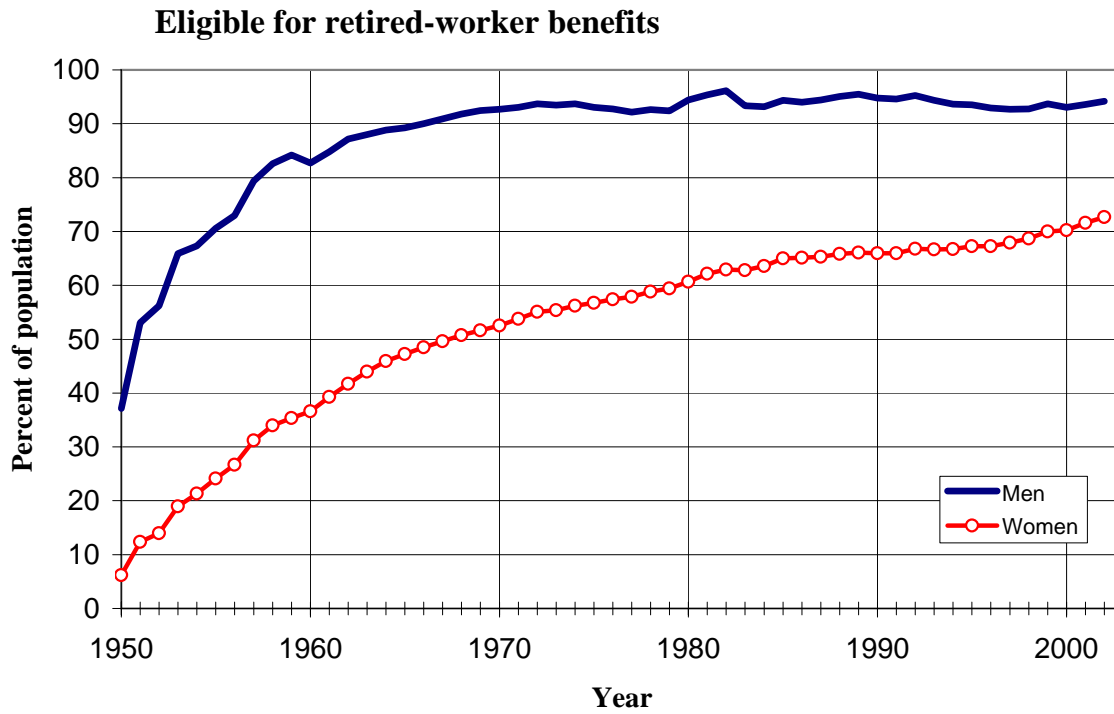
Figure 5. Social Security Retired Worker Replacement Rates, 1950-2002



Note: The replacement rate is measured as the ratio of the average newly awarded PIA to net median or mean earnings, where the net wage is the gross wage minus workers' payroll tax contributions for OASDHI.

Sources: PIA from *Social Security Bulletin, Annual Statistical Supplement* (various years); median earnings from U.S. Bureau of the Census; mean earnings of 55-59 year-olds from authors' tabulations of March CPS files, 1968-2003.

Figure 6. Percentage of Persons 65-69 Eligible for and Receiving Retired-Worker Benefits, 1950-2001



Sources: Authors' tabulations of data from *Social Security Bulletin, Annual Statistical Supplement* (various years) and U.S. Bureau of Census.

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