The Trend in Lifetime Earnings Inequality and Its Impact on the Distribution of Retirement Income

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Between 1973 and the end of the 1990s earnings inequality increased dramatically in the United States. Among men who work on a full-time schedule and on a year-round basis, the ratio of the 90th percentile wage to the 10th percentile wage increased 38 percent. Among women who work on the same schedule, the 90-10 wage ratio increased 33 percent.

Economists investigating this development have noted three main trends that produced wider inequality. First, the wage premium that workers receive as a result of more formal education and greater occupational skill has increased. Second, older workers and workers with more employment experience have obtained bigger wage gains than people just entering the work force. Many young job finders with little education now earn lower wages than young job holders with the same schooling received in the 1970s. Third and most important, wage differentials among workers who appear to have identical characteristics have widened significantly over the past quarter century. Workers of the same age and sex who have the same amount of schooling and have been employed for the same number of years now receive more unequal wages than was the case in the 1970s.

The trend toward greater wage inequality will obviously affect the distribution of future retirement incomes. A large percentage of retired workers may qualify for low and possibly inadequate monthly pensions if their lifetime earnings are adversely affected by the trend toward bigger pay disparities. These consequences may be even more pronounced in a reformed pension system if the redistributive retirement benefits provided by social security are scaled back and partly replaced by benefits derived from individual investment accounts.

It is unclear, however, whether the recent increases in wage inequality will actually produce a noticeable increase in lifetime earnings inequality. Nearly all analyses of wage inequality trends have been based on tabulations of weekly or annual earnings data for a succession of cross-section samples drawn from the national population. Economists have performed almost no analyses of the trend in inequality of lifetime wages. The reason for this

omission is understandable, for there exist almost no publicly accessible data sets that contain information on the lifetime wages of successive birth-year cohorts.

This paper examines the trend in career earnings profiles and lifetime earnings inequality using a new data set that links micro-census information from a Census Bureau survey (the Survey of Income and Program Participation, or SIPP) with the summary earnings records (SER) maintained by the Social Security Administration. The goal of our paper is to use this unique data set to examine the trend in average career earnings profiles and in lifetime earnings inequality of men and women born in successive years between 1926 and 1965. The paper is organized in three sections. First, we describe the matched SIPP-SER data file and the modifications we have made in the file to make the data comparable to that available in the major cross-sectional surveys. This section shows how average earnings and the level and trend of annual earnings inequality in our adjusted data set correspond with those observed in the Census Bureau's Current Population Survey (CPS). As we show in some detail, the adjusted earnings in our panel file differ in some respects from those in the CPS, but the same trends in pay differentials and inequality are present in both files.

In the second section of the paper, we describe our methods for predicting the full lifetime earnings of workers who have only an incomplete earnings record on the SIPP-SER file. For the youngest members of our sample, only about one-third of a full career is observed in the historical earnings records. The remaining two-thirds of each worker's career earnings must be imputed to create a 40-year record of labor income. Our imputations mirror the earnings patterns evident in the recent past. Pay differentials, year-to-year earnings fluctuations, and age-earnings patterns present in the social security earnings records during the 1990s are assumed to continue over the next three decades. For the oldest members of our sample, no earnings imputations are required. They have already completed their careers when the historical data end. We used the combined historical and predicted earnings information to compare the age-earnings profiles of successive birth cohorts. These tabulations show a dramatic convergence of typical career earnings patterns of men and women. Men and women born in the 1920s had very dissimilar age-earnings profiles. Women born in the 1960s will have career earnings patterns that are more similar to those of men born in the same decade than they are to those of women born in the 1920s. Our tabulations also show that earnings mobility over a worker's career is declining, especially among women. Workers who are in the bottom third of the wage distribution when

they are in their 30s have never enjoyed good chances of rising to the top third of the wage distribution when they reach their 50s. But the probability of a dramatic change in fortune has fallen in recent cohorts, especially for women.

The third section of the paper examines trends in lifetime earnings inequality among successive birth year cohorts. Lifetime inequality has increased at least 10 percent in recent cohorts of men compared with the oldest cohorts in our sample. This result is consistent with our findings on the growth of male inequality at a single point in time and on wage mobility over a worker's career. If annual wage inequality increased between 1973 and the end of the 1990s while earnings mobility remained constant or declined slightly, it is highly likely that lifetime earnings inequality has increased. Our findings confirm this intuition. The trend of lifetime earnings inequality is just the opposite for women. Even though women's inequality has increased if we measure inequality among full-time, year-round workers who are employed during a particular year, inequality has fallen sharply if we widen the sample to include all women who are potentially available to work. The rising employment rate of women has increased the percentage of working-age years that women spend in jobs. It has dramatically reduced the fraction of women who earn extremely low lifetime wages because they are employed during only a few years of their lives. Thus, the noticeable increase in lifetime earnings inequality among men has been offset, at least in part, by a sizable reduction in career earnings inequality among women.

I. Evaluation of the Mint Data Set

The SIPP-SER data set was constructed by merging demographic, income, and other information from the SIPP with individuals' summary earnings records as maintained by the Social Security Administration (SSA). These data were modified to construct the SSA's Model of Income in the Near Term (MINT), which predicts earnings and retirement incomes through about 2030. The SIPP is a representative longitudinal survey of the resident population of the United States, excluding people who live in institutions and military barracks. After their initial selection into the SIPP sample, households are re-interviewed at 4-month intervals over a period of 2½ years. The MINT data file combines information from the 1990-1993 SIPP panels, but the sample is restricted to SIPP respondents who participated in all interview waves and had a full-

panel weight.[1] The SSA summary earnings record originally included in the MINT file provides a history of social-security-taxable earnings for the period from 1951 through 1998. Given our interest in obtaining a longitudinal profile of earnings, we focused on individuals with a birth year between 1926 and 1965.[2] About twenty percent of the initial SIPP respondents were lost as a result of attrition, and SSA earnings records are not available for about eight percent of the full-panel respondents. The correspondence between the SER and the SIPP data with full-sample weights is shown in Table 1. The resulting MINT sample with matched SER contains about 72,000 sample members, and it represents a population of 118 million American adults.[3]

The SER provides an unrivaled source of information on lifetime earnings, but it only includes earnings up to the OASDI taxable wage ceiling and only for employment covered by social security. The taxable wage ceiling is a particular problem because it affected a significant number of workers in past years, and the ceiling wage has varied substantially relative to the average wage (see Figure 1). Before 1990 the ceiling wage had a pronounced upward trend relative to the economy-wide average wage. Since 1990 the taxable wage ceiling has been indexed to the economy-wide average wage with a two-year lag.

While we do not have enough information to estimate mean earnings in the entire upper tail of the earnings distribution, we have made adjustments to the SER earnings data to increase the consistency of the historical SER wage data. For all individuals with social security covered earnings at the taxable maximum in the years prior to 1990, we created estimates of expected earnings above the taxable maximum but below a hypothetical ceiling based on the 1990-1996 average ratio of the ceiling wage to the average economy-wide wage. Between 1990 and 1996, the ratio of the taxable ceiling wage to the economy-wide average wage was 2.46.[4] Thus, the revised wage series in the MINT file should reflect a consistent degree of censoring.

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[1] The full-panel weights were adjusted by the Census Bureau for attrition bias to maintain a sample that is representative of the overall population. In addition, when combining the four surveys we have adjusted the weights to reflect varying number of survey participants in each SIPP panel.

[2] Because the SER records begin with 1951 earnings, we have no meaningful measure of early career earnings for workers born prior to the 1920s. In addition, the sample of older cohorts becomes increasingly biased because of deaths prior to 1990-1993, when the SIPP sample was drawn.

[3] This is the MINT sample used in our tabulations unless otherwise noted.

[4] In our adjustments of the earnings data, we did not alter the data for years after 1989, nor did we alter any earnings estimate that was below the taxable ceiling. For a full description of our methodology, see Toder et al. (September 1999), pp. 14-15.

Our adjustment procedure for workers who have SER-reported earnings at the taxable ceiling differs for years before and after 1978. For the 1978-1989 period we used the March Current Population Surveys (CPS) files to derive estimates of the mean of the wage distribution in excess of the taxable maximum but below our hypothetical ceiling of 2.46 times the economy-wide average wage. In the period before 1978, our imputation procedure can be more precise because the SER contains information on the calendar quarter in which a worker attains the wage ceiling. Workers who attain the taxable wage ceiling in the first three months of a calendar year should be expected to have much higher annual earnings than workers who earned wages in all four calendar quarters before attaining the ceiling wage. We took advantage of this information to obtain a more refined estimate of a worker's expected earnings if he or she had taxable earnings at the wage ceiling. We used the CPS to estimate the cell means for earnings within the range corresponding to reaching the taxable maximum in any specific quarter. As with our imputations of expected earnings for the period from 1978-1989, our imputations for the period 1951-1977 reflect the expected value of earnings above the annual taxable wage ceiling but less than 2.46 times the economy-wide average wage. For brevity, we refer to the transformed measure of earnings as "less censored" earnings.

Less than 100 percent of U.S. employment is covered by the social security system. Unfortunately, we cannot determine the precise size of the coverage problem in the MINT file. In one respect, the population covered by social security is larger than the population represented by the SIPP and CPS. The SIPP and CPS samples are drawn from the resident non-institutional population. In contrast, the social security area population includes the resident population of the United States and its territories, overseas members of military and their dependents, and some civilian workers employed overseas. In recent years the social security area population over age 15 has exceeded the civilian non-institutional population by about 5 percent.

Some labor earnings will be missing from the MINT file, however. Many employed people who reside in the United States are not covered by the social security system. Although coverage has expanded since 1951, a small percentage of Americans who have labor earnings are still not covered by the system. The largest changes in social security coverage occurred in the 1950s and early 1960s, when coverage was extended to farm employees and the self-employed. There was a further expansion of coverage in the 1980s to include a larger fraction of government employees. Before 1983 federal civilian employees and about one-third of state and

local employees were outside the social security system.[5] All federal employees hired after 1983 have been enrolled in social security, and some employees already working for the federal government in that year voluntarily elected to be covered by the system. By the early 1990s social security coverage had increased to about two-thirds of workers in the federal civil service and to 70 percent of state and local government employees. Approximately 96 percent of the resident U.S. workforce is now covered by social security. Because social security coverage is less than 100 percent, the MINT file contains an incomplete record of employment and labor earnings. Earnings in uncovered employment is recorded as zero earnings in the MINT file. In addition, social-security-covered earnings will understate annual earnings for workers who shift between covered and uncovered employment during the course of a calendar year.

Figure 2 shows the calendar-year average wage rate estimated using our modified earnings file as well as the average economy-wide wage index calculated by the Social Security Administration. Both of these measures differ from the concept of "average wage" usually reported in national wage statistics. First, the SSA average wage index is computed from W-2 forms. It is an inclusive measure of money wage income earned during the year for all workers whose employers submit a W-2 form, and it includes employment covered and uncovered by the social security system. Part-time and part-year workers have the same weight in calculating this average as full-time, full-year workers. In contrast, national wage measures drawn from monthly surveys count part-time and part-year workers only for the months in which they are employed. In fact, most national measures of the "average wage" reflect a concept that is closer to an index of the hourly wage or the average earnings of a full-time equivalent worker. Second, the SSA estimate of the economy-wide wage is an average for workers of all ages in a given year. Thus, it provides a snapshot or a cross-section of the entire workforce, including very young workers who may earn minimal wages over the course of a year. In contrast, our estimate of average earnings in the MINT sample follows a fixed group of workers – people born between 1926 and 1965 – over the period from 1960-1998. By definition, our estimate of average earnings excludes workers born between 1926 and 1965 who died before they could be enrolled in the

[5] Other groups who are excluded are railroad employees covered by the Railroad Retirement system, private household and agricultural workers with low earned incomes, and workers with low net earnings from self-employment.

1990-1993 SIPP surveys.[6] Finally, our estimates of average earnings in the MINT sample include net self-employment earnings as well as wage and salary income, and they exclude individuals' earnings before the age of 22 and after age 61.

We have calculated average earnings in the MINT sample in two ways. The lower line in Figure 2 refers to an average that includes individuals who had no taxable earnings in the specific calendar year. The higher line, labeled "nonzero earnings," is computed with the subsample of MINT respondents who earned enough in the year to meet the current standard for one calendar quarter of social security coverage.[7] This second estimate of average earnings in the MINT sample closely tracks the SSA estimate of economy-wide average earnings up to the late 1980s. After 1986, average earnings in the MINT sample rise faster than the economy-wide wage, probably because the MINT sample progressively excludes an ever larger fraction of younger workers, who typically have below-average earnings. (The youngest members of the MINT sample attained age 33 in 1998, the last year considered in Figure 2.)

Historical Trends: The MINT file versus the CPS

We can evaluate the MINT data set to see whether it provides an accurate reflection of earnings in the resident population by comparing it to other data sets. In this section, we compare the historical trends of social-security-covered earnings in the MINT sample with the annual earnings of members of the same birth cohorts who participated in the March Current Population Surveys (CPS) extending back to 1961. The CPS provides relatively consistent estimates of earnings for the period from 1961 to 1998, and it provides the basic data for most empirical studies of changes in the structure of U.S. labor earnings.

CPS Sample Alignment. Our comparison of earnings data from the March CPS files with similar data from the MINT file is obviously affected by the limitations of the MINT data. The

[6] The combination of the restriction on specific birth cohorts and the limited number of survivors from the pre-1926 cohorts suggests that the MINT measure is very unrepresentative in the early years. In 1960, it only includes workers in the age range of 22-34. By 1970 the sample has increased to include individuals aged 22-44, and by 1980 it includes workers aged 22-54.

[7] Since 1979, the standard has been indexed at 2.7 percent of the economy-wide average wage lagged two years. Workers who earn 2.7 percent of the economy-wide wage are given credit for one quarter of earnings, and workers can earn up to 4 quarterly credits per year. Workers who accumulate 40 or more quarters of earnings credits become fully insured for OASDI benefits. For consistency, we have calculated an earnings credit as 2.7 percent of the average wage over the entire period from 1951-1998, even though the actual standard differed somewhat in years before 1979.

MINT sample is not representative of the overall population in at least two respects. It is restricted to the birth cohorts of 1926-65, and it includes only individuals who survived to the date of the first SIPP interview. In addition, we had to impute an earnings estimate for workers in the MINT sample who earned the taxable ceiling wage. We have constructed a comparable CPS data set by imposing the same restriction with respect to birth cohorts and by applying our algorithm for estimating less-censored earnings above the taxable wage ceiling to the CPS sample.[8] We cannot adjust the CPS data file to reflect the selection bias in the MINT file due to deaths. In the analysis that follows, we measure individual earnings relative to the SSA's estimate of the economy-wide average wage in each year. That is, we divide each worker's annual earnings by the economy-wide wage to measure earned income in a consistent way over the 28 years after 1960.

The effects of our adjustments to the March CPS files are displayed in Figure 3. The top panel shows the impact of our age restrictions. In 1961 the youngest person in the restricted CPS sample was 22 year old, while the oldest was 35. In 1998 the youngest person was 33 and the oldest was 61. The full CPS sample and the restricted CPS sample have the same age composition only in 1987, when all workers aged 22 to 61 are included in both samples. As expected, the average earnings of both men and women in the restricted CPS sample are about 10 percent below the average of the full sample in 1961, when the restricted sample excludes workers older than 35. The gap is eliminated by 1987-88, and the restricted sample has higher average earnings than the full sample in 1998, when young workers are excluded from the restricted sample.

In the lower panel of Figure 3 we show the effect of censoring on the estimates of mean earnings in the CPS data. The difference between the means of "uncensored" and "less-censored" CPS earnings does not remain constant. The difference increases substantially after 1961. This trend is caused by the fact that earnings of individuals who have earnings greater

[8] There are two potential methods for obtaining a comparable measure of less-censored earnings in the CPS file. The first simply truncates earnings reported on the CPS at the hypothetical ceiling of 2.46 times the SSA average wage. The second replicates the algorithm for estimating earnings above the taxable ceiling based on the quarter in which a person with level earnings would reach the taxable maximum. The two procedures produced "less censored" earnings estimates that led to virtually identical conclusions when we used them to evaluate "less censored" earnings in the MINT file. The analysis we describe below relies upon a CPS data file constructed using the second method. Our definition of "nonzero earnings" is also the same as the one we use in the MINT data set.

than 2.46 times the economy-wide average wage consistently grew faster than the earnings of workers who earned lower wages.[9] Thus, the censoring of earnings in the modified CPS file has a sizeable effect on the trend of the average wage. Even though we have censored CPS earnings using a constant multiple of the economy-wide average wage, the mean of this censored distribution increases proportionately more slowly than the mean of the uncensored distribution. This finding implies that the "less censored" earnings series will show smaller increases in inequality than would a series constructed with uncensored data.

We display a time series comparison of historical average earnings in the MINT file and the restricted CPS sample in Figure 4. The average of all earnings in the MINT file is substantially below the corresponding average in the CPS, although the difference declines over time (see the two panels on the left of Figure 4). For men, the average of all earnings in the MINT file is only 76 percent of the corresponding average in the CPS during the 1960s, but it rises to 91 percent in the 1990s. The difference is smaller for women. Average female earnings in the MINT file rise from 83 percent of the CPS average in the 1960s to 91 percent in the 1990s.[10]

The differences between the CPS and MINT estimates narrow substantially if we exclude people who have zero earnings (see right-hand panels in Figure 4). When the samples are restricted to men who have positive earnings, the average wage in the MINT file is about 10 percent less than average in the CPS during the 1960s, but the two measures are essentially equal by the mid-1990s. Average earnings of women in the MINT file are actually above those reported in the CPS in two years of the early 1960s, but the two series are very similar in years after 1965.

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[9] Note that earned incomes in the CPS public-use file are not really uncensored. They are also censored, but at a higher level of earnings than 2.46 times the economy-wide average wage. The effect of CPS censoring varies over time, because the Census Bureau has increased the nominal censoring point at infrequent intervals. We have constructed a consistent time series of "uncensored" CPS earnings distributions by censoring earned incomes in each year at the 97th percentile of the distribution of male earnings. In each year, we convert CPS-reported earnings that are above the 97th percentile earnings to the earnings amount corresponding to the 97th percentile.

[10] For the period 1990-94, for which earnings estimates are available from the CPS, the SIPP interview, and the SER, the three data sources show similar means of earnings among workers who have positive earnings, but the CPS consistently yields the highest estimate, the SER produces a lower estimate, and the SIPP gives the lowest average. However, because of the greater frequency of zero earnings in the SER, that data source produces a much lower estimate of overall mean earnings (including zero earnings), while the SIPP and CPS yield similar estimates of the overall mean.

Sources of the Differences. Figures 5 and 6 display information on the sources of the gap between the CPS and MINT estimates for men and women, respectively. There are two important sources of difference. Annual employment rates are higher in the CPS than in the MINT file, and the distribution of earnings among workers who have positive earnings is somewhat different in the MINT file than in the CPS. The first panel in Figures 5 and 6 shows a much higher incidence of zero earnings in the SER earnings records of MINT respondents relative to the CPS survey responses. This difference reflects the problem of incomplete social security coverage in the SER, for the difference declines slowly in the 1960s and 1970s and at an accelerated rate after 1983, when coverage rates increased. As shown in the panel on the top right of Figures 5 and 6, the SER data suggest that a larger percentage of workers who have positive earnings have wages in the bottom part of the earnings distribution (that is, they have earnings below 0.5 of the economy-wide average wage). This discrepancy between the MINT and CPS earnings distributions is especially pronounced in the case of men (Figure 5). In contrast, the MINT and CPS data match closely in terms of the proportion of workers who have earnings between 0.5 and 1.0 of the average wage. The percentage of male workers with earnings above the average wage is less in the MINT than in the CPS file in the early years, although this difference narrows significantly by the 1980s (lower right-hand panel in Figure 5).

The low percentage of MINT workers in the top part of the earnings distribution is also reflected in the MINT estimates of the proportion of workers who have earnings that exceed the (actual) taxable ceiling. The top panels in Figure 7 show that a smaller percentage of workers in the MINT compared with the CPS have annual earnings above the taxable ceiling in years before 1980. This problem is particularly noticeable for men, who were far more likely than women to earn above-average wages in the 1960s and 1970s. However, the difference between the CPS and MINT files narrows significantly after 1972, and it is never very important for women.

Our estimate of mean income of male workers above the taxable maximum in the years up to 1978 is lower in the MINT than in the restricted CPS data set (see the lower left-hand panel in Figure 7). This result is somewhat surprising. Since we used the same algorithm to estimate less-censored earnings above the ceiling in both data sets, we should expect to obtain identical estimates for both the MINT and CPS samples.[11]

[11] For years before 1978, our method of imputing "less censored" earnings to a MINT respondent who has earnings above the taxable earnings ceiling depends on knowing the calendar quarter in a year in

The most plausible explanation for the differences in the earnings distributions in the MINT and restricted CPS samples is the incomplete coverage of earnings in the MINT file. The fact that some wage and salary employment is not covered by social security clearly explains the high frequency of zero earnings in the SER records of MINT sample members. Transitions between covered and uncovered employment during a single calendar year can account for some of the difference in the distribution of earnings among workers who have nonzero earnings. This explanation does not fully account for the larger size of the discrepancy among men as compared with women. Nor do changes in social security coverage seem large enough to account for the narrowing of the gap between the MINT and CPS estimates of nonzero earnings.

Another partial explanation for the discrepancy between the MINT and CPS data sets is the inclusion of military earnings in the SER and the absence of such earnings in the CPS. The CPS sample excludes military personnel living in barracks or overseas at the time of each survey. In contrast, the military pay of workers who have previous military service is recorded in the SER. The inclusion of military pay would reduce the mean earnings of young workers who have positive earnings in the MINT by increasing the percentage of positive earners who have low earnings. The inclusion of military pay is more important for men (especially young men) than it is for women, which helps explain why the comparison of MINT and CPS earnings produces somewhat different results for the two sexes. The influence of military pay on average earnings should decline by about two-thirds between 1970 and the mid-1990s, because the size of the military services shrank and average military pay increased. Military base pay in the early 1970s was about two-thirds of economy-wide average earnings, and the military was 3-5 percent of the male labor force.[12] The shrinking importance of military pay should be even more noticeable in the MINT sample, because that sample excludes all people younger than 30 by 1995, and it is among younger workers that military pay is most common.

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which the worker attains the earnings ceiling. According to information in the SER, comparatively fewer workers with ceiling earnings reached the ceiling during the first three quarters of the year than is implied by earnings reports in the March CPS. By implication, earnings reports in the SER suggest that the average earnings of workers attaining the ceiling was lower than the average observed in the March CPS file.

[12] A minor difference between the MINT and the CPS is that the earnings of students from on-campus jobs is often not subject to social security taxation. It is also possible that younger people are more likely to avoid taxes, on tip income for example, but it would be hard to argue that tax avoidance has declined over time.

The CPS and MINT samples differ because workers in the MINT sample only include members of the 1926-1965 birth cohorts who survived to the year of the SIPP survey. People who die before 1990 are of course included in the CPS samples for 1961-1988. Differential rates of mortality by income class might create a difference between the annual earnings of CPS respondents compared with MINT respondents in years up through the early 1990s. To the extent that the MINT sample is made up of relatively more healthy survivors from each birth cohort, differential rates of mortality will result in a higher average level of past earnings in the MINT file than in the CPS file.[13]

Structure of Relative Earnings. Despite the differences in average earnings between the MINT and CPS files, the wage data in the MINT file reflect the same changes in the structure of relative earnings that have been found in analyses based on the CPS.[14] Several of these trends are displayed in Figure 8. The top panels in the figure show 1965-1998 trends in the ratio of average wages earned by college graduates to those earned by high school graduates. These panels show a significant and sustained rise in the wage premium for more educated male and female workers after 1980, a pattern that is evident in both the MINT and CPS data files. The middle panels show the trend of male-to-female wages. On the left we show the ratio of average male to female earnings when average earnings are calculated over the entire samples of men and women. On the right we show the trend in the same ratio when the samples of men and women are restricted to those who earned positive earnings in a given year. Both the MINT and CPS data sets show very similar negative trends in the earnings of men relative to women. Much of this decline is due to the sustained rise in the employment/population rate of women. The bottom panels indicate that there has been a secular rise in the slope of the age-earnings profile. In recent years older workers have enjoyed faster earnings gains than young workers. This relative improvement in the earnings of older workers is evident in both the MINT and CPS data sets. The two data files would be even more similar if the comparisons excluded the very youngest workers, whose earnings are significantly lower in the MINT file than in the CPS.

[13] We used the eight post-survey years of 1991-1998 for which we have earnings records to examine the extent of differences in mortality by income level and age. That analysis suggests that mortality rates in the lower two quintiles of the earnings distribution are roughly twice those of the top two quintiles.

[14] For further discussion these changes in the earnings structure see Kosters (1991) and Murphy and Welch (1992).

Earnings Inequality in the CPS and MINT files

Our primary interest in the MINT earnings data is to measure the long-term change in lifetime earnings inequality and to assess the impact of this change on the distribution of social security pensions. While most of the evidence that shows an increase in the disparity of earnings is based on cross-sectional tabulations of the March CPS for successive years, our analyses of the MINT historical earnings data show a similar pattern of growing earnings disparity.[15]

In weighing the evidence about earnings inequality in the MINT file, however, it is necessary to bear in mind the limitations of the social security earnings records. A worker's annual earnings are a function of both her hourly wage rate and her annual hours at work, but the SSA's summary earnings record only shows the product of these two variables.[16] Even more important, our less-censored SER wage data are truncated at a relatively low level, 2.46 times the SSA estimate of economy-wide average annual earnings. Because the actual ceiling on taxable earnings was much lower than this in the 1960s and 1970s, our imputation of a single value for earnings above the taxable ceiling distorts some measures of earnings inequality. Finally, because the MINT sample consists of a fixed group of individuals who survived until 1990-1993, it is not representative of the entire resident population that was alive twenty or thirty years earlier.

A popular measure of earnings inequality is the ratio of income at the 90th percentile to income at the 10th percentile. However, because annual earnings in the MINT data set is censored at a level below the 90th percentile of male earners, the MINT file only shows distribution of earnings up to about the 80th percentile.[17] As illustrated in the top panel of Figure 9, the ratio of earnings at the 80th and 20th percentiles and the 90-10 ratio show generally similar trends in earnings inequality in the CPS sample.

The middle panel of Figure 9 shows the ratio of the 80th to 20th percentile earnings for 22-61 year-old men born between 1926 and 1965 in the CPS and MINT data files. The overall

[15] Gottschalk (1997) provides a concise summary of the recent literature on earnings inequality. See also the Council of Economic Advisors (1997).

[16] We can make a limited adjustment for changes in labor force participation by focusing on those individuals with positive annual earnings, but we still miss the growing importance of part-time employment (Burtless, 1994).

[17] Because the actual taxable wage ceiling was as low as the 60th percentile of male earnings in the 1960s, we must sometimes used imputed "less-censored" earnings to calculate 80th percentile earnings.

patterns of change are very similar in the two data sets, but the MINT file shows a bigger rise in inequality from 1969 through 1983. Male earnings inequality, as measured by the 80-20 wage ratio, then stabilizes in both data sets. The trend in the same ratio for women indicates a steady decline in inequality that is slightly less pronounced in the MINT than in the CPS (see the bottom panel in Figure 9).

Despite the substantial decline in the ratio of 80-20 percentile wages among women, the *absolute* earnings difference between the 80th and 20th percentiles has increased substantially. Because the female wage at the 20th percentile was extremely low in the 1960s and rose by a large percentage amount in the 1970s and 1980s, the absolute difference between the 80th and 20th percentiles would need to nearly double simply to maintain an unchanged 80-20 ratio. Furthermore, the variance of earnings among women with positive earnings doubles over the period from 1971 to 1998. On the other hand, if we restrict the analysis to women who work on a full-time schedule inequality, as measured by the 80-20 ratio, steadily increased between 1980 and the mid-1990s (the bottom panel of Figure 9). We estimated full-time workers by excluding those who earn less than 25 percent of the economy-wide wage on an annual basis. (This is roughly the minimum wage multiplied times 2,000 hours, or the annual earnings of a full-time, year-round minimum-wage worker.) In sum, although there is a consistent story of increased earnings inequality among men, the inequality trend among women depends crucially on the sample and earnings concept used.

The results in Figure 9 track pay disparities in a population that is steadily getting older. It should not be surprising to observe some increase in inequality because pay disparities are typically larger among workers near the peak of their careers than they are among young workers entering employment for the first time. When we examine inequality trends among workers at a common aged, the MINT data show large increases in inequality among men and among women who earn at least 25 percent of the economy-wide average wage. For example, among 35-39 year-old men who have positive social-security-covered earnings, the ratio of the 80th percentile wage to the 20th percentile wage increased 38 percent in the 1980s compared with the same ratio in the 1970s, and the ratio increased another 6 percent in the 1990s

On balance the inequality trends observed in the historical MINT data track the well-known trends observed in the March CPS files. Despite the truncation of the annual wage in our modification of the SSA summary earnings record, the MINT file shows a substantial increase

in annual wage inequality over the period from 1970 through the 1980s. This finding, however, is based on tabulations of workers who have positive earnings. The MINT estimates of inequality trends among *all* workers, including those who have zero earnings, do not fully reflect the trends observed in the CPS files because of the incomplete coverage of public sector employment in the social security records. As a result, there is a higher probability of zero earnings in the MINT file than in the CPS.

II. Full Career Earnings Profiles

The historical earnings data do not by themselves provide enough information to evaluate the effects of the pension system or of pension reform on the future distribution of retirement income. In the historical data, we see a large rise in the labor force participation of successive cohorts of women and a sizeable improvement in women's earnings compared with men's. The historical data also reveal a jump in the wage premium attached to skill between the late 1970s and 1990s and a sizeable increase in annual earnings inequality. In order to assess the impact of the existing pension system or pension reform on retirement incomes, it is necessary to observe or project a full career of earnings for workers who are covered by the system. Among workers in the MINT file, only the very oldest ones had completed their careers by the last year of earnings recorded in the SSA's Summary Earnings Record. If we treat age 62 as the average age at retirement, only those workers born in 1936 or earlier years had attained the retirement age by 1998. The great majority of the MINT sample, including all workers born between 1937 and 1965, had not yet completed a full career. It is therefore necessary to predict earnings in 1999 and later years for younger workers if we are to predict the pensions they will receive.

Forecasting Earnings after 1998

To predict earnings over the remainder of a worker's career, we developed a forecasting method we refer to as "earnings splicing." Rather than estimate a structural model of lifetime earnings, we used the observed earnings patterns of individual workers in older birth cohorts to predict future earnings of individual workers in younger cohorts. In order to duplicate the exact statistical properties of the observed earnings patterns of older birth cohorts, we used a "hot deck" statistical imputation procedure to splice part of the earnings record of an older worker to that of a younger worker. We applied this technique repeatedly in 5-year intervals to build up

the full lifetime earnings histories of workers who had not yet completed their careers in the last year of the SER (1998).

Survey statisticians frequently use the hot deck procedure to impute missing data in the event of interview non-response. This type of problem arises when a participant fails to give a valid answer to a survey question. In a typical hot deck imputation, non-respondents and those with valid survey responses are stratified into cells defined by several categorical variables (not including the variable to be imputed). Within each cell, a "donor" (that is, a responding person) is randomly selected to represent a person who failed to give a valid response. In some cases, the procedure is carried out with the limitation that the same donor cannot be selected twice, a practice known as "hot decking without replacement." (We did not impose this constraint in our implementation.) Once a donor and nonrespondent are matched, the valid responses of the donor are copied over to the nonrespondent while leaving the valid responses of the nonrespondent unchanged. It might be the case that, with a given set of matching variables, a nonrespondent is a member of a cell containing no suitable donors. To increase the chances of a match, the number of cells can be reduced by using fewer variables to define the cells or broader categories.

We used the hot decking procedure to select older workers' earnings records to splice to the end of uncompleted earnings records of younger workers in the MINT file. However, rather than splice the entire completed earnings record of a older donor onto the record of a worker with an incomplete earnings record, we performed successive imputations in 5-year time segments at the end of each incomplete record. (For our purposes, an incomplete earnings record is one in which the MINT sample member had not yet attained age 67 by 1998, the last year covered by the SSA earnings record.) The historical earnings data for each worker are used up through 1998, and imputed earnings data are used only for the years after 1998. Different donors from successively older cohorts provide the earnings information that is spliced to the end of each incomplete earnings record.

In order to select a donor record for a particular target worker and particular five-year imputation period, we defined ten key variables that were matched for the donor and target worker: age, sex, race, educational attainment, disability status, average career earnings prior to the matching period, and several variables describing each workers' earnings in the five-year matching period. (The five-year period immediately before the imputation period is the "matching period.") To describe a worker's earnings in the matching period, we defined four

variables: average earnings in the matching period, number of years in the matching period in which the worker had positive earnings, presence of earnings in the fifth year of the matching period, and presence of earnings in the fourth year of the matching period.[18] A worker was randomly selected from among eligible donors to provide earnings information for the five-year segment at the end of the incomplete earnings record. Although it was not always possible to find donors who matched target workers on all nine key variables, we always successfully matched non-disabled workers on age, gender, a measure of average earnings during the match period, and number of years worked during the matching interval. With access to an exceptionally large sample of candidate donors, we were able to match over three-quarters of the targets to donors on this first level. Thus, we were able to predict future five-year earnings segments for younger workers on the basis of corresponding earnings records of donor workers who were very closely matched to the target workers.

An important advantage of earnings splicing over other hot decking procedures is that the imputations use only data from the most recent available years in the SSA earnings records. The procedure does not impute earnings data drawn from workers' records in any year before 1992. It seems reasonable to believe that future earnings patterns will be more similar to those observed in the 1990s than those observed in the 1970s or 1980s. Of course, earnings patterns will probably change in the future compared with those observed in the 1990s, and some of the changes will not be reflected in our earnings forecasts. Earnings inequality may continue to increase among workers who have the same education and work experience, for example. The wage premium for higher skill and greater educational attainment may also continue to rise, and this trend will not be captured in our projections.

This does not mean, however, that our forecasts imply a static distribution of future earnings. The educational and other characteristics of younger MINT cohorts differ from those of the older cohorts. Since younger workers are only matched to observationally equivalent older workers, our forecast of future wage patterns is crucially affected by the changing pattern of observational characteristics in successive cohorts. One of the most important changes in characteristics has been the steady rise in employment rates and relative wages of American women. Women with incomplete earnings records are matched to older workers who have had similar earnings profiles up through the beginning of the splicing period. The increase in

[18] A full description of our earnings splicing method may be found in Burtless and Sahm (2001).

women's employment rates means that younger women are matched to women in the older cohorts who had unusually persistent employment or high earnings when they were young. Thus, the earnings splicing procedure yields a forecast of future employment and earnings that tends to reproduce the experiences of women in the older cohorts who remained steadily employed and earned good wages. The result is a forecast that predicts continued increases in female employment rates and improvements in women's wages, although at a slower pace than was observed in the 1980s and early 1990s.

We also used the earnings splicing methodology to predict disability and mortality among workers who had not yet attained age 62 by the end of 1998. If the donor worker died or began to receive social security disability insurance (DI) in a five-year imputation period, we predicted that the target worker would die or become entitled to DI in the same year of the five-year age interval. If these predictions had been used without any adjustment, they would imply that the mortality and disability onset rates observed in the MINT sample during the 1990s would persist during the entire forecast period. However, the Social Security Actuary predicts that mortality rates will decline and disability rates increase over the next three decades. We therefore adjusted our projections of future mortality and disability to duplicate the assumptions in the Trustees' 2000 annual report.[19] In effect, our forecasts of future earnings represent predictions for a population that will have the same mortality and disability rates predicted by the Social Security Actuary rather than the historical mortality and disability rates observed in the MINT sample.

Career Earnings Patterns

The MINT earnings records, including our forecasts of individual earnings after 1998, can be used to examine the pattern of earnings over a full work life. The longitudinal nature of the MINT data allows us observe characteristic earnings patterns in successive birth cohorts. The longitudinal data also permit us determine how frequently individuals move up and down the earnings distribution over the course of their careers.

The age-earnings profile is the simplest way to summarize the pattern of a worker's earnings over a 40-year career. In the analysis that follows, we examine the trend of the typical

[19] In order to accurately forecast the earnings of sample members who were predicted to become disabled, we had to slightly modify our procedures for selecting donor earnings records. Once individuals became DI entitled, they were matched only to potential donors who had also been DI entitled, and donor records were selected using a different set of key variables than the ones used to select donor records for the never-disabled population.

age-earnings profile over successive birth cohorts. To provide reasonable sample sizes, we grouped the individual birth-year cohorts into cohorts that span five-year intervals, starting with the cohort born between 1926-1930 and ending with the one born between 1961-1965. We define a full career as one that extends forty years from age 22 to 61.[20] The results displayed in Figures 10 and 11 include partial earnings records for workers who die or become disabled before attaining age 62. The disabled are included up to the time of their disability, at which point they are excluded from the computation of average earnings. The average age-earnings profiles of four birth cohorts of male workers are displayed in Figure 10. (We exclude every other five-year birth cohort to make the chart more readable. This exclusion has no effect on the qualitative conclusions described below.) The solid lines in the figure represent estimates of average earnings that are based on historical earnings reports in the SSA Summary Earnings Record as modified to represent "less censored" annual wages. Projected earnings for each cohort are indicated with dashed lines.

The top panel in Figure 10 shows the average earnings profiles of all men in a cohort up through the year members of the cohort die, become disabled, or attain age 67. Years in which a worker earned no social-security-covered wages are included when calculating the cohort's mean earnings. The average age-earnings profile for each cohort follows a characteristic hump-shaped pattern, with earnings increasing up through middle age and then declining steeply after workers attain age 60. There is very little difference in the age-earnings profiles of successive male cohorts, although workers in the youngest cohort are predicted to earn somewhat lower wages than workers in older cohorts from middle age through about age 60.

The age-earnings profiles displayed in the top panel are affected both by the trend in workers' wages when they are employed and by their age-specific employment rates. The bottom two panels illustrate the life-cycle pattern of earnings when employed and labor force participation. Average earnings at a given age is calculated in the middle panel using a sample that consists of workers who earn at least 2.7 percent of the economy-wide average wage. Note that the peak of this age-earnings profile occurs later in life than it does in the top panel, which measures the average earnings of both earners and non-earners. It is also notable that the peak of life-cycle earnings occurs later in life for the older cohorts than for the younger ones. The

[20] More precisely, a worker's career begins at the start of the calendar year she attains age 22 and ends at the conclusion of the year she attains age 61.

bottom panel in Figure 10 shows the fraction of men in successive cohorts who have positive earnings, a fraction that is roughly equivalent to the employment-to-population ratio.

A striking feature in all three panels of the chart is the very modest shifts in the male age-earnings profiles over successive cohorts. This stability is apparent in the life-cycle pattern of wages when workers are employed and in the age pattern of employment-to-population rates.[21] Our projections of future earnings and employment rates represent continuations of recent historical patterns. There is virtually no change in the future employment-population rate, and average earnings of employed workers decline only slightly for middle-age workers, mainly in the case of men in the youngest cohort.

The stability of the age-earnings profile reflected in the chart might seem surprising. There has been a dramatic fall in the employment rates of men past age 55 since World War II, but virtually no change in older workers' employment rates is visible in Figure 10. The explanation for our forecast is straightforward. The trend toward earlier male labor force withdrawal came to an end in the mid-1980s, when the oldest men in our sample were about 60 years old.[22] Since male participation rates remained almost constant over the late 1980s and 1990s, there is little reason to predict much change in participation rates over the next three decades. The trend toward somewhat lower earnings among men in the youngest cohorts may also seem surprising, because the younger cohorts have accumulated much more formal schooling than the older ones. Bear in mind, however, that we have measured earnings at each age in comparison with the economy-wide average wage in the same calendar year. Even though workers in the younger cohorts will earn higher inflation-adjusted wages, their wages will represent a smaller multiple of the economy-wide average wage, primarily because the wages of women are rising in comparison with those of men. Since the economy-wide wage is the weighted average of wages paid to men and to women, the improvement in the relative earnings of women will be reflected in some reduction in the relative earnings of men.

The relative stability of the average age-earnings profiles of successive male cohorts obscures a much larger movement in the profiles of men in particular educational categories.

[21] For reasons that may be connected to the Korean War or changes in program coverage, there is an apparent distortion in reported earnings during the early 1950s. This is most evident in the unusually high frequency of men with zero earnings.

[22] Burtless and Quinn (2001).

The statistics displayed in Table 2 indicate a large and persistent decline in the observed and predicted earnings of men who have not received any education beyond high school. The decline is smaller for men who have some college education, and men who have a college degree suffer very little if any reduction in relative earnings. The loss of earnings among men with little education is mainly the result of a drop in relative wages when these men are employed. Table 2 contains no evidence of a major change in the employment rate of less educated men, except at the oldest ages among men with the least schooling. The bleak pattern of male earnings loss presented in Table 2 is not reflected in the trends for all male workers displayed in Figure 10. Successive male cohorts have accumulated higher levels of schooling, offsetting the trend toward lower relative earnings among the men who have average or below-average educational attainment. (See Appendix Table 1 for tabulations of educational attainment in successive cohorts.)

Tabulations of women's age-earnings profiles reveal a much greater shift in female employment and earnings than is the case for men. The top panel of Figure 11 shows the age-earnings profile of four female cohorts, where average earnings at each age is calculated using all surviving women in the cohort who have not yet become disabled, including those women who have no social-security-covered earnings at that age. The solid lines reflect historical earnings information; the dashed lines reflect our forecasts of future average earnings. These tabulations show a large increase in women's earnings at most ages. For example, at age 35 women born in 1961-1965 are predicted to have a relative wage that is 2.4 times that earned by 35-year-old women born between 1931-1935. This change is due to a 40 percent increase in the earnings of women who are employed (see middle panel) and a 73 percent increase in the employment-population ratio (bottom panel). At most ages the increase in the employment-population ratio is more important than the increase in the relative earnings of workers with positive wages in explaining the jump in average earnings. The upward shift in the female age-earnings profile slows markedly for the cohorts born after the 1951-1955 cohort. In fact, the 1951-1955 and 1961-1965 cohorts differ only in that the younger cohort has a slightly higher employment rate through its mid-50s. Although women's relative earnings and employment rates are predicted to increase in the future compared with the recent past, the rate of increase will be dramatically slower than it was in the 1970s and 1980s. This prediction seems consistent with trends observed in the CPS files, which show a sharp slowdown in the rise of age-specific labor force

participation rates during the 1990s. The wage data on the CPS files also show that the male-female earnings gap shrank more slowly in the 1990s than it did in the 1980s, implying that the relative wage of employed women improved more slowly than it did in earlier decades.

When we examine cross-cohort shifts in the age-earnings profiles of women who have the same level of schooling, we find as we did for men that well educated workers have fared better than workers with less schooling (see Table 3). Participation rates rise for successive cohorts of women, no matter what their level of schooling, but the gains in average earnings of employed women are limited to employed women who have above-average educational attainment. For women with less than a high school education, small increases in participation rates in successive cohorts are more or less offset by declines in the average earnings of employed women, leaving the least educated group with no consistent pattern of wage change. Thus, the overall improvement in women's relative earnings is strongly linked to educational attainment. Since women in younger cohorts have accumulated more schooling than women in previous generations, the gain in relative earnings for women as a whole has been greater than it has been for women in any single educational attainment group. (Appendix Table 1 shows the trend in educational attainment across cohorts.)

Earnings Mobility

The panel earnings data in the MINT file permit us to examine wage mobility over the full life cycle as well as the average profile of career earnings. If a worker earns average wages early in her career, what is the likelihood she will earn higher wages later in her career? What is the probability she will earn *lower* wages in later years? Earnings gains and losses can be measured using either an absolute or a relative standard, and a variety of relative standards can be devised to measure movement among ranks in the distribution. In the analysis that follows, we examine earnings mobility using a relative standard. Workers within each birth cohort are ranked according to their annual earnings in a five-year period and then are divided into three equal-size groups (low-, average-, and high-wage) based on their rank in the earnings distribution. Because we are interested in approximating workers' potential earnings at different points in the life cycle, we disregard years with no earnings when computing a worker's five-year average wage.

The tabulations displayed in Table 4 show earnings mobility in two birth cohorts. The older cohort was born between 1931 and 1935; the younger one, between 1961 and 1965. Each

entry in the table shows the percentage of workers who move from one earnings class to another or who remain in the same earnings class between ages 31-35 and 51-55. For example, among men born in 1931-1935 who earned low wages when aged 31-35 years old, 59 percent also earned low wages when they were 51-55 years old. However, 33 percent earned average wages at age 51-55, and 7 percent earned a high wage. (To be included in these tabulations, workers were required to earn wages in at least one year when they were 31-35 years old and at least one year when they were 51-55 years old. The sample is also restricted to workers who survived to age 62 and did not become disabled before that age.)

The results in Table 4 imply a substantial amount of persistence in workers' position in the earnings distribution. Almost 60 percent of young men who are in the lowest third of their cohort's wage distribution will remain in that part of the distribution when they reach their early 50s. A slightly higher percentage of young men in the top third of the distribution will remain in the top third when they are 51-55 years old. The estimates in Table 4 also suggest that mobility patterns are similar in the younger and older cohorts. If anything, the persistence of men's earnings ranks is predicted to increase slightly over time. In other words, wage mobility may be somewhat lower in the youngest male cohort compared with older cohorts. This conclusion is based in part on our predictions of future wage developments, so it should be treated with caution.

Women's earnings profiles show a greater amount of mobility than men's (compare the top and bottom panels in Table 4). One explanation for higher earnings mobility among women is that many working women choose to work part-time hours or fewer than twelve months a year when they are rearing young children. Even though they may earn high hourly wages, their low annual hours gives them a low rank in the annual earnings distribution. Because many women who work on part-time or part-year schedules eventually resume full-time, full-year work schedules, their positions in the annual earnings distribution can change appreciably between ages 33 and 53, even if their position in the hourly wage distribution remains roughly unchanged. The persistence of women's earnings is projected to increase in Table 4. Women born between 1961-1965 are expected to have significantly less earnings mobility than women born between 1931-1935. This prediction seems consistent with other trends in female labor force behavior. New mothers are now less likely to drop out of the work force for many months or years after

giving birth. As women's labor force attachment increases, it seems plausible that the persistence of their earnings will approach levels historically observed among men.

Not surprisingly, workers with more schooling are more likely to move up the wage distribution between ages 31-35 and 51-55 than workers with less schooling. Workers with less education who initially earn low wages show greater persistence in their earnings than more highly educated workers who initially earn poor wages. On the other hand, less educated workers who initially earn high wages are much more likely to see their earnings rank fall as they reach middle age. Among workers who have a college degree and earn a high wage when they are 31-35 years old, about three-quarters will also earn a high wage when they are 51-55. Among workers who have only a high school diploma and earn a high wage in their early 30s, less than half continue to earn a high wage in their early 50s (see Appendix Table 2). These generalizations are true both for male and female earners and for members of all birth cohorts, implying that the effects of education on earnings mobility are pervasive as well as highly significant.

III. Lifetime Earnings Inequality and the Distribution of Pension Income

The career earnings data in the MINT file, including our predictions of annual covered earnings after 1998, can be used to examine trends in lifetime earnings inequality as well as the trend in social security benefits. The results we have presented so far suggest that lifetime inequality has increased in younger birth cohorts compared with older cohorts, at least among men. Male earnings inequality within a single year has increased substantially in recent years, a result that is evident in both the March CPS and MINT files (see Figure 9). In addition, earnings mobility has probably declined slightly (see Table 4). If point-in-time inequality has increased while earnings mobility over a worker's career has remained constant or dipped slightly, it seems likely that lifetime earnings inequality among men has increased.

The situation of women is different. While earnings inequality has increased among women who earn at least 25 percent of the average economy-wide wage, mirroring the trend among men, inequality has shrunk dramatically among all women who are at work in a typical year (see the bottom panel in Figure 9). Female earnings inequality has declined even faster if we consider trends among *all* women in a birth cohort, including those who do not have earnings in a particular year. The long-term trend toward higher female participation rates has meant that many fewer women earn the lowest possible wage (see the bottom panel in Figure 11). Thus, the

increase in lifetime earnings inequality among men has been offset by the large reduction in lifetime pay disparities among women.

Median Lifetime Earnings and Earnings Inequality

With information about a worker's annual earned incomes over a full career, it is straightforward to calculate the worker's career average wage. Recall, however, that the SSA earnings records have shortcomings that affect the reliability of our calculations. Less than 100 percent of employment is covered by the social security system, and coverage rates have risen somewhat over the past 45 years. The cap on social-security-taxable earnings has increased over time. We have an accurate indication of workers' covered earnings only up to that ceiling. While we have adjusted annual earnings reports of workers who earned the ceiling wage to produce a consistent wage series, our adjustment procedure introduces some errors in the measurement of earned income below our new wage ceiling (2.46 times the economy-wide average wage). Moreover, even with our adjusted wage series the MINT file does not reflect any of a worker's earnings above the ceiling. Finally, the younger cohorts in the MINT file have not completed a full career. We have imputed annual earnings amounts for years after 1998 to make up a full career, and these imputations are based on observed earnings distributions in the 1990s. If wage differentials change in the future, our predictions of lifetime earnings could over-state or under-state the true amount of inequality in the lifetime earnings of younger cohorts.

In spite of these limitations, the MINT file provides a unique source of data to evaluate recent trends in wage inequality and their potential effects on retirement income inequality. To minimize the bias caused by changes in social security coverage, we limit our analysis in the remainder of the paper to cohorts born between 1931 and 1965, ignoring information on the oldest cohorts, which experienced the biggest changes in social security coverage during their early careers. In addition, we limit our analysis samples to workers who meet three criteria. To ensure that our sample is relatively homogenous with respect to health, we limit the sample to workers who survive (or are predicted to survive) to age 62 and who do not become entitled to social security DI benefits before attaining age 62. If we did not impose these two criteria, the younger and older cohorts would contain a different mix of healthy and unhealthy workers. Many of the least healthy workers in the oldest cohorts are missing from the MINT sample, either because they died before the SIPP sample was enrolled or because they were too sick to

participate in the survey. Finally, we only included SIPP respondents in our analysis sample if they reported (or were predicted to report) covered earnings in at least one year between ages 22 and 61. This sample exclusion eliminates from our sample all people who did not work at all or who worked exclusively in jobs not covered by social security. Unfortunately, this criterion does not eliminate workers who earned some but not all of their career wages in uncovered jobs.

We calculated workers' average career earnings in two ways. In both cases we first calculated the sum of a worker's earnings between ages 22 and 61, where each year's earnings were measured as a fraction of the economy-wide average wage in that year. In our first definition of average career earnings, we divided this sum by 40, the number of years between ages 22 and 61. We refer to this measure as the "career average wage." In our second definition, we divided by the number of years in which a worker reported positive wages. This measure of average earnings in years when a worker is employed comes closer to measuring the worker's potential annual earnings, so we refer to the measure as the "career *potential* wage."

Men. Figure 12 shows trends in median male career earnings and the inequality of career earnings under these two definitions. The median career average wage, which includes years with zero earnings, is about 10 percent lower than the median career potential wage (that is, the average wage for years when the worker has positive earnings). The difference reflects the fact that most workers do not have covered earnings in every year from age 22 to 61. The peak of career earnings under both definitions was attained for men born in 1941-1945. Compared with this peak, we predict that median career earnings in the 1961-1965 cohort will fall about 13 percent. Other measures of central tendency might show a smaller fall-off in career earnings. For example, if the MINT file contained uncensored earnings records and we were able to measure accurately the mean value of average career earnings, the younger cohorts of men might appear to fare better. The percentage of annual earnings that is above the adjusted ceiling wage has increased over time (see lower panel in Figure 3). Most of the uncounted earnings above the ceiling are received by men, implying that the mean (uncensored) annual earnings of the youngest cohort has improved faster than the median.

The lower panel of Figure 12 shows the trend in male lifetime earnings inequality as measured by the Gini coefficient. Inequality is substantially lower if career average earnings are measured using only those years in which a worker has positive earnings. Note that the estimates in Figure 12 must understate true inequality, because our measure of annual earnings

excludes earnings above 2.46 times the economy-wide wage. The trend in inequality displayed in Figure 12 conforms with expectations. Workers born in 1936-1940 had significantly less inequality than is predicted for workers born after 1950. Compared with the cohort born in 1936-40, male workers born in 1961-1965 have a Gini coefficient of lifetime earnings that is 12 percent higher. The increase in the Gini coefficient is 19 percent using the definition of career earnings that only includes years with positive earnings. These estimates almost certainly understate the true increase in lifetime inequality, because they miss the change in annual earnings above 2.46 times the economy-wide wage. Most evidence suggests that the mean of earnings above the ceiling has increased faster than mean earnings below the ceiling.

Table 5 contains additional detail about the trend in median lifetime earnings and career earnings inequality. The top panel in the table shows trends when annual earnings are measured using the *actual* earnings reported to the SSA, that is, earnings up to the actual taxable wage ceiling. The lower panel shows trends when earnings at the legal ceiling are adjusted to reflect a consistent wage ceiling from 1951 to the present. This adjustment to the data has an important effect on our interpretation of recent trends. For example, the second column in the table shows that the unadjusted wage reports in the SSA wage record imply that the median career wage has remained almost unchanged across cohorts. In contrast, the adjusted wage reports show a significant decline in the median career wage. Not surprisingly, the inequality of career earnings rose much faster if the trend is measured using unadjusted wage data. Because the taxable wage ceiling increased from about 1.2 times the economy-wide wage in the 1950s to 2.46 times the economy-wide wage in the 1990s, a much larger percentage of high-wage workers' wages is included in taxable earnings for members of the youngest birth cohorts.

The sixth column in Table 5 shows the median number of years worked between ages 22 and 61. Median years worked has remained almost unchanged among men. Workers in the youngest cohort are predicted to have social-security-covered earnings in just 3 percent more years than workers in the oldest cohort. The seventh column shows the trend in inequality of years worked as measured by the Gini coefficient. This column shows a sizable reduction of inequality. Workers in the younger cohorts are predicted to have more similar employment patterns over their careers than workers in the older cohorts. Some of this trend might be explained by the expansion in social security coverage. A higher percentage of career employment among younger cohorts is covered by the social security system.

Women. Not surprisingly, trends in career earnings of women differ significantly from those of men. Figure 13 shows the trends in median career earnings and the inequality of career earnings among women.[23] The median career average wage, excluding years with zero earnings, is predicted to be almost 40 percent higher for women in the youngest cohort compared with women in the oldest cohort. The increase in the median potential career wage is 125 percent higher in the youngest cohort than the oldest. While the median member of the 1931-1935 cohort had only 21 years of social-security-covered earnings, the median member of the youngest cohort is predicted to have positive earnings in 34 years. This represents a 62-percent increase in the number of years with social-security-covered earnings. Interestingly, our tabulations imply that the rate of improvement in the median career wage will be slower for the cohorts born after 1950 than for the cohorts born before that year. For example, the median potential career wage of the 1946-1950 cohort is one-third higher than the median wage of women born in 1931-1935. We predict the median potential career wage of the 1961-1965 cohort will be only 5 percent higher than the median wage of the 1946-1950 cohort. This prediction seems sensible. As women's wage rates approach those of men and as the female workforce grows to represent almost half of all workers, it will be harder for women to experience rapid gains in wages compared with the economy-wide wage.

The lower panel of Figure 13 shows the trend in female career earnings inequality. The Gini coefficient of lifetime earnings is much higher for women than it is for men, although the difference between the two sexes has narrowed spectacularly in successive cohorts as female inequality has declined and male inequality increased. Among male and female workers born between 1931-1935 who had at least one year of social-security-covered earnings, the Gini coefficient of the career average wage was 0.314 among men and 0.514 among women. Among men and women born between 1961-1965, we predict that the Gini coefficients will be 0.346 for men and 0.425 for women. The most important part of the explanation for the narrowing difference is the predicted rise in the percentage of women who will work 30 or more years during their careers and the sharp fall in the percentage who will work 10 or fewer years. With a

[23] Because very few women earned wages above the taxable ceiling before 1980, our estimates of women's lifetime earnings are virtually unaffected by our treatment of wages above the legal ceiling. The results presented in Figure 13 and Table 6 were obtained using actual earnings reported to the SSA rather our adjusted wage series that reflects a consistent ceiling wage. However, the adjusted wage data yield essentially identical results.

reduction in the percentage of women who earn extremely low lifetime wages, career earnings inequality will decline.

Additional information about the trend of median career earnings and the distribution of women's earnings is presented in Table 6. Statistics on the trend in career earnings among all women who have at least one year of social-security-covered earnings are presented in the top panel of the table. The fifth column in the table shows the trend in inequality of the potential career wage. The Gini coefficient of inequality is predicted to be 5 percent lower in the youngest cohort than the Gini coefficient in the oldest cohort. Our calculations imply there will be a much larger decline in the inequality of years of covered employment (see column 7). The Gini coefficient of covered years of employment is predicted to be 41 percent lower in the youngest cohort compared with the oldest. The increasing equality of lifetime years in covered employment is the main reason for the reduction in lifetime earnings inequality among women (see column 3).

The first column in Table 6 shows the percentage of women in each cohort who obtain enough earnings credits to become eligible for social security retirement benefits. Workers need to earn substantial covered wages in at least 10 years to be assured of eligibility for social security pensions. Among women born in 1931-1935 who earned social-security-covered wages in at least one year during their careers, 24 percent did not obtain enough earnings credits by age 62 to become entitled to retirement benefits. As female employment rates rose, the percentage of ineligible women declined in later cohorts. Among women in the 1961-1965 cohort, only 8½ percent are predicted to accumulate too few earnings credits to become eligible for social security. (Among men in the same birth cohort, 4½ percent fail to obtain enough earnings credits to become entitled to social security benefits. See column 1 in Table 5.)

Because the proportion of women who become entitled to social security is noticeably higher in the youngest cohort compared with the oldest, it interesting to consider inequality trends among those women who accumulate enough earnings credits to qualify for social security. The lower panel in Table 6 presents tabulations based on career earnings in this restricted sample. Compared with the tabulations for the full sample of working women, these tabulations show a smaller increase in median career earnings and a smaller decline in inequality. In fact, the inequality of potential career earnings actually increases over time among women who accumulate enough earnings credits to qualify for social security pensions.

Social Security Pensions

The MINT earnings data allow us to calculate the social security entitlements of workers in successive cohorts. The social security benefit formula is an extremely complicated function of a worker's own career earnings, the age at which he or she claims benefits, the number and ages of the worker's dependents, and the career earnings, if any, of the worker's spouse. To simplify the analysis, we calculate each worker's benefit entitlement as a retired worker without dependents who first claims benefits at the normal retirement age. This benefit amount is called the "primary insurance amount" or PIA. The PIA is a nonlinear function of the worker's average indexed earnings, which in turn is the worker's average wage (after indexation) during the 35 years of highest earnings during his or her career. (Our calculations are restricted to the 35 years of highest indexed earnings between ages 22 and 61.) The PIA formula is highly redistributive in favor of workers with low lifetime earnings. It provides much better replacement rates to workers with low career wages than to workers with high wages. Thus, among workers who actually receive old-age pensions, the distribution of social security benefit entitlements is more equal than the distribution of lifetime average wages. However, workers who earn very low wages or who earn wages in fewer than ten years do not qualify for any retirement benefits at all. If there are enough workers who earn positive career earnings, but who earn too little to qualify for a pension, the distribution of pensions might be less equal than the distribution of lifetime earnings.

The right-hand columns in Tables 5 and 6 show trends in the median PIA and in the distribution of PIAs across successive cohorts of male and female workers. Bear in mind that the trend in the median PIA offers an incomplete picture of the past and future trend in social security retirement benefits. Workers who claim retirement benefits before the normal retirement age will receive a pension that is less than the PIA. The size of the benefit penalty for early retirement is proportional to the number of months between the age when a worker claims a pension and the normal retirement age. Under Social Security Act amendments passed in 1983, the normal retirement age will increase from 65 for workers born before 1938 to 66 for workers born between 1943 and 1954 and to 67 for workers born after 1960. Thus, if we had calculated the retired-worker benefit at a fixed age, such as 65, instead of the normal retirement age,

younger cohorts would appear to have lower benefits than the ones we have shown. Our computations of women's retirement benefits are also incomplete. Many women receive a dependent spouse benefit (equal to roughly one-half of a spouse's PIA) or a survivor's pension (approximately equal to a spouse's PIA) instead of a retired-worker benefit. If a retired worker is eligible for both a retired-worker benefit and a dependent spouse or a survivor benefit, she receives the benefit that provides the highest monthly payment. Thus, the retired-worker benefits we calculated for Table 6 understate the social security benefits actually received by many retired female workers.

The tabulations nonetheless shed light on the effects of wage trends on the level and distribution of social security pensions. Our tabulations show a substantial rise in the median PIA payable to women and a relatively constant median PIA for men. Entries in the top panel of Table 5 show the trend in the median PIA payable to men calculated using the actual taxable earnings reported to the SSA. The median PIA is approximately 42 percent of the economy-wide average wage, or 40 percent of the median career wage reported to the SSA. In other words, the median male worker can claim a retirement benefit at the normal retirement age that replaces 40 percent of his career earnings. The stability of the median PIA is due in part to the trend in the ceiling wage for calculating taxable earnings. Entries in the lower panel of Table 5 show that the median PIA would have declined for the youngest cohorts if the wage ceiling had been fixed at 2.46 times the economy-wide average wage over the entire period after 1950. This mirrors the trend in the median career average wage, which also fell if we measure annual earnings using a consistent wage ceiling.

The increase in the median career earnings of women has produced a proportionately smaller increase in women's median PIA. Among all women in a birth cohort who earned covered wages in at least one year between age 22 and 61, the median PIA increased from 20 percent of the economy-wide wage for women born in 1931-1935 to 30 percent of the economy-wide wage for women born in 1961-1965. This increase was not as fast as the increase in the median career wage, however. For workers in the 1931-1935 cohort, the median PIA represented 83 percent of the median career wage; for workers in the 1961-1965 cohort, the median PIA is equal to just 55 percent of the median career wage. Among women who actually qualify for a social security pension, the median PIA rises somewhat more slowly than it does among all women in a cohort (see lower panel in Table 6). The median replacement rate for

workers who qualify for a pension declines noticeably, shrinking from 68 percent to 52 percent when measured as a fraction of the median career wage.

The tabulations also provide evidence about the impact of earnings inequality on the distribution of social security pensions. Social security benefits are much more equally distributed than lifetime wages. This generalization is true in all cohorts, for both men and women, and under all definitions of career earnings inequality. For example, the Gini coefficient of the career wage for men born in 1961-1965 is 0.346, assuming that career earnings are measured using a consistent wage ceiling (see the third column, lower panel of Table 5). If social security benefits were calculated using earnings below a consistent wage ceiling, the Gini coefficient of PIAs for this cohort would be 0.238 (see the right-hand column, lower panel of Table 5). Because social security pensions are actually determined using covered earnings below a lower and more erratic wage ceiling, the Gini coefficient is somewhat lower than this, 0.237 (see the right-hand column, upper panel of Table 5). Whichever definition of career earnings is used, the inequality of PIAs is substantially less than the inequality of career earnings.

The increased inequality of male wages has caused a corresponding increase in the inequality of retirement benefits. The nonlinear benefit formula should moderate the effect of increasing earnings inequality, but the evidence in Table 5 suggests that this has not occurred. If we measure career earnings using a consistent annual wage ceiling, lifetime earnings inequality has increased 10 percent (see column 3, lower panel in Table 5). If all of these earnings were used to calculate the PIA, the inequality of PIAs would have increased just 6 percent (see the right-hand column, lower panel of Table 5). However, the actual benefit formula only uses earnings below the legal wage ceiling. Because the actual wage ceiling has increased over time, workers who earn high wages have received credit for an increasing percentage of their actual earnings, thus boosting their retirement benefits faster than would have been the case if the wage ceiling remained unchanged. The actual Gini coefficient of PIAs will therefore increase 11 percent, slightly faster than the Gini coefficient of career earnings.

Changes in the taxable wage ceiling have had almost no impact on the computation of women's lifetime earnings, and consequently they have had little effect on the level or trend of inequality in women's retirement benefits. The tabulations in Table 6 show that lifetime earnings inequality among women has fallen, but the inequality of social security retired-worker benefits has fallen even faster. This is the pattern we would expect given the nonlinear formula

used to calculate PIA benefits and the sizeable increase in the fraction of women that becomes eligible for retired-worker benefits.

IV. Conclusion

Our analysis of historical earnings records taken from the social security administrative files confirms many findings derived from analysis of cross-sectional surveys. Earnings inequality among employed men has increased substantially since the 1970s. Inequality among women who earn more than the annual wage of a full-time, year-round minimum wage worker has also increased. Part of the increase in inequality is connected to an increase in the wage premium for additional education and experience, and part is due to a jump in pay disparities among workers with equal education and experience.

By supplementing the historical earnings records with wage projections based on earnings patterns observed in the social security administrative files, we can construct full-career earnings records for a representative sample of workers born between 1926 and 1965. Our projections of future earned income assume that pay disparities, earnings fluctuations, and employment patterns in the 1990s will persist over the next three decades. This does not mean employment rates and wage fluctuations will be the same in the future as they were in the recent past. Our forecasts assume that workers with the same initial characteristics as workers from earlier cohorts will have very similar earnings profiles. Because the initial characteristics of younger cohorts differ from those of older cohorts, aggregate employment and wage patterns will differ in the future compared with the recent past. The full career earnings records of workers in successive cohorts contain a different mix of historical and projected wages. The earnings records of the oldest cohorts are derived entirely from historical earnings reported to the SSA. Only about one-third of the career earnings record of the youngest cohort is based on observed wages. The remaining two-thirds is imputed based on the year-to-year earnings patterns of workers in older cohorts, observed in the 1990s.

The combination of observed and predicted earnings allows us to examine individual and average cohort earnings patterns over a full career and for successive birth cohorts. This analysis confirms many findings from previous cross-section and panel studies, and it adds to our understanding of the life-cycle implications of the increase in cross-sectional inequality. Male wage and employment patterns, in the aggregate, have remained much more stable than is the case for women. Although less educated men in recent birth cohorts have fared worse than men

in earlier cohorts who had the same schooling, the increase in average educational attainment has largely offset the employment and relative wage losses suffered by less educated men. (This generalization, like others in the paper, is strictly valid only for the birth cohorts we examine, that is, cohorts born between 1926 and 1965.) Among women, the sustained rise in employment and earnings has led to a career profile of average earnings that is in many respects more similar to that of men than it is to the average profile of women in earlier cohorts. The dip in employment rates and average earnings that women in older cohorts experienced when they were in their late 20s and 30s has almost disappeared among the youngest cohorts. While female employment rates and average earnings remain lower than those of men of the same age, even in the youngest cohorts, the male-female gap is now much smaller than it was in earlier cohorts. Our projections imply that the gap will continue to narrow, although much more slowly than in the 1980s and early 1990s.

The individual-level data on career earnings patterns allow us to examine wage mobility over workers' careers. Earnings mobility cannot be measured in a cross-sectional survey, such as the CPS. Our findings confirm an earlier finding from the Panel Study on Income Dynamics (PSID), which shows either little change or a slight decline in male earnings mobility (Gottschalk, 1997, p. 38). Our results also suggest that earnings mobility has declined among women. In this respect, earnings patterns among women are converging toward those of men. Women born between 1931-1935 had significantly higher rates of wage mobility than men born in the same years. Women born between 1961-1965 are likely to have mobility rates that are closer to those of men born in the same years.

Finally, the career earnings records allow us to observe and predict trends in lifetime earnings inequality. Our tabulations understate the inequality of career earnings, because they do not include annual earned income above the recent social security taxable wage ceiling. The ceiling is almost 2½ times the economy-wide average wage, however, so our tabulations will capture an important part of the trend in male inequality and virtually all of the trend in female inequality. The tabulations suggest that lifetime earnings inequality has increased significantly among men. Compared with men born between 1936-1940, we predict that men born in 1961-1965 will see career earnings inequality rise by 12 percent. For women the trend in career earnings inequality is one of long term decline. Younger cohorts should experience less inequality over their careers than older cohorts. The drop in female inequality is driven mainly

by the increases in female employment rates at every stage of the life cycle and a sharp drop in the inequality of time spent in the paid workforce. As a rising percentage women remain steadily employed from age 20 to 60, a shrinking percentage will have extremely low lifetime wages, earned mainly before the birth of a first-born child.

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Table 1. Sample Size and Sample Loss in the MINT Data File

Initial year of SIPP survey	*SIPP observations*			*Population represented (in thousands)*		
	Men	Women	Total	Men	Women	Total
Originally interviewed in first wave of the panel						
1990	14,047	15,561	29,608	18,598	19,324	37,923
1991	9,193	9,857	19,050	11,887	12,408	24,295
1992	12,286	13,528	25,814	16,160	16,860	33,020
1993	12,406	13,469	25,875	16,222	16,904	33,126
Total	*47,932*	*52,415*	*100,347*	*62,867*	*65,495*	*128,363*
"Full panel" respondents: Provided responses on all SIPP interviews						
1990	10,307	11,868	22,175	17,749	18,526	36,275
1991	7,443	8,206	15,649	12,527	12,997	25,524
1992	9,626	10,886	20,512	16,419	17,177	33,596
1993	9,591	10,665	20,256	16,299	16,993	33,292
Total	*36,967*	*41,625*	*78,592*	*62,993*	*65,693*	*128,687*
"Full panel" respondents with a matched SSA summary earnings record						
1990	9,697	11,089	20,786	16,718	17,364	34,082
1991	6,795	7,427	14,222	11,390	11,747	23,138
1992	8,859	9,967	18,826	15,034	15,718	30,752
1993	8,742	9,644	18,386	14,805	15,349	30,154
Total	*34,093*	*38,127*	*72,220*	*57,948*	*60,178*	*118,125*
Percent of "full panel" respondents lacking a matched summary earnings record						
1990	6	7	6	6	6	6
1991	9	9	9	9	10	9
1992	8	8	8	8	8	8
1993	9	10	9	9	10	9
Total	8	*8*	*8*	*8*	*8*	*8*

Source: Authors' calculations with the MINT sample as explained in the text.

Table 2. Male Earnings and Employment-to-Population Ratios at Selected Ages, by Education and Birth Cohort

Educational attainment and birth cohort	*Age 30*			*Age 45*			*Age 60*		
	Mean of all earnings	Mean earnings in years with positive wage	Employment / population ratio	Mean of all earnings	Mean earnings in years with positive wage	Employment / population ratio	Mean of all earnings	Mean earnings in years with positive wage	Employment / population ratio
High school drop outs									
1931-1935	0.79	0.95	0.84	1.04	1.26	0.83	0.66	0.98	0.68
1941-1945	0.77	0.97	0.80	0.77	0.94	0.83	0.60	0.82	0.73
1951-1955	0.54	0.80	0.67	0.69	0.94	0.74	0.51	0.74	0.69
1961-1965	0.54	0.70	0.77	0.65	0.88	0.73	0.46	0.70	0.65
Percent change a/	*-32*	*-26*	*-8*	*-38*	*-30*	*-11*	*-30*	*-28*	*-4*
High school graduates									
1931-1935	1.05	1.18	0.89	1.33	1.53	0.87	0.86	1.14	0.75
1941-1945	1.12	1.26	0.89	1.18	1.38	0.85	0.83	1.11	0.75
1951-1955	0.92	1.08	0.85	1.01	1.18	0.85	0.72	0.96	0.74
1961-1965	0.85	0.93	0.91	0.97	1.12	0.86	0.71	0.91	0.77
Percent change a/	*-19*	*-21*	*2*	*-27*	*-27*	*-1*	*-18*	*-20*	*2*
Some college									
1931-1935	1.05	1.20	0.88	1.36	1.60	0.85	0.89	1.21	0.73
1941-1945	1.18	1.30	0.90	1.36	1.57	0.87	0.86	1.14	0.75
1951-1955	1.06	1.20	0.88	1.20	1.39	0.86	0.76	1.03	0.73
1961-1965	0.97	1.07	0.91	1.08	1.26	0.86	0.69	0.95	0.72
Percent change a/	*-7*	*-11*	*4*	*-21*	*-21*	*1*	*-22*	*-21*	*-1*
College graduates									
1931-1935	1.12	1.40	0.80	1.54	1.84	0.83	1.17	1.56	0.75
1941-1945	1.20	1.45	0.83	1.61	1.89	0.86	1.17	1.53	0.77
1951-1955	1.20	1.40	0.86	1.53	1.73	0.88	1.11	1.41	0.79
1961-1965	1.33	1.46	0.91	1.53	1.72	0.89	1.09	1.39	0.79
Percent change a/	*18*	*4*	*14*	*0*	*-7*	*7*	*-7*	*-11*	*5*

a/ Percent change in mean earnings or employment-population ratio comparing the cohort born in 1961-65 with the cohort born in 1931-1935.

Note: Tabulations exclude workers who are disabled prior to indicated age. Entries in shaded area reflect authors' forecasts of average earnings in 1999 and later years; unshaded entries are calculated using historical data.

Source: Authors' tabulations of MINT 2.0 file as explained in text.

Table 3. Female Earnings and Employment-to-Population Ratios at Selected Ages, by Education and Birth Cohort

Educational attainment and birth cohort	*Age 30*			*Age 45*			*Age 60*		
	Mean of all earnings	**Mean earnings in years with positive wage**	**Employment / population ratio**	**Mean of all earnings**	**Mean earnings in years with positive wage**	**Employment / population ratio**	**Mean of all earnings**	**Mean earnings in years with positive wage**	**Employment / population ratio**
High school drop outs									
1931-1935	0.13	0.40	0.32	0.28	0.57	0.50	0.22	0.55	0.41
1941-1945	0.20	0.46	0.45	0.32	0.56	0.57	0.24	0.53	0.45
1951-1955	0.18	0.46	0.39	0.30	0.53	0.57	0.23	0.57	0.41
1961-1965	0.22	0.42	0.52	0.38	0.61	0.63	0.30	0.65	0.47
Percent change a/	*71*	*4*	*64*	*35*	*7*	*26*	*36*	*18*	*15*
High school graduates									
1931-1935	0.18	0.53	0.34	0.40	0.67	0.60	0.37	0.69	0.53
1941-1945	0.24	0.56	0.43	0.50	0.72	0.70	0.42	0.74	0.56
1951-1955	0.38	0.63	0.61	0.58	0.73	0.79	0.48	0.79	0.61
1961-1965	0.42	0.58	0.73	0.60	0.75	0.81	0.50	0.82	0.61
Percent change a/	*136*	*9*	*117*	*51*	*12*	*35*	*37*	*20*	*14*
Some college									
1931-1935	0.20	0.59	0.34	0.47	0.73	0.65	0.49	0.82	0.60
1941-1945	0.33	0.63	0.52	0.65	0.88	0.74	0.56	0.85	0.65
1951-1955	0.50	0.74	0.68	0.79	0.95	0.83	0.65	0.96	0.67
1961-1965	0.59	0.75	0.78	0.78	0.94	0.84	0.64	0.93	0.69
Percent change a/	*193*	*26*	*132*	*66*	*29*	*29*	*30*	*13*	*15*
College graduates									
1931-1935	0.24	0.73	0.32	0.57	0.95	0.60	0.65	1.08	0.60
1941-1945	0.39	0.80	0.48	0.84	1.17	0.72	0.71	1.14	0.62
1951-1955	0.70	0.98	0.71	0.95	1.22	0.78	0.74	1.15	0.65
1961-1965	0.91	1.10	0.82	1.05	1.31	0.80	0.77	1.20	0.64
Percent change a/	*282*	*50*	*154*	*86*	*38*	*35*	*19*	*11*	*8*

a/ Percent change in mean earnings or employment-population ratio comparing the cohort born in 1961-65 with the cohort born in 1931-1935.

Note: Tabulations exclude workers who are disabled prior to indicated age. Entries in shaded area reflect authors' forecasts of average earnings in 1999 and later years; unshaded entries are calculated using historical data.

Source: Authors' tabulations of MINT 2.0 file as explained in text.

Table 4. Earnings Mobility between Ages 31-35 and 51-55, by Sex and Birth Year Cohort

Probability of moving among thirds of the earnings distribution between ages 31-35 and 51-55

Average earnings, ages 31-35	Average earnings, ages 51-55 *(1931-1935 birth cohort)*				Average earnings, ages 51-55 *(1961-1965 birth cohort)*			
	Low	**Average**	**High**	***Sum***	**Low**	**Average**	**High**	***Sum***
Males								
Low	**59%**	33%	7%	*100%*	**59%**	33%	8%	*100%*
Average	26%	**42%**	32%	*100%*	29%	**45%**	26%	*100%*
High	14%	24%	**61%**	*100%*	12%	22%	**67%**	*100%*
Females								
Low	**47%**	32%	21%	*100%*	**54%**	32%	14%	*100%*
Average	36%	**38%**	26%	*100%*	31%	**44%**	25%	*100%*
High	17%	30%	**53%**	*100%*	15%	24%	**61%**	*100%*

Note: For each five-year age interval, workers are ranked within birth cohort by their average wage and divided into three equal groups corresponding to low, average, and high wages in the age interval. Only years with positive earnings are used to calculate the average wage. Workers must have at least one year of positive earnings in both five-year age intervals to be included in the tabulations.

Source: Authors' tabulations with MINT 2.0 data set.

Table 5. Lifetime Earnings and Benefit Inequality among Men Using Alternative Measures of Social-Security-Taxable Wages

[Worker-only sample]

	% of sample ineligible for OAI	Mean career earnings		Mean in years with positive wage		Years with positive wage		Primary Insurance Amount	
		Median	Gini	Median	Gini	Median	Gini	Median	Gini
When annual earnings are counted only up to the taxable wage ceiling									
All persons who survive to 62 without becoming disabled									
1931 - 1935	6	0.98	0.290	1.11	0.231	32.9	0.148	0.42	0.214
1936 - 1940	5	1.05	0.293	1.17	0.235	33.5	0.144	0.42	0.210
1941 - 1945	5	1.10	0.305	1.23	0.250	33.5	0.140	0.43	0.214
1946 - 1950	5	1.10	0.316	1.23	0.265	33.4	0.141	0.43	0.222
1951 - 1955	5	1.07	0.333	1.19	0.286	33.6	0.135	0.42	0.232
1956 - 1960	5	1.05	0.336	1.17	0.289	33.8	0.128	0.42	0.230
1961 - 1965	5	1.01	0.345	1.12	0.301	34.0	0.125	0.41	0.237
Percent change a/		*4*	*19*	*1*	*30*	*3*	*-15*	*-1*	*11*
When annual earnings are included up to 2.46 x economy-wide average wage									
All persons who survive to 62 without becoming disabled									
1931 - 1935	6	1.11	0.314	1.25	0.258	32.9	0.148	0.44	0.224
1936 - 1940	5	1.14	0.309	1.27	0.253	33.5	0.144	0.43	0.216
1941 - 1945	5	1.15	0.314	1.29	0.259	33.5	0.140	0.44	0.218
1946 - 1950	5	1.12	0.322	1.25	0.271	33.4	0.141	0.44	0.224
1951 - 1955	5	1.08	0.336	1.20	0.288	33.6	0.135	0.43	0.233
1956 - 1960	5	1.06	0.337	1.17	0.291	33.8	0.128	0.42	0.230
1961 - 1965	5	1.02	0.346	1.12	0.302	34.0	0.125	0.41	0.238
Percent change a/		*-8*	*10*	*-10*	*17*	*3*	*-15*	*-7*	*6*

a/ Percent change in median or in Gini coefficient comparing the cohort born in 1961-1965 with the cohort born in 1931-1935.

Note : Calculations include MINT full panel respondents (also imputed SER) with social-security-covered earnings in at least one year from age 22 to 61.

Table 6. Lifetime Earnings and Benefit Inequality among Women Using Alternative Measures of Social-Security-Taxable Wages

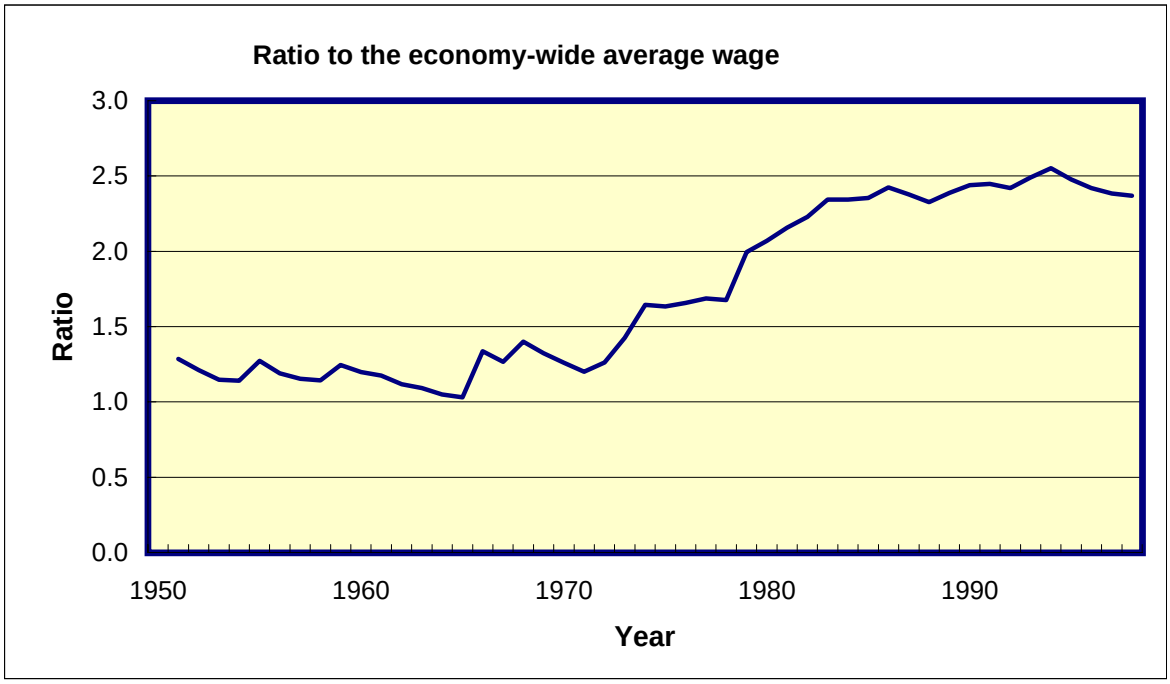
[Worker-only sample]

	% of sample ineligible for OAI	Mean career earnings		Mean in years with positive wage		Years with positive wage		Primary Insurance Amount	
		Median	Gini	Median	Gini	Median	Gini	Median	Gini
When annual earnings are counted only up to the taxable wage ceiling									
All persons who survive to 62 without becoming disabled									
1931 - 1935	24	0.24	0.514	0.49	0.361	21.0	0.322	0.20	0.441
1936 - 1940	20	0.30	0.498	0.53	0.359	24.0	0.299	0.22	0.411
1941 - 1945	17	0.36	0.484	0.58	0.356	27.0	0.274	0.24	0.389
1946 - 1950	14	0.46	0.459	0.65	0.354	30.0	0.243	0.27	0.355
1951 - 1955	11	0.51	0.445	0.67	0.347	32.0	0.220	0.29	0.335
1956 - 1960	10	0.54	0.436	0.69	0.347	33.0	0.211	0.30	0.323
1961 - 1965	8	0.55	0.425	0.69	0.343	34.0	0.191	0.30	0.309
Percent change a/		*125*	*-17*	*39*	*-5*	*62*	*-41*	*49*	*-30*
				32%					
OAI-eligible workers who survive to 62 without becoming disabled				5%					
1931 - 1935	0	0.35	0.401	0.57	0.304	25.0	0.197	0.24	0.264
1936 - 1940	0	0.40	0.400	0.61	0.307	28.0	0.190	0.25	0.265
1941 - 1945	0	0.47	0.398	0.65	0.311	29.0	0.177	0.28	0.262
1946 - 1950	0	0.56	0.388	0.72	0.312	32.0	0.160	0.30	0.253
1951 - 1955	0	0.58	0.383	0.73	0.313	33.0	0.150	0.31	0.248
1956 - 1960	0	0.60	0.382	0.74	0.314	34.0	0.149	0.32	0.247
1961 - 1965	0	0.60	0.381	0.73	0.316	35.0	0.141	0.32	0.246
Percent change a/		*71*	*-5*	*27*	*4*	*40*	*-28*	*32*	*-7*

a/ Percent change in median or in Gini coefficient comparing the cohort born in 1961-1965 with the cohort born in 1931-1935.

Note : Calculations include MINT full panel respondents (also imputed SER) with social-security-covered earnings in at least one year from age 22 to 61.

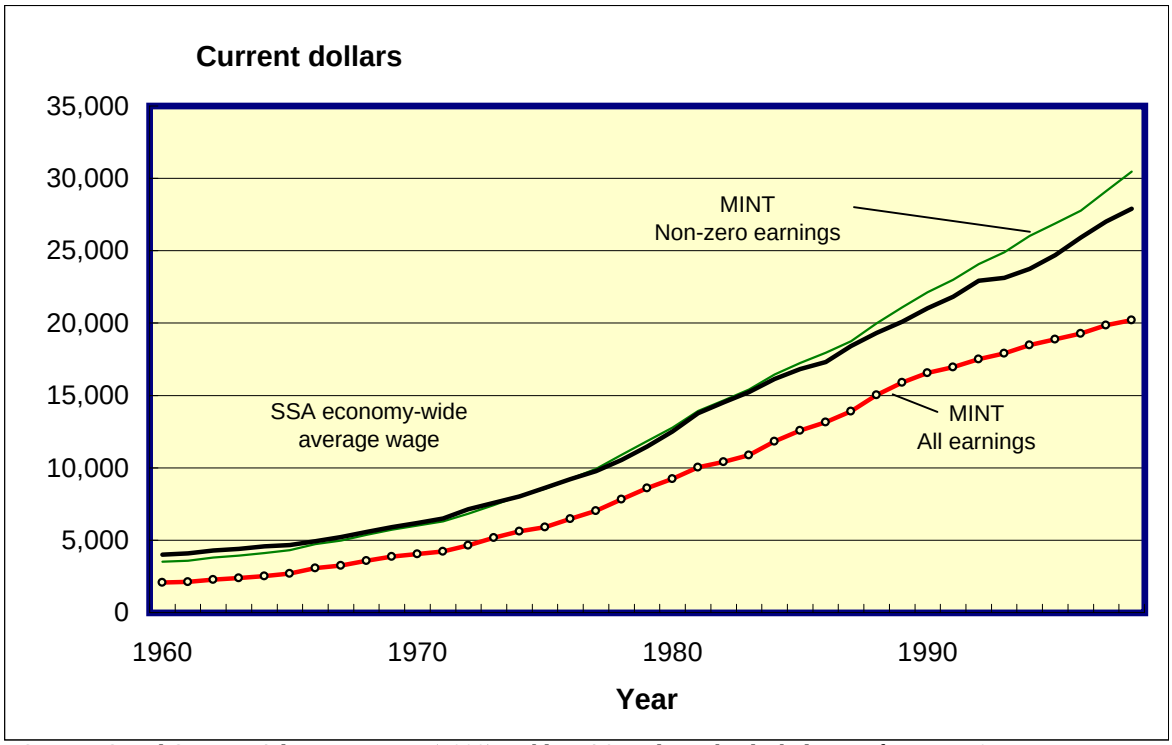
Figure 1. The Taxable Wage Ceiling, 1951-98



Source: Social Security Adminsinstration (2000), Table 2.A8.

Figure 2. Index of Average Earnings in the MINT Sample, 1960-1998

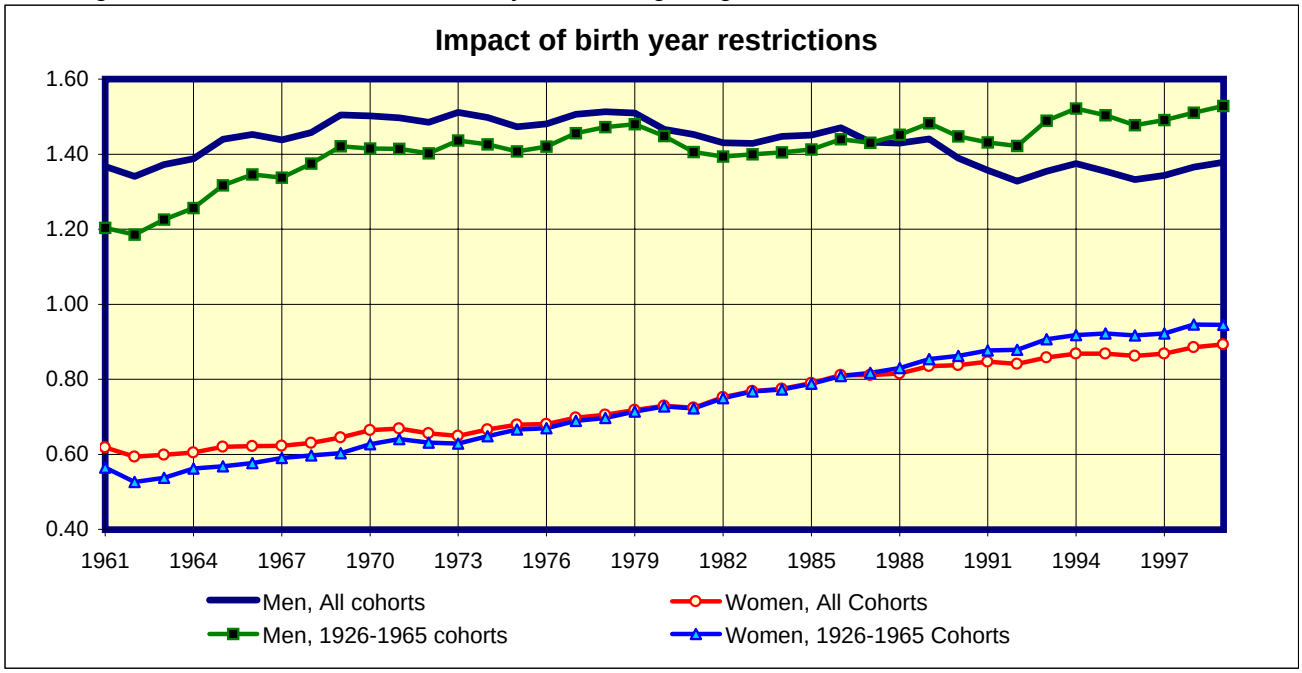
Thousands of current dollars

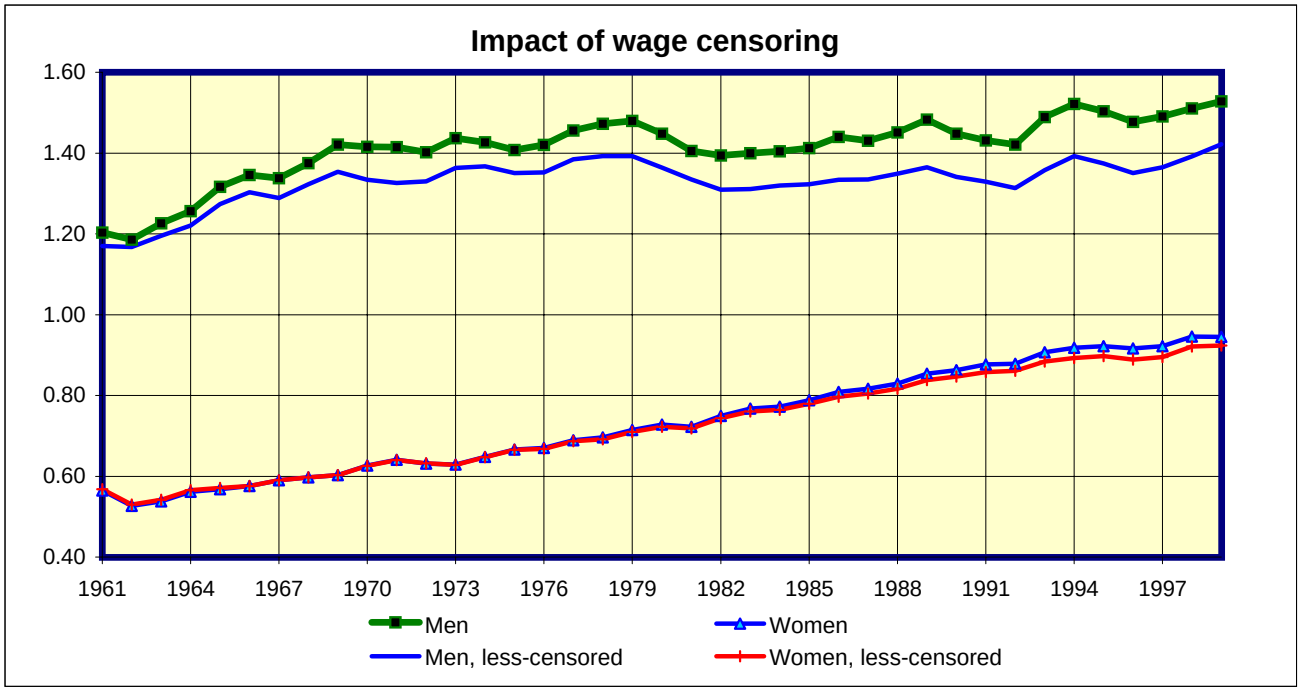


Source: Social Security Adminsinstration (2000), Table 2.A8; and weighted tabulation of MINT 2.0 (SIPP-SER) data file.

Figure 3. Mean Earnings of Workers with Positive Earnings in the CPS, 1961-1998

Earnings measured as a ratio to the economy-wide average wage

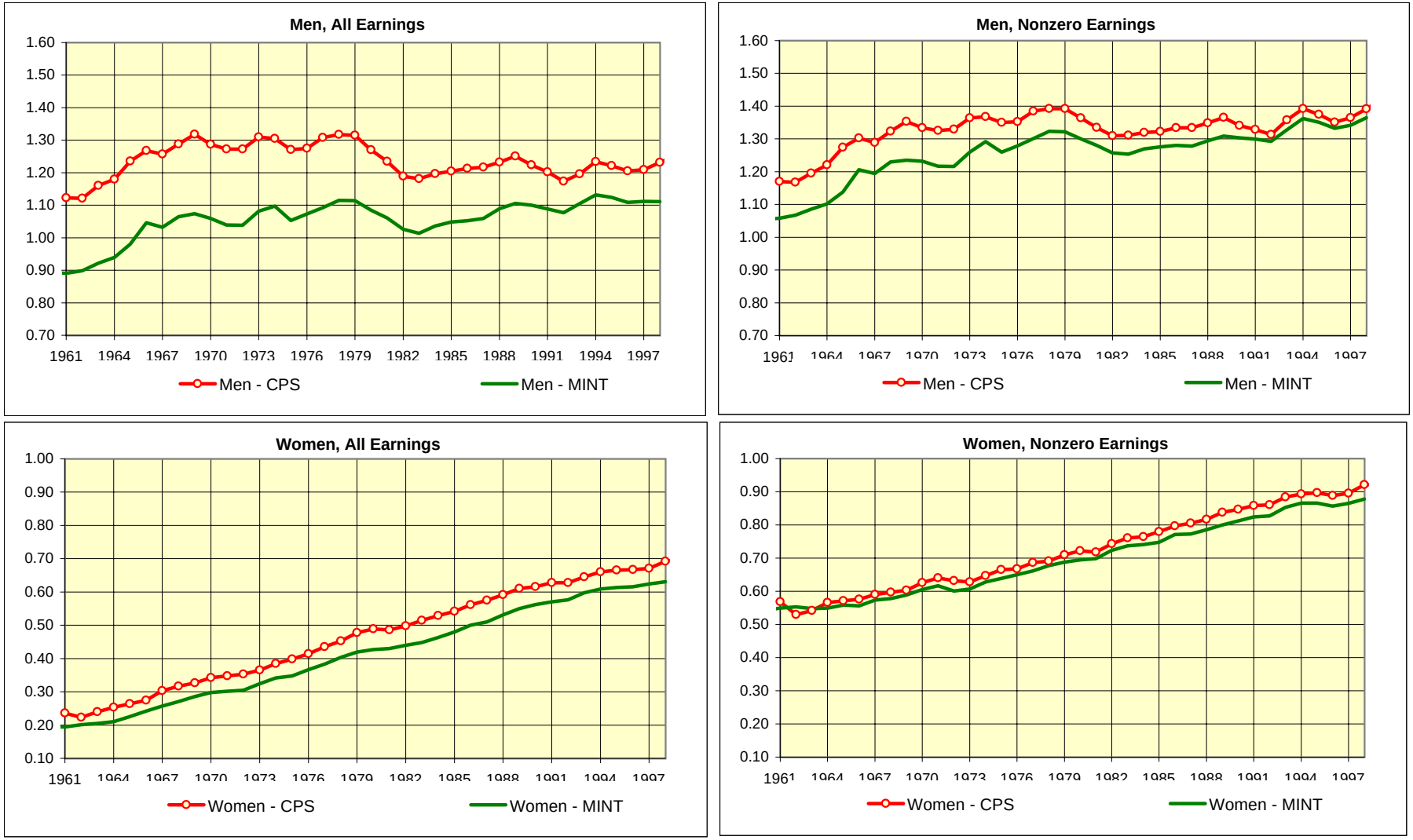




Source: Authors' tabulations of data from the 1962-1999 March Current Population Survey files.

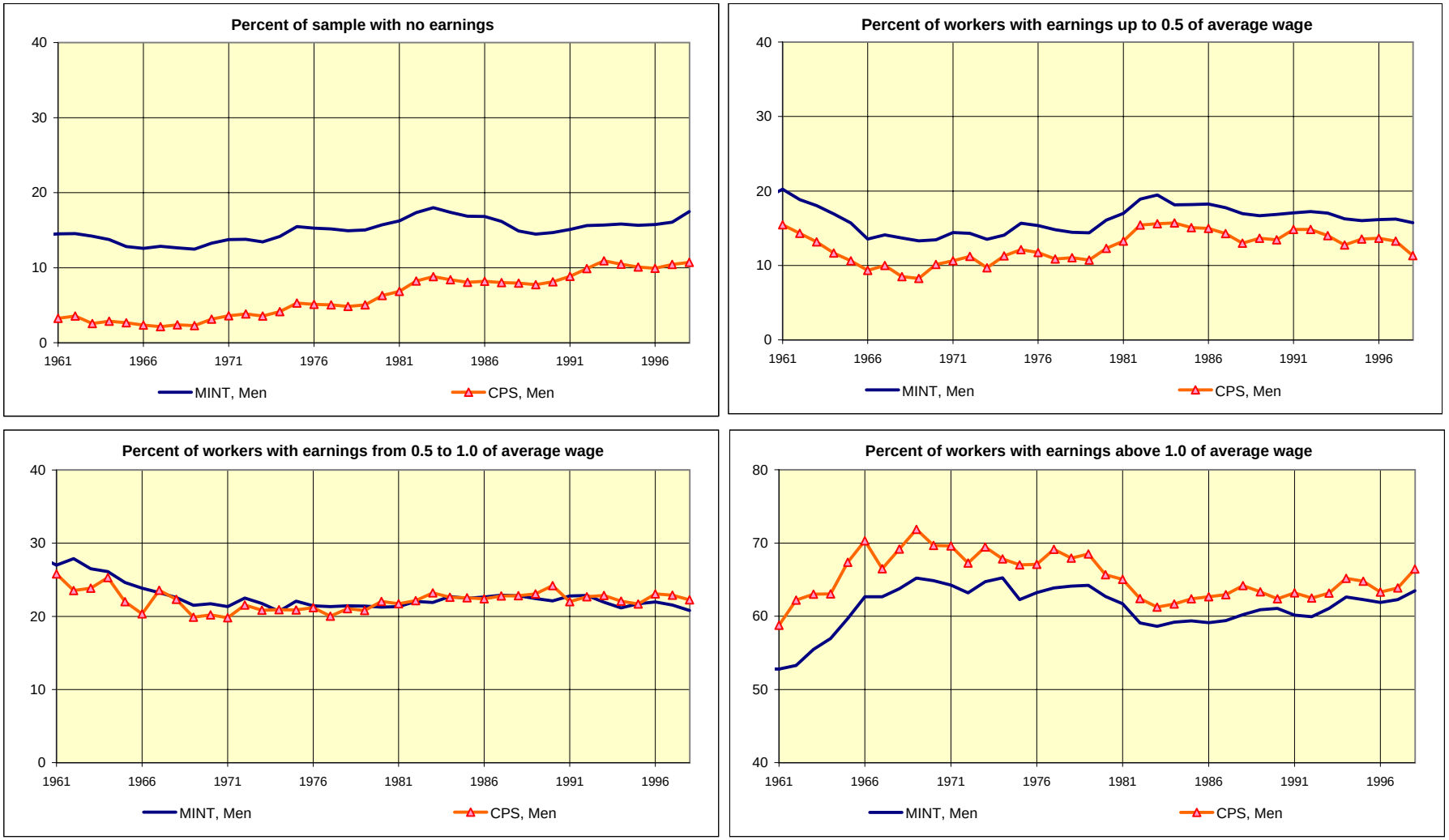
Figure 4. Comparison of Mean Earnings in the March CPS and MINT Files, by Year, 1961-1998

Earnings measured as a ratio to the economy-wide average wage



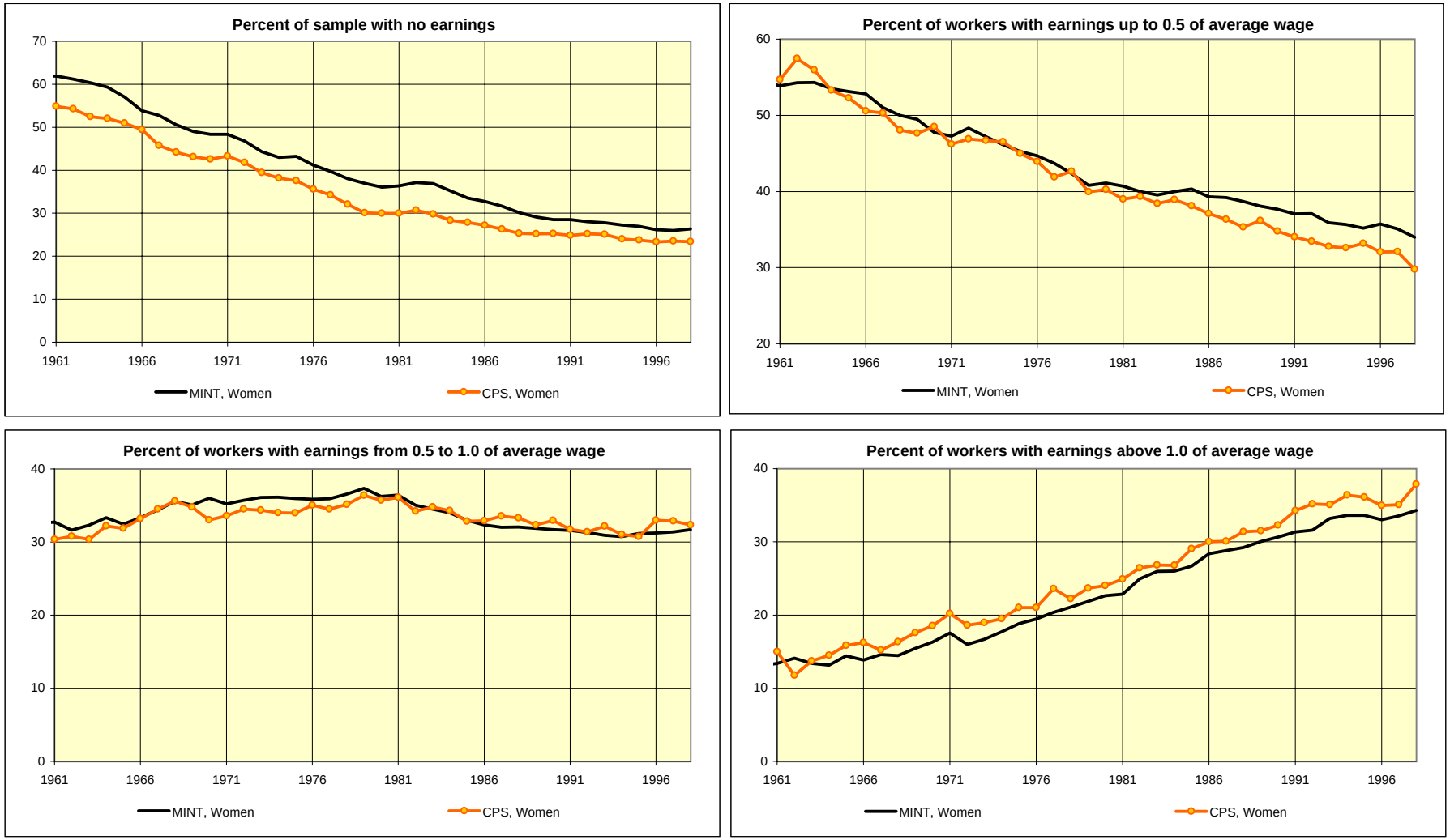
Source: Authors' tabulations of the March CPS and MINT 2.0 files using data on people born in 1926-1965 when they are between 22 and 61 years old.

Figure 5. Comparison of the Frequency Distributions of Male Earnings in the March CPS and MINT Files, 1961-1998



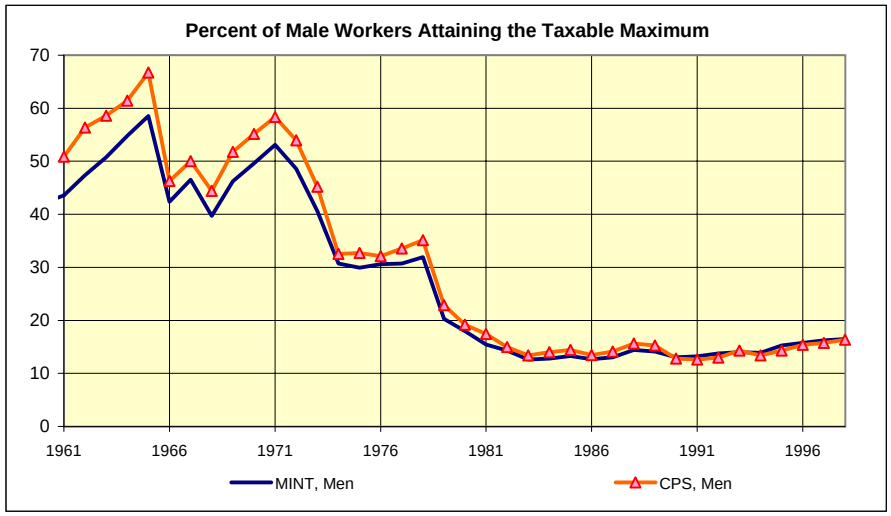
Source: Authors' tabulations of the March CPS and MINT 2.0 files using data on people born in 1926-1965 when they are between 22 and 61 years old.

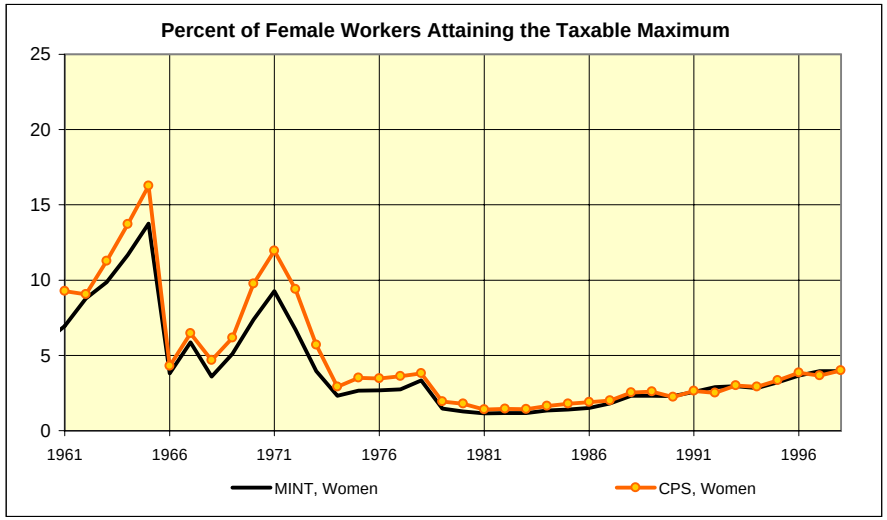
Figure 6. Comparison of the Frequency Distributions of Female Earnings in the March CPS and MINT Files, 1961-1998

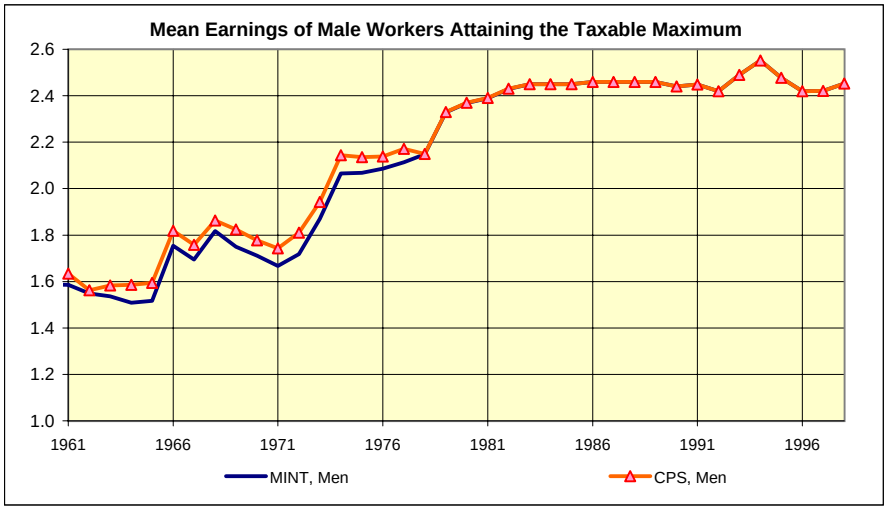


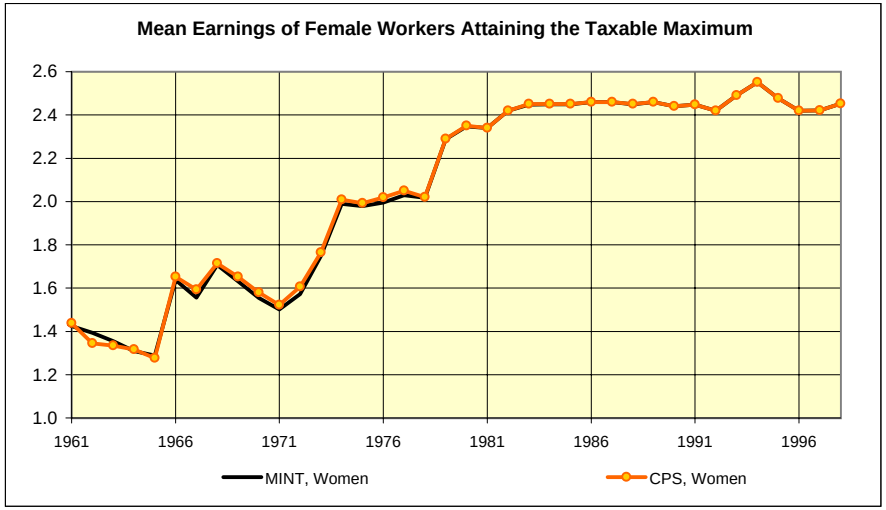
Source: Authors' tabulations of the March CPS and MINT 2.0 files using data on people born in 1926-1965 when they are between 22 and 61 years old.

Figure 7. Earnings of Workers Who Earn the Annual Taxable Maximum Wage, 1961-1998



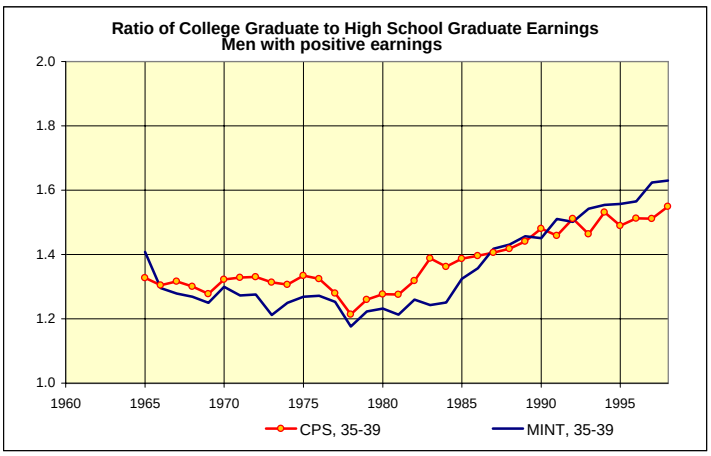


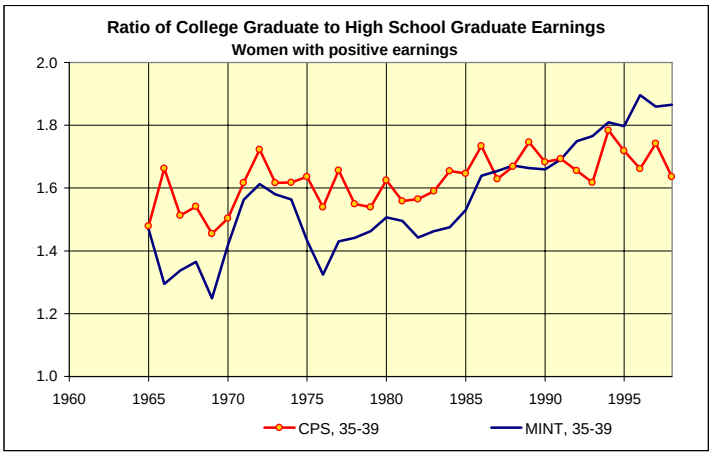


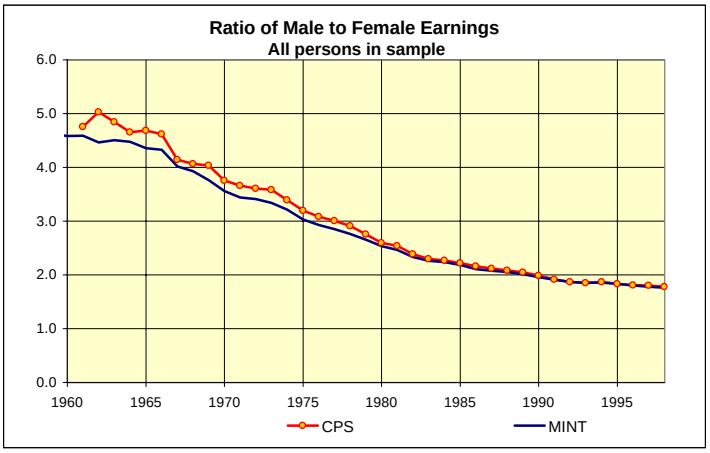


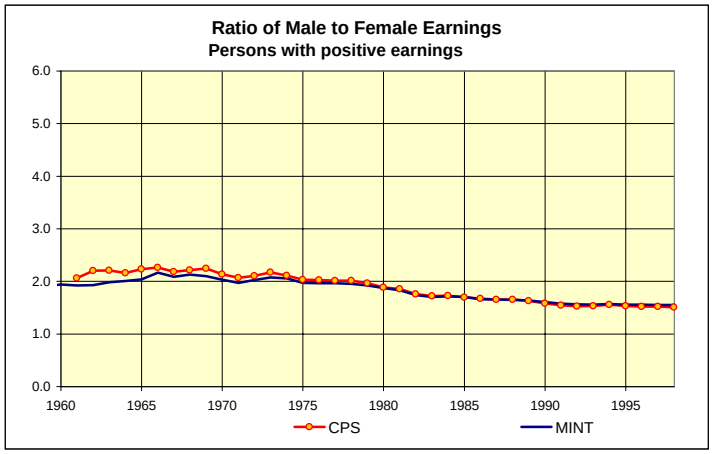
Note: Sample in each year only includes workers who have positive earnings in that year. Annual earnings are measured as a ratio to the economy-wide average wage.
Source: Authors' tabulations of the March CPS and MINT 2.0 files using data on people born in 1926-1965 when they are between 22 and 61 years old.

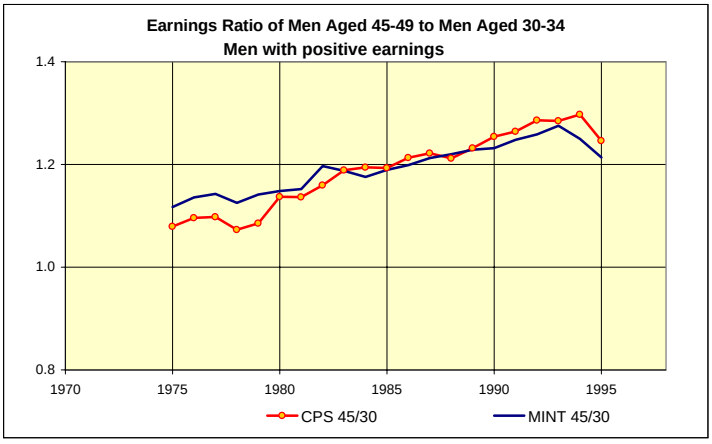
Figure 8. Comparison of Earnings Trends in the CPS and MINT Files, 1961-1998

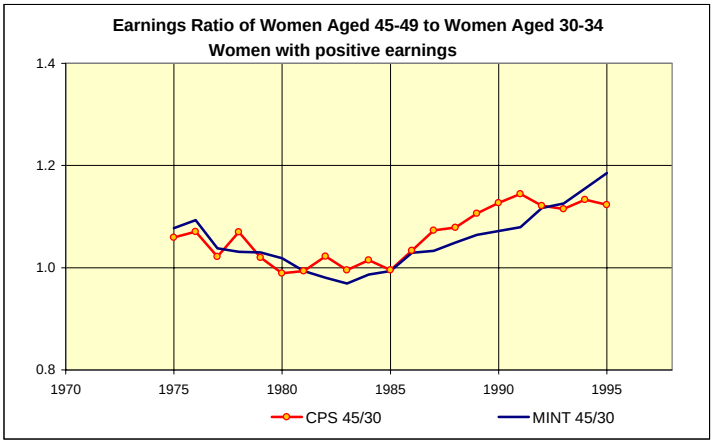






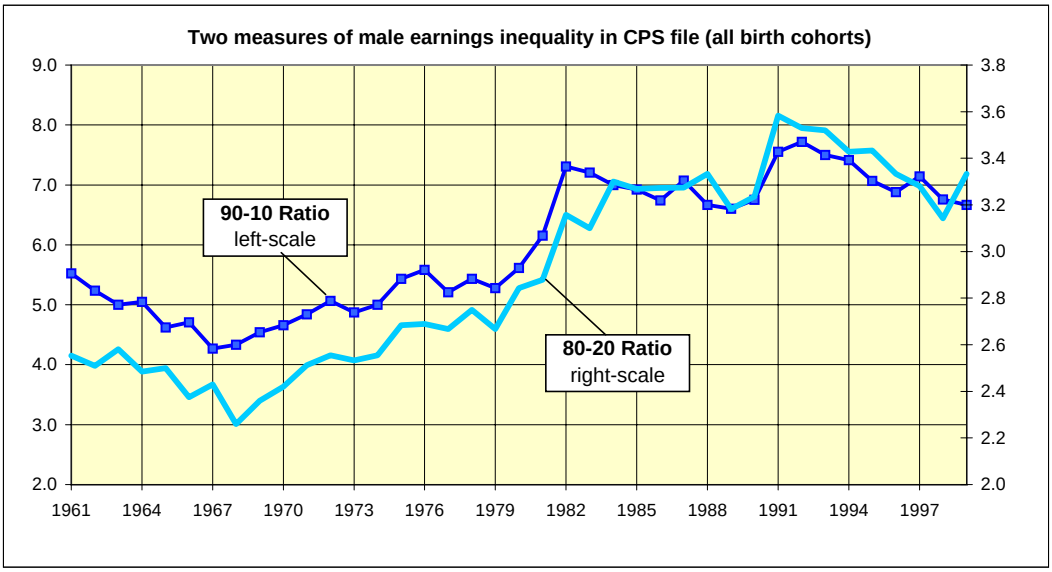


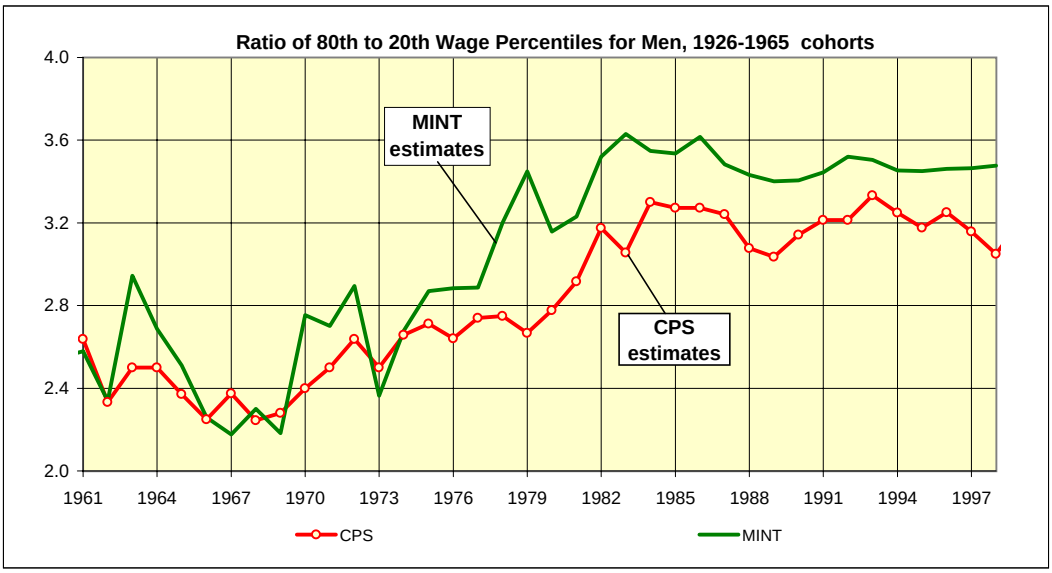


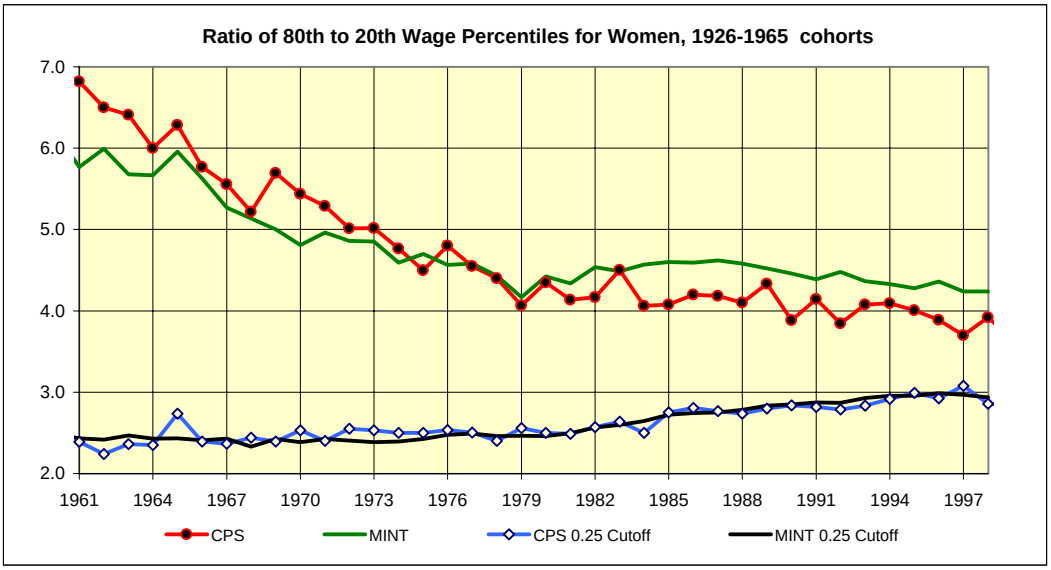


Source: Authors' tabulations of the March CPS and MINT 2.0 files using data on people born in 1926-1965 when they are between 22 and 61 years old.

Figure 9. Comparison of Earnings Inequality in the CPS and MINT Files, 1961-98

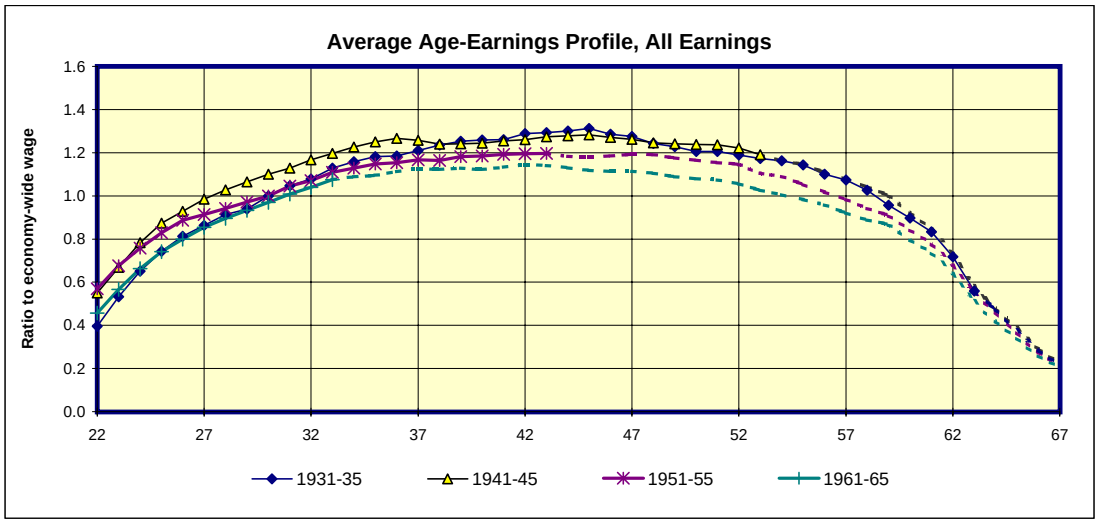


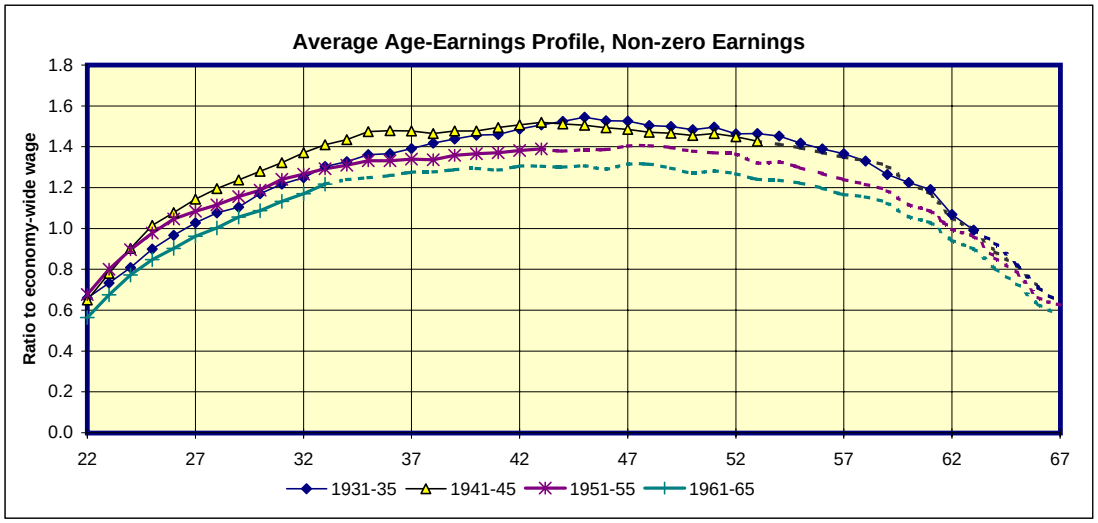


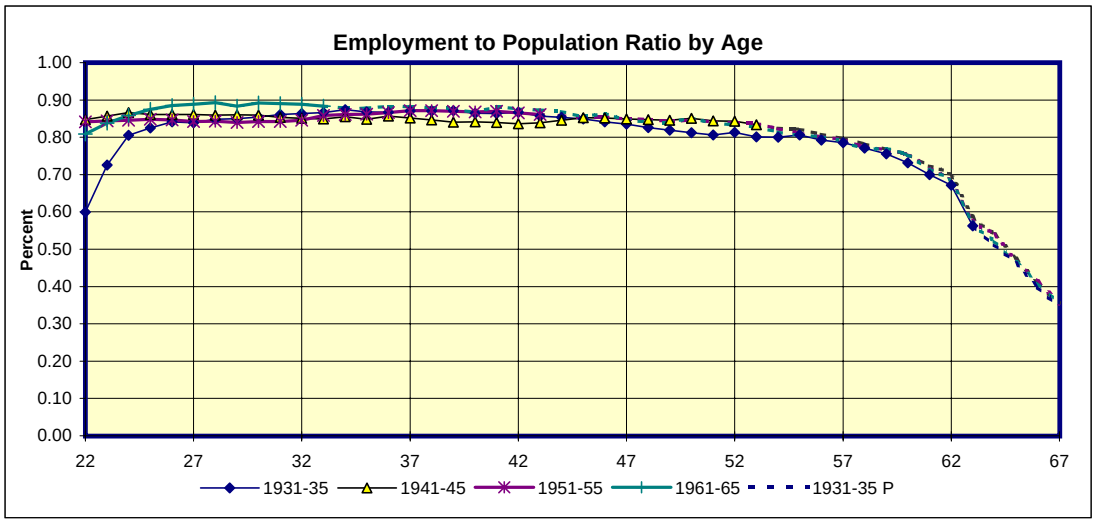


Source: Authors' tabulations of the March CPS and MINT 2.0 files.

Figure 10. Earnings Profiles and Participation Rates of Men by Birth Cohort and Age



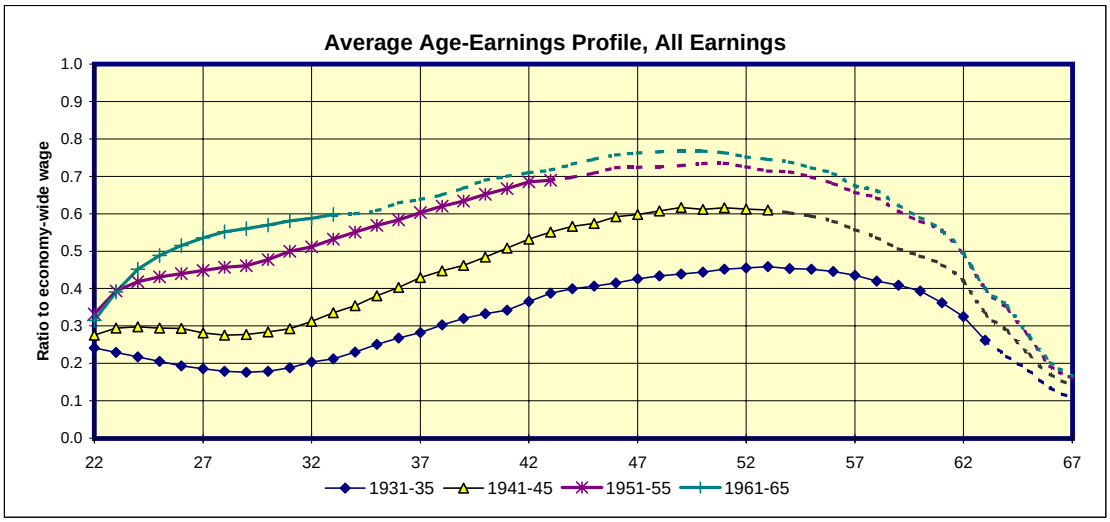


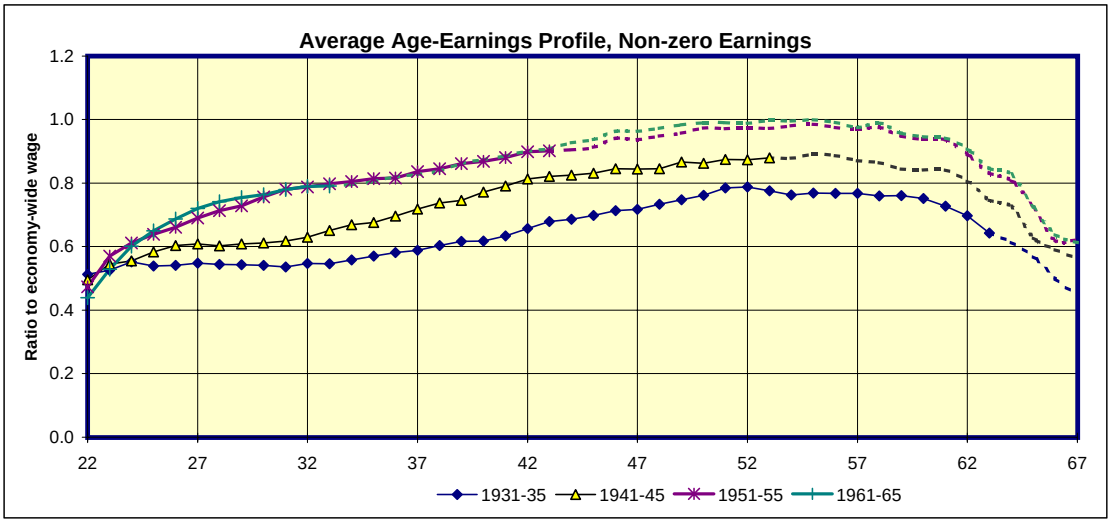


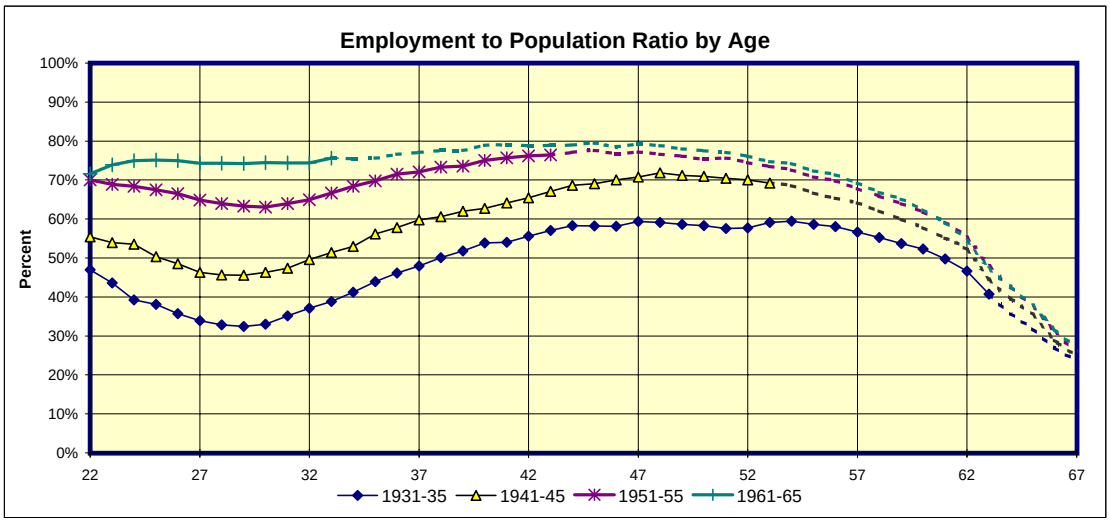
Note: Observations are included in the sample until the year before they die or become disabled (or are predicted to die or become disabled). Historical data are indicated with a solid line; projected data are indicated with a broken line.

Source: Authors' tabulations of the MINT 2.0 file as explained in the text.

Figure 11. Earnings Profiles and Participation Rates of Women by Birth Cohort and Age



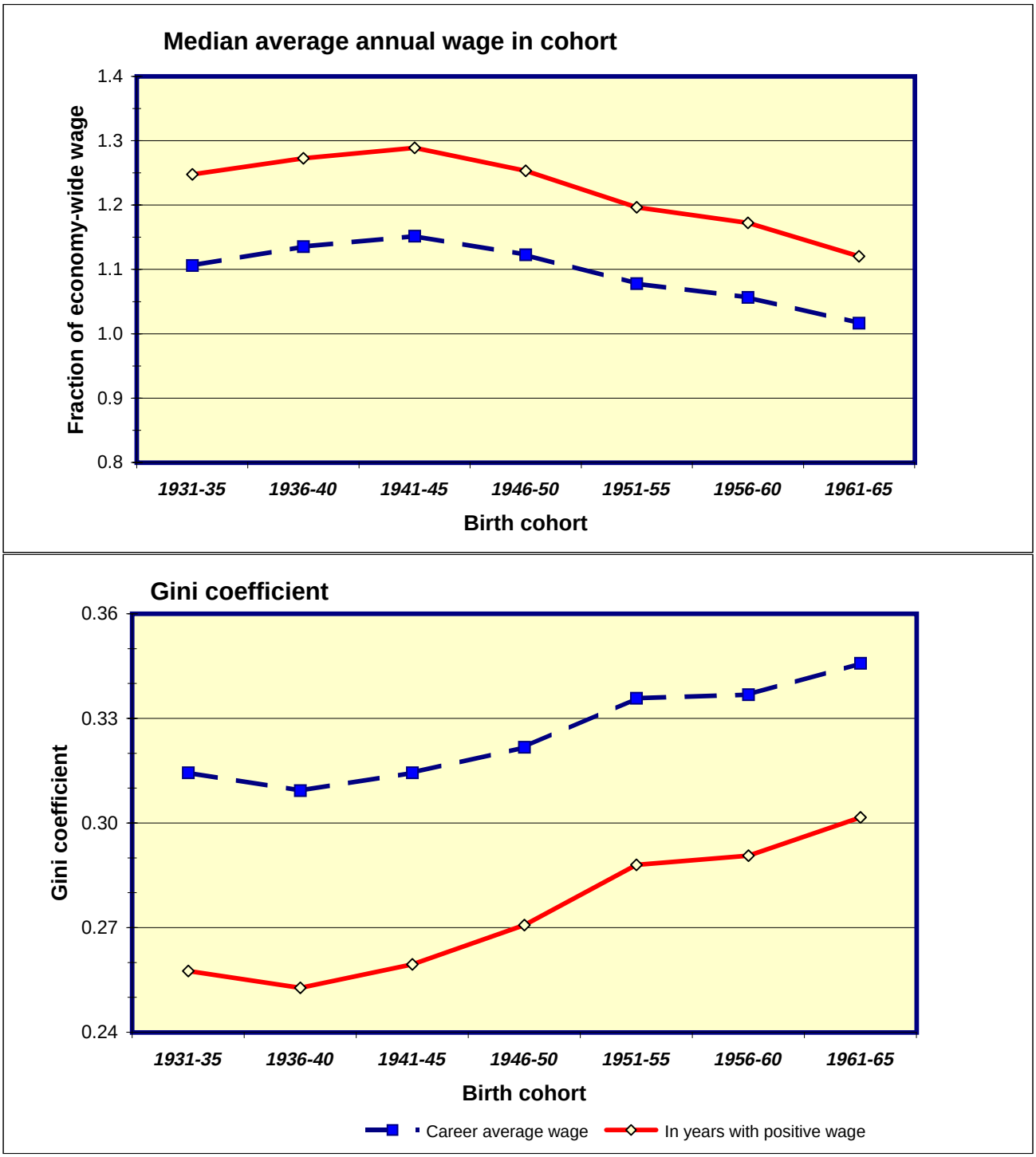




Note: Observations are included in the sample until the year before they die or become disabled (or are predicted to die or become disabled). Historical data are indicated with a solid line; projected data are indicated with a broken line.

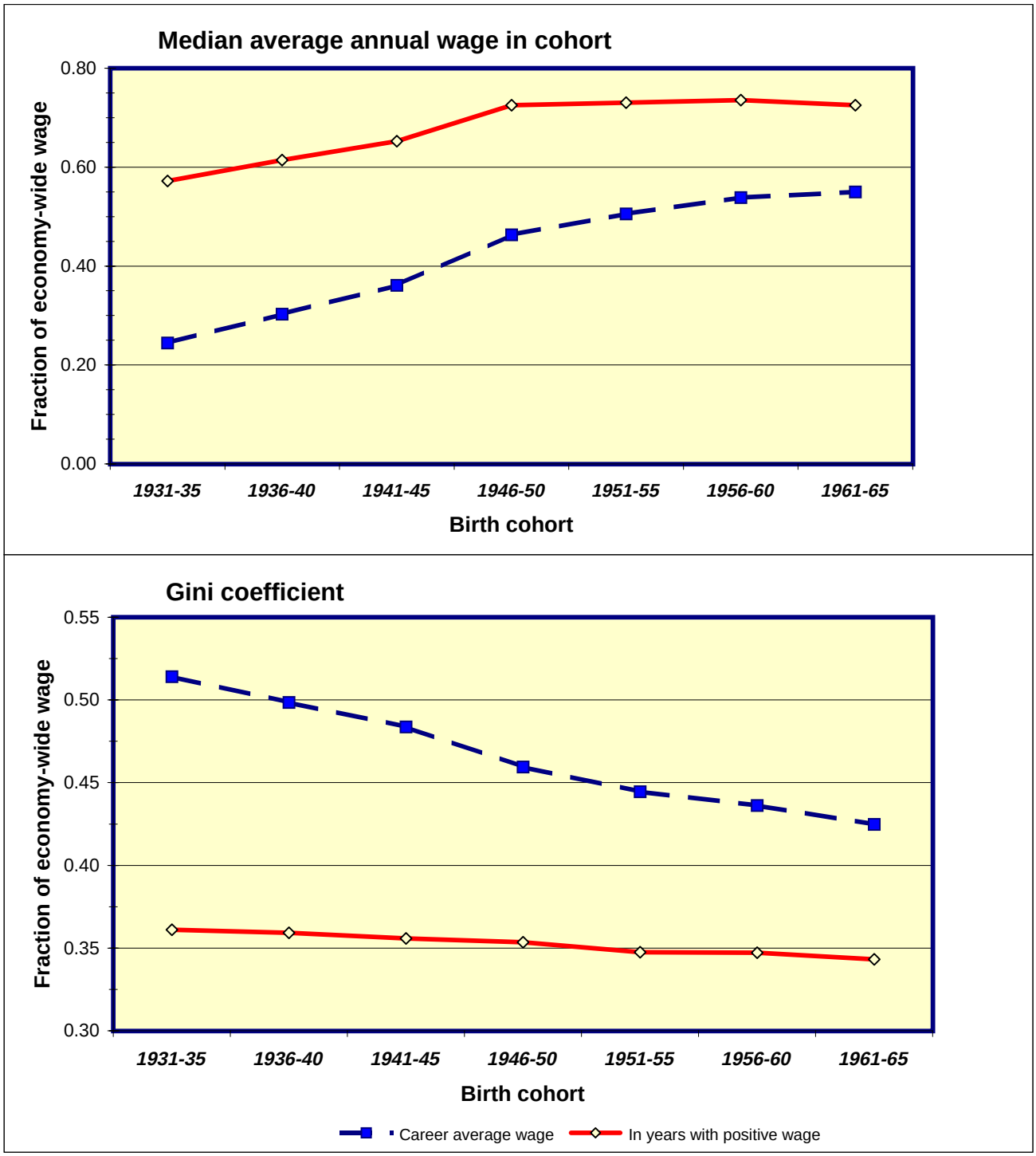
Source: Authors' tabulations of the MINT 2.0 file as explained in the text.

Figure 12. Average Lifetime Earnings and Earnings Inequality among Men, by Birth Year Cohort



Note: Sample consists of all men in each birth cohort who have at least one year of social-security-covered earnings and who survived to age 62 without becoming disabled. Estimates of lifetime average earnings are based on adjusted annual social-security-covered earnings up to an earnings limit equal to 2.46 times the economy-wide average wage. Persons with imputed SER are included.

Figure 13. Average Lifetime Earnings and Earnings Inequality among Women, by Birth Year Cohort



Note: Sample consists of all men in each birth cohort who have at least one year of social-security-covered earnings and who survived to age 62 without becoming disabled. Estimates of lifetime average earnings are based on adjusted annual social-security-covered earnings up to an earnings limit equal to 2.46 times the economy-wide average wage. Persons with imputed SER are included.

Appendix Table 1. Educational Attainment of SIPP Respondents by 5-year Birth Cohort

Percent of full-panel SIPP respondents

Educational attainment	Birth cohort							
	1926-30	1931-35	1936-40	1941-45	1946-50	1951-55	1956-60	1961-65
				Men				
High school drop outs	31	26	20	15	11	9	11	11
High school graduates	34	34	38	33	29	34	40	37
Some college	13	16	16	19	23	25	21	22
College graduates	11	13	13	16	21	18	18	20
5+ years of post-secondary	11	12	13	17	17	13	10	9
Total	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
				Women				
High school drop outs	30	24	20	15	11	10	10	10
High school graduates	43	45	46	43	38	37	38	38
Some college	14	16	17	20	23	24	26	24
College graduates	7	9	10	12	16	18	18	20
5+ years of post-secondary	5	6	7	10	12	11	8	7
Total	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*

Source: Authors' calculations from SIPP interview responses.

Appendix Table 2. Earnings Mobility between Ages 31-35 and 51-55, by Sex and Birth Year Cohort

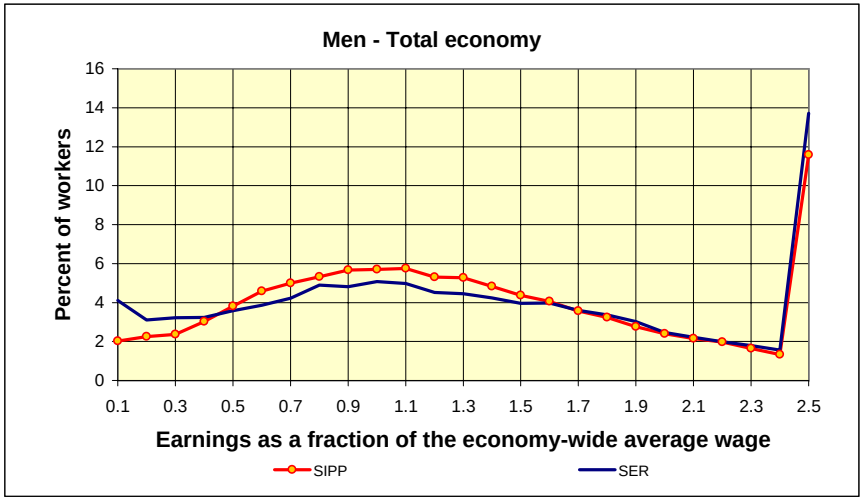
Probability of moving among thirds of the earnings distribution between ages 31-35 and 51-55

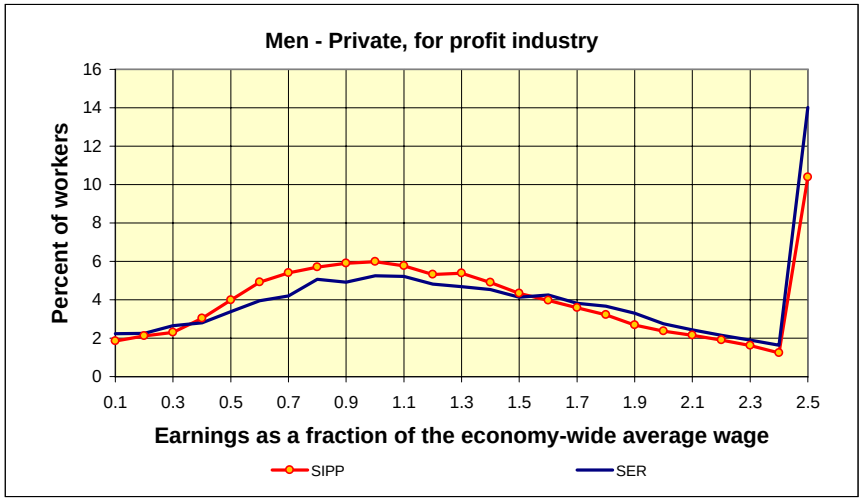
Average earnings, ages 31-35	Average earnings, ages 51-55 (1931-1935 birth cohort)			Average earnings, ages 51-55 (1941-1945 birth cohort)			Average earnings, ages 51-55 (1951-1955 birth cohort)			Average earnings, ages 51-55 (1961-1965 birth cohort)		
	Low	**Average**	**High**	**Low**	**Average**	**High**	**Low**	**Average**	**High**	**Low**	**Average**	**High**
Male high school graduates												
Low	**61%**	33%	6%	**66%**	28%	5%	**64%**	31%	5%	**58%**	36%	5%
Middle	28%	**45%**	27%	28%	**52%**	20%	29%	**52%**	18%	29%	**53%**	18%
High	18%	33%	**49%**	17%	37%	**46%**	13%	34%	**52%**	13%	31%	**55%**
Male college graduates												
Low	**48%**	29%	23%	**43%**	31%	26%	**42%**	31%	26%	**46%**	29%	25%
Middle	17%	**29%**	54%	15%	**38%**	48%	18%	**39%**	43%	20%	**34%**	46%
High	9%	15%	**76%**	9%	14%	**78%**	10%	14%	**77%**	9%	15%	**76%**
Female high school graduates												
Low	**47%**	39%	14%	**55%**	33%	12%	**59%**	34%	7%	**57%**	35%	8%
Middle	36%	**39%**	25%	33%	**48%**	19%	40%	**46%**	14%	35%	**49%**	17%
High	16%	34%	**50%**	18%	38%	**43%**	20%	34%	**46%**	17%	39%	**43%**
Female college graduates												
Low	**31%**	19%	50%	**37%**	20%	43%	**39%**	26%	35%	**40%**	24%	35%
Middle	27%	**24%**	49%	14%	**25%**	61%	23%	**27%**	50%	25%	**24%**	52%
High	19%	9%	**72%**	12%	12%	**76%**	16%	16%	**68%**	14%	13%	**73%**

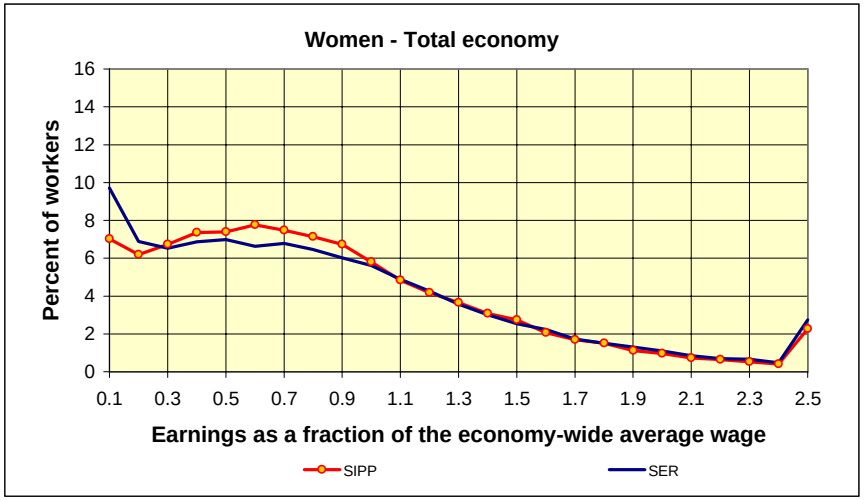
Note: For each five-year age interval, workers are ranked within birth cohort by their average wage and divided into three equal groups corresponding to low, average, and high wages in the age interval. Only years with positive earnings are used to calculate the average wage. Workers must have at least one year of positive earnings in both five-year age intervals to be included in the tabulations.

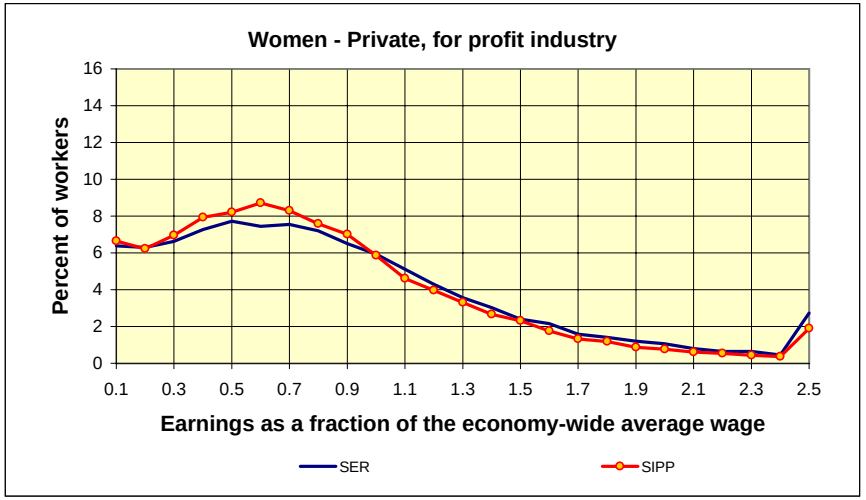
Source: Authors' tabulations with MINT 2.0 data set.

Appendix Figure 1. Frequency Distribution of Earnings for Workers Who Have Positive Earnings









Source: Authors' tabulations of MINT 2.0 file as explained in text.