Historical Redistribution Under the Social Security Disability Insurance Program

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This study uses Social Security administrative data on historical taxes and benefits by year, age, gender, and race for an *ex post* analysis of redistribution under the Disability Insurance (DI) program. The relationship between the taxes paid and benefits received to date under the program is described for successive cohorts as a whole and for specific race and gender groups both within cohorts and across time.

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I. Introduction

Relatively few studies have focused on redistribution under the Social Security Disability Insurance (DI) program.[1] The studies that have addressed the issue generally have adopted a "hypothetical" worker approach. For example, Bakija and Steuerle (1993) estimate results under the DI program for hypothetical workers of different gender, earnings level, and family composition groups in the 1965 birth cohort. As with most other hypothetical worker analyses, the generality of these results is fairly limited because critical inputs to the analysis, such as the earnings profiles, ages of labor force entry, mortality rates, and disability incidence rates of persons in the various gender, earnings level, and family composition groups, are not realistically differentiated by the same characteristics as the estimated results.[2]

In contrast, the present study uses Social Security administrative data on actual historical taxes and benefits by year, age, gender, and race for an *ex post* analysis of redistribution under the DI program. To the extent that the data allow, the treatment to date of specific birth cohorts under the DI program is described, as is the relationship between the taxes paid and benefits received by members of specific race and gender groups both within cohorts and across time. Because the analysis uses administrative data based on actual program outcomes, the results are not subject to many of the limitations of the hypothetical worker approach—differences across race and gender groups, for example, in earnings profiles and levels, ages of labor force entry, labor force participation patterns, unemployment spells, mortality experience, and disability incidence and termination rates are implicitly incorporated into the analysis results. On the other hand, there is still a lack of sufficient years of historical data to analyze the full lifetime effects of the DI program on successive birth cohorts, and *ex post* results are not necessarily indicative of future outcomes under the program. Moreover, limitations of the administrative tax and benefit data used in this analysis prevent the present study from isolating the differential treatment of the race and gender groups while controlling for associated differences in other characteristics of interest, such as earnings levels; that is, while the present analysis describes the differential historical treatment of these race and gender groups,

the analysis is unable to identify the extent to which this differential treatment would persist in the absence of certain other differences observed historically between the groups.

Among the results presented, this article finds that the pattern of redistribution across cohorts under the DI program differs from that found in previous studies for the Old-Age and Survivors Insurance (OASI) program, particularly for the earliest cohorts. Within cohorts, this article finds that the overall distributional results across race and gender groups are generally consistent with results found in *ex post* analyses of the OASI program. In particular, benefits have generally been smaller relative to taxes for whites than for nonwhites, as defined in this analysis, and, in most cohorts, for males than for females. There is some evidence, however, that relative outcomes for current and future female participants may be less favorable under DI than for earlier cohorts.

Section II of this article describes the methods used to develop the redistributional estimates that are presented in Sections III and IV. Section III adopts a cohort perspective and presents results to date under the DI program for cohorts as a whole and for specific race and gender groups within each cohort. Section IV adopts an intertemporal perspective and presents estimates of current and cumulative redistribution over time across members of specific race and gender groups without regard to their cohort affiliation. Section V draws together the results from both perspectives and summarizes the main findings of the analysis.

II. Method

Social Security administrative data were used to develop estimates of the DI taxes paid and benefits received by persons of each race, gender, and single year of age for the years 1957-95, where 1957 was the first year of the DI program and 1995 was the last available data year. The nature of the administrative data imposed a number of constraints on the analysis. The first concerns the allocation of auxiliary benefits[3] to specific age, race, and gender groups. One approach, referred to here as the "individual-specific" approach, would allocate such benefits to the age, race, and gender group of the auxiliary beneficiary. An alternative approach, referred to here as the "worker-account" approach, would allocate such benefits to the age, race, and gender group of the insured worker on whose account the benefits are paid. These two alternative approaches offer different perspectives on the redistributional effects of the program—each has advantages and disadvantages, depending on the specific question being addressed. As a practical matter, however, the data sources used in the present analysis permitted the use of the individual-specific approach but not the worker-account approach. As such, the present analysis assigns benefits received by dependents to the cohort, race, and gender groups to which the dependents belong, not to the groups to which the worker on whose account the benefits are paid belongs.[4]

The second constraint imposed by the use of Social Security administrative data relates to the race variable, which has a number of problems that cloud its interpretation. The administrative race variable is collected when an individual completes a form "SS-5" to apply for a Social Security card or request a replacement card. One potential problem arises because the race category is selected by the Social Security card applicant; if attitudes affecting the selection of race change over time, the racial composition of each administrative race category may also change over time. A second problem arises because response to the race question is voluntary. The proportion of records with unknown race has been increasing over time, gradually eroding the quality of the race variable; although this problem does not appear to be serious for the present analysis, it is likely to become so for future analyses.[5] A third problem with the race variable arises because the SS-5 form has changed over time. Prior to November 1980, the form allowed only three responses to the race question, corresponding to "White," "Black," and "Other." The administrative race information for most present beneficiaries is based on this three-way classification. Beginning in November 1980, the race question was expanded to allow five race/ethnic responses—"White (not Hispanic)," "Black (not Hispanic)," "Hispanic," "Asian or Pacific Islander," and "American Indian or Alaskan Native."

As discussed in the Appendix, this five-way race/ethnic classification does not map cleanly into the prior three-way race classification, and additional problems are created by the grouping of race categories in the benefit data underlying this analysis. These benefit data collectively support only two race categories over the full analysis period, 1957-95; these two categories are referred to in this study as White and Nonwhite. The White category consists of persons coded as White under the old SS-5 code, persons coded as White (not Hispanic) under the new SS-5 code, and persons coded as Unknown under either the old or new SS-5 codes.[6] The Nonwhite category consists of persons coded as Black or Other under the old SS-5 code and persons coded as Black (not Hispanic), Hispanic, Asian or Pacific Islander, or American Indian or Alaskan Native under the new SS-5 code. As discussed in the Appendix, most Hispanics in this analysis are probably represented in the White race category, despite the inclusion of new SS-5 Hispanics with Nonwhites, since the new SS-5 codes were not introduced until late 1980.[7]

While most of the results in this article reflect the White/Nonwhite race categorization, some results are presented that cover only the years 1968-95, for which the benefit data underlying this analysis support three race categories. These three categories are referred to in this article as White, Black, and Other. The definition of the White category is identical to that given in the previous paragraph for the White/Nonwhite categorization. The Black category consists of persons coded as Black under the old SS-5 code and persons coded as Black (not Hispanic) under the new SS-5 code, while the Other category consists of all other Nonwhites as defined in the previous paragraph.[8]

The allocation of taxes in this analysis assumes full backward shifting of the employer portion of the payroll tax to workers in the form of lower wages. Although there is disagreement among economists about the incidence of the payroll tax,

full backward shifting is by far the most common tax incidence assumption in analyses of the redistributional effects of the Social Security program.[9]

The aggregate DI taxes paid by persons of each race, gender, and age in each year from 1957 through 1995 were derived from the Social Security Administration's 1-Percent Continuous Work History Sample (CWHS) data file.[10] This file contains information on annual Social Security taxable earnings, beginning in 1951, for a 1.0 percent sample of all Social Security numbers. The general approach involved identifying the DI taxable wages or self-employment income for each valid record in each year and computing the associated DI tax payment using the DI tax rates and rules for that year, accounting for potential complications such as multiple employers and the mix between taxable wages and self-employment income in each year. Aggregate tax payments by race, gender, and age in each year were calculated from the sample and then adjusted proportionally to sum to the actual aggregate DI tax liability for that year.[11] In effect, then, the sample data were used to define the proportional distribution of aggregate DI tax liability by race, gender, and age in each year.[12]

A similar approach was adopted for identifying historical benefit payments, except that summary tables on actual DI monthly benefit payments as of year-end by beneficiary type, race, age, and year from the *Annual Statistical Supplement* to the *Social Security Bulletin* were used in place of individual sample data.[13] The use of summary tables was necessitated because individual sample data files derived from administrative records do not contain complete historical benefit records.

Monthly cash benefit payments under the DI program fall within three major beneficiary categories: disabled workers, spouses of disabled workers, and children of disabled workers.[14] Within each of these monthly beneficiary categories, the proportional distribution by race, gender, and age of the corresponding type of benefits from the summary benefit table for that year was used to allocate aggregate benefits paid from the DI Trust Fund for that beneficiary category in that year across race, gender, and age groups;[15] for example, the proportional distribution by race, gender, and age of disabled worker benefits in current-payment status at the end of 1988, as derived from the summary benefit table for that year, was used to allocate aggregate disabled worker benefit payments during 1988, as reported for the DI Trust Fund, across those race, gender, and age groups.[16]

These estimates of historical DI benefits were adjusted to reflect the income taxation of Social Security benefits that was initiated in 1984. Accurately identifying the incidence of benefit income taxation across the race, gender, and age groups in each year would require much more information than was available in the source data used in this analysis. Consequently, the effective rate of benefit income taxation was assumed to be constant across the race, gender, and age categories in any given year. In each year from 1984 on, the effective benefit income taxation rate was identified from Department of the Treasury estimates of the aggregate income tax liability in that year accruing from DI benefits.[17] The assumption of identical effective benefit taxation rates across the race, gender, and age categories introduces potential biases into the analysis. These biases are likely to be small, however, since the estimated average effective benefit taxation rate is itself quite small, rising from about 0.5 percent in 1984-86 to slightly more than 1.3 percent of DI benefits in 1995.[18]

Three alternative interest rate series were used in the analysis underlying this article to accumulate taxes and benefits over time; these three series correspond to a nominal rate equal to the rate of inflation (a zero real interest rate), the rate of return earned on DI Trust Fund assets, and the total rate of return to an index of large company stocks.[19] The resulting redistributional estimates using these three rates are provided in appendices to Leimer (1998) to accommodate readers with different preferences regarding the appropriate interest rate to use in analyzing the DI program. The appropriate interest rate, of course, depends on the particular question being addressed.[20] The discussion, charts, and table presented in this article are based solely on the interest rate earned historically on DI Trust Fund assets. Using the historical interest rates at which the program was actually able to transform funds over time is appropriate for identifying *ex post* redistribution from a program perspective.

As a final note, the redistributional measures presented in this article should not be interpreted as money's worth measures, *per se*, since they simply contrast the taxes paid with the benefits received by various groups of participants. Some of the taxes collected have been used to cover the expenses of administering the program, necessarily creating an imbalance between taxes and benefits.[21] Analogous, and likely higher, expenses would be borne by private companies attempting to provide insurance equivalent to that provided under the DI program.[22] Reported benefit/tax ratios less than one, or benefit-tax differences less than zero in this article, then, do not by themselves suggest that the corresponding program participants failed to receive their money's worth in insurance coverage under the program, since these measures do not adjust for the administrative costs of providing the disability insurance. Differences between these measures across groups of workers with different characteristics of interest, such as race and gender, can be used, however, to suggest the net effects of redistribution under the program.[23]

III. Cohort Analysis

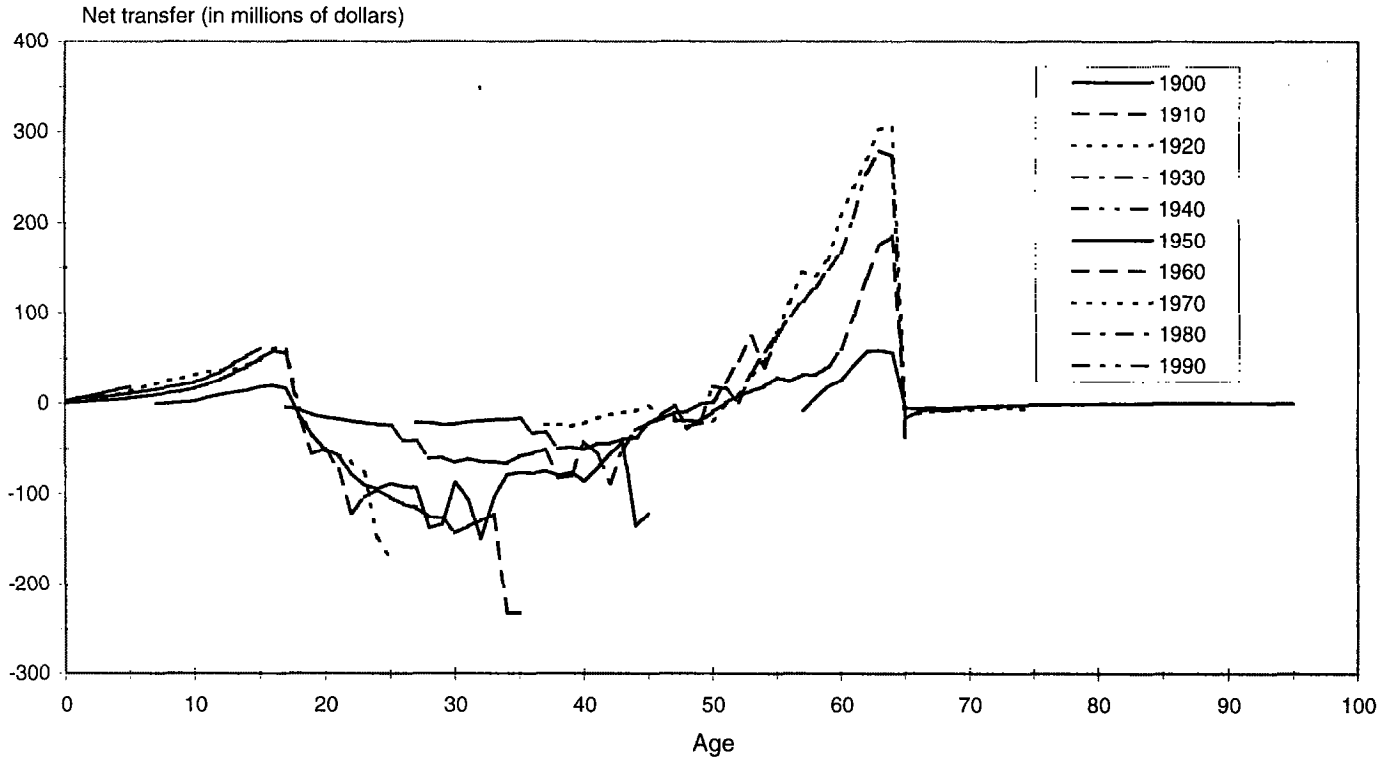
This section focuses on redistribution under the DI program across and within specific birth cohorts; that is, results are first presented for cohorts as a whole and then for specific race and gender groups within each cohort. Although the historical treatment of each cohort under the DI program is identified in this analysis through 1995, the DI program has not been in existence sufficiently long for any cohort to have participated in the program over its entire lifetime. Nevertheless, a sense of typical patterns of treatment under the program over the life cycles of individual cohorts can be garnered by piecing

together the treatment of different cohorts who have experienced the program at different points in their life cycles. Chart 1 displays the aggregate real net transfer flows experienced by selected decennial year birth cohorts at various points in their life cycles; that is, for a given cohort, this chart plots aggregate DI benefits less taxes, adjusted for inflation, across all cohort members at each age.[24] For example, data for the cohort born in 1950 are shown for ages 7 through 45, corresponding to the calendar years 1957-95 during which the DI program has been in existence and for which data are available.

While it is difficult to pick out the specific graph associated with any particular decennial year birth cohort in chart 1, that is not the point of including the chart. The primary purpose of this chart is to illustrate the typical life cycle pattern of net transfers under the DI program, as defined in this article, for any given cohort. At the earliest ages, prior to entry into the labor force, the cohort typically experiences positive net transfers as children of disabled worker beneficiaries. As the cohort attains typical labor force entry ages, the DI taxes paid by working cohort members begin to offset and eventually outweigh these child benefits, and net transfers under the DI program become negative, on balance. Over the early portion of the working life, when disability incidence rates are relatively low, the DI taxes paid by working cohort members continue to outweigh DI benefits. As the cohort ages, however, disability incidence rates eventually rise to levels sufficient for DI benefits to outweigh the DI taxes paid by working, nondisabled, cohort members; this switchover back to positive net transfers for the cohort typically occurs around age 50. Net transfers for the cohort typically rise sharply and remain positive until age 65, when disabled worker benefits are automatically converted to old-age benefits paid out of the OASI Trust Fund rather than out of the DI Trust Fund. For the cohorts shown in chart 1, the early part of the remainder of the life cycle is primarily characterized by negative, but relatively small, net transfers for the cohort, as the DI taxes paid by working cohort members outweigh the DI benefits paid to aged dependents of disabled workers; although not as obvious in the chart, the latter part of the cohort's life cycle may also be characterized by small positive aggregate net transfers, as labor force participation and, therefore, DI taxes diminish even further among cohort members.

These typical life cycle patterns are also important in interpreting chart 2, which displays the ratio of aggregate accumulated benefits to accumulated taxes from the inception of the DI program in 1957 through 1995 for cohorts born from 1875 through 1975. As in all of the charts displaying accumulated values, DI benefits and taxes are accumulated using the trust fund interest rate.[25] The accumulated benefit/tax ratio in chart 2 is less than one for the earliest cohorts, through the cohort born in 1894, since net transfers under the DI program for these cohorts center on the last portion of the life cycle, mostly beyond age 64, where net transfers are mostly negative, but small. As shown in chart 2, accumulated benefits from the start of the program through 1995 exceed accumulated taxes over the corresponding period for the cohorts born from 1895 through 1933; net transfers under the DI program for these cohorts generally center more heavily on the latter portion of the working life, when higher disability rates typically generate positive net transfers. Within this cohort range, the benefit/tax

Chart 1.—DI real net transfer flows over the 1957-95 period for selected decennial birth cohorts, by age, 1957 dollars



ratio remains relatively stable, with accumulated benefits more than twice accumulated taxes, for cohorts born from 1900 through 1920. The accumulated benefit/tax ratio in chart 2 then declines to less than one for cohorts born from 1934 through 1968. Again, experience under the DI program to date for these cohorts has generally centered more heavily on the early working life, where lower disability rates typically translate into negative net transfers; as these cohorts complete their life cycle and move into the last portion of the working life with higher disability rates, the accumulated benefit/tax ratio will tend to become more favorable. Finally, the chart 2 benefit/tax ratio becomes greater than one again for cohorts born after 1968, for whom experience under the DI program to date has centered most heavily on the early life cycle, where child and young adult benefits under the DI program typically outweigh any taxes paid by working, nondisabled, cohort members.

While the accumulated benefit/tax ratio in chart 2 indicates the relative sizes of accumulated DI benefits and taxes for each cohort, it does not reveal the absolute size of the lifetime net transfer. The aggregate lifetime net transfer to each cohort is illustrated in chart 3, which displays the difference between accumulated benefits and accumulated taxes from the inception of the DI program in 1957 through 1995 across all cohort members for cohorts born from 1875 through 1975. Again, DI benefits and taxes in this chart are accumulated using the trust fund interest rate.[26] It is clear from this chart that while accumulated benefits fall short of accumulated taxes for the earliest cohorts, the negative lifetime net transfer to these cohorts is relatively small in absolute size. The aggregate lifetime net transfer to date rises sharply across subsequent cohorts, peaking at about $19 billion for the 1920 cohort. The aggregate lifetime net transfer to date falls sharply for subsequent cohorts, but remains positive for cohorts who attained at least age 62 by the end of the analysis period, that is, for cohorts whose lifetimes have spanned, for the most part, the ages of most intense interaction with the DI program. For many of the remaining cohorts in chart 3, whose experience under the DI program thus far excludes the ages of most intense positive net transfers, the aggregate lifetime net transfer to date is negative, bottoming out at almost -$25 billion for the 1947 cohort.

Chart 4 is intended to provide a rough feel for the level of expected lifetime net transfers per cohort member for a subset of birth cohorts, those born from 1909 through 1975. This chart displays the aggregate DI lifetime net transfer through 1995 for these cohorts divided by a series intended to represent the initial population of the cohorts.[27] While these per initial cohort member estimates are only

Chart 2.—DI accumulated benefit/tax ratio through 1995, accumulated at the trust fund interest rate, by cohort

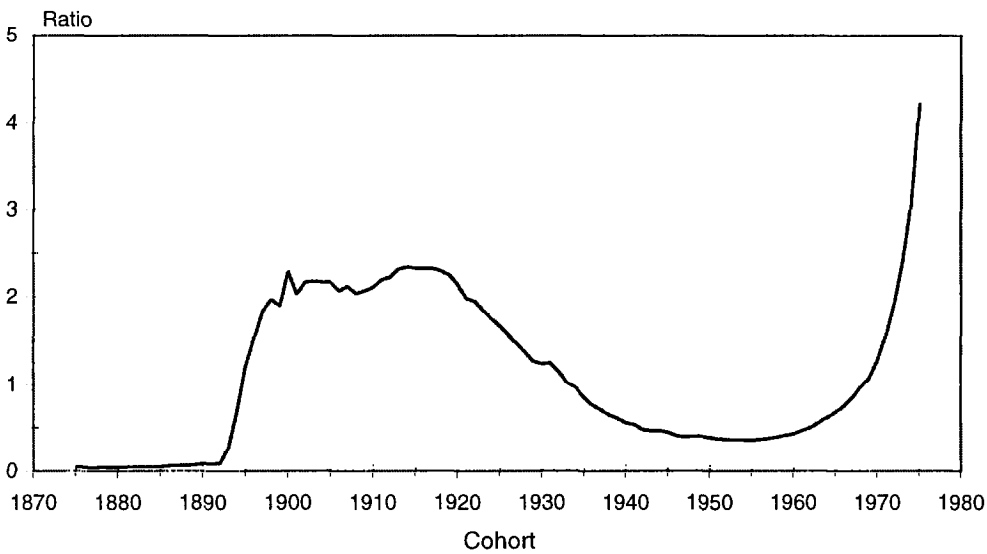
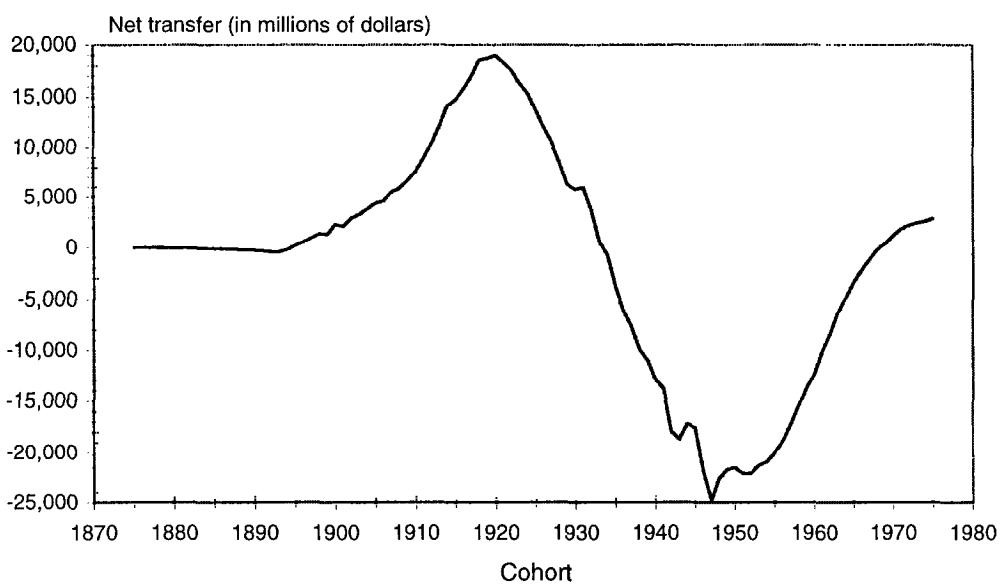


Chart 3.—DI aggregate lifetime net transfer through 1995, accumulated at the trust fund interest rate, by cohort



illustrative,[28] they exhibit a pattern across cohorts similar to that for the aggregate lifetime net transfers, peaking at over $6,800 for the 1919 cohort, remaining positive for cohorts who attained at least age 62 by the end of the analysis period, and bottoming out at less than -$6,500 for the 1947 cohort, which had only attained age 48 by the end of the analysis period in 1995. Again, the lifetime net transfer will tend to become more favorable for these latter cohorts as they move into the last portion of the working life characterized by higher disability rates and positive net transfers.

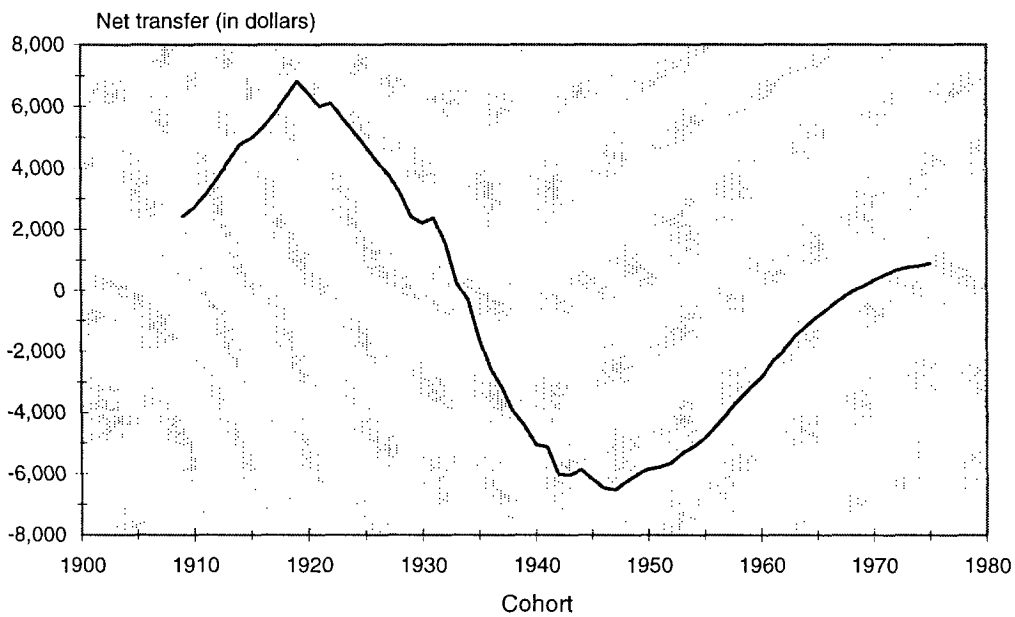
Since the bulk of net transfers under the DI program occur prior to age 65 (as illustrated in chart 1), the lifetime taxes and benefits represented in charts 2 through 4 are largely complete for cohorts born through 1931.[29] Except for the relatively small negative lifetime net transfers to the earliest cohorts (those born through 1894), all of these cohorts received positive lifetime net transfers under the DI program. Because the DI program did not begin until 1957, however, none of these cohorts paid DI taxes over their entire working lives; the 1931 cohort, for example, first paid taxes (and received benefits) under the DI program at age 26.

The patterns of DI accumulated benefit/tax ratios and lifetime net transfers across cohorts displayed in charts 2 through 4 differ from those typically found for the OASI program. Under the OASI program, estimated benefit/tax ratios are generally highest for the earliest cohorts and decline fairly rapidly across subsequent cohorts, typical of the startup of a pay-as-you-go retirement program. Similarly, estimated lifetime net transfers under the OASI program for the earliest cohorts, while relatively small because of these cohorts' limited exposure to the program, are nonetheless positive.[30] In contrast, estimated lifetime net transfers, while small absolutely, are negative for the earliest cohorts under the DI program before becoming positive for cohorts born after about 1895. Again, negative lifetime net transfers to the earliest cohorts are possible under the DI program because tax payments in the last portion of the life cycle, although relatively small, may still outweigh benefits paid to aged dependents of disabled workers. Estimated outcomes under the DI program are most favorable in terms of the lifetime net transfer measure for cohorts born roughly around 1920.[31] Rather than declining rapidly across the early cohorts, as under the OASI program, benefit/tax ratios under the DI program are less than one for the earliest cohorts through the cohort born in 1894, but then increase rapidly, becoming greater than one and remaining relatively stable for cohorts born around the turn of the century through cohorts born around 1920. The series of relatively large *ad hoc* DI benefit increases in the late 1960s and early 1970s increased the benefit/tax ratio for many of these cohorts, especially those born around 1920, whose ages at that time fell in the portion of the life cycle characterized by relatively high disability rates.

These accumulated benefit/tax ratio and aggregate lifetime net transfer patterns across cohorts generally hold up for the race and gender subgroups within each cohort, but some differences do emerge, as shown in charts 5 through 7. Chart 5 displays accumulated benefit/tax ratios under the DI program through 1995 for the White and Nonwhite race groups in each of the 1875-1975 birth cohorts. As shown in chart 5, the accumulated benefit/tax ratio for Nonwhite cohort members generally exceeds that for White cohort members. This suggests that Nonwhites, as defined in this analysis, have been treated more favorably as a group under the program than Whites as the net outcome of systematic historical differences between the groups in such areas as earnings levels, disability rates, dependent beneficiary relationships, and survival probabilities.

In particular, the historically lower earnings, higher disabled beneficiary to taxpayer ratios, and higher auxiliary beneficiary to disabled worker beneficiary ratios generally experienced by Nonwhites contribute to this outcome.[32] In general, lower earnings result in more favorable treatment under the DI program, *ceteris paribus*, because of the progressive benefit formula that provides higher replacement rates for workers with lower average lifetime earnings. Groups with higher disability rates, of course, also experience more favorable treatment, *ceteris*

Chart 4.—DI lifetime net transfer through 1995 per initial cohort member, accumulated at the trust fund interest rate, for selected cohorts



paribus, as do groups with more potential dependent beneficiaries.

Over the period of analysis, nonwhites have also generally experienced higher mortality rates than whites at ages under about 65-70.[33] In the present analysis, mortality differentials beyond age 64 are much less important than mortality differentials earlier in the life cycle because of the concentration of DI benefits and taxes at the earlier ages. The effect of mortality differentials at earlier ages is more complex, however, because of the cycles of positive and negative DI net transfer flows typically experienced over the life cycle of each cohort and because of the correlation between disability and mortality at the earlier ages. In the absence of a positive correlation between disability and mortality, the higher mortality of nonwhites prior to age 65 probably works to lower the benefit/tax ratios for that group relative to whites under the DI program, since workers are less likely to attain the older working ages characterized by the highest disability rates and net transfer flows—survivor benefits are paid under the OASI program. This effect may be reduced or even reversed, however, to the extent that differential mortality at the earlier ages is associated with preceding periods of disability. On balance, then, differences in such factors as earnings levels, disability rates, and dependent beneficiary relationships appear to work in favor of Nonwhites relative to Whites under the DI program and also appear to collectively outweigh any opposing effect associated with differences in survival probabilities.

Chart 5.—DI accumulated benefit/tax ratio through 1995 for each race group, accumulated at the trust fund interest rate, by cohort

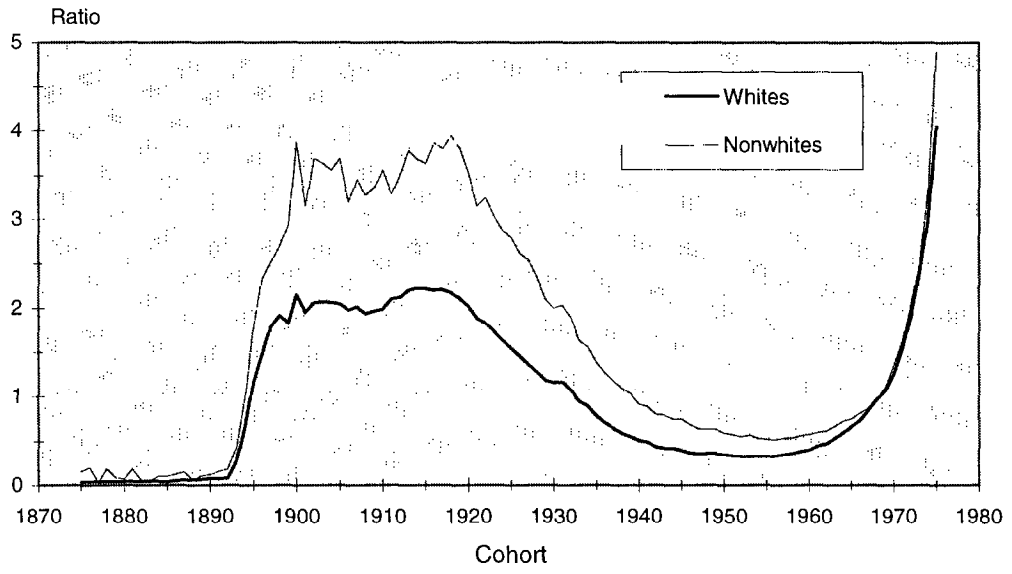


Chart 6.—DI accumulated benefit/tax ratio through 1995 for each gender group, accumulated at the trust fund interest rate, by cohort

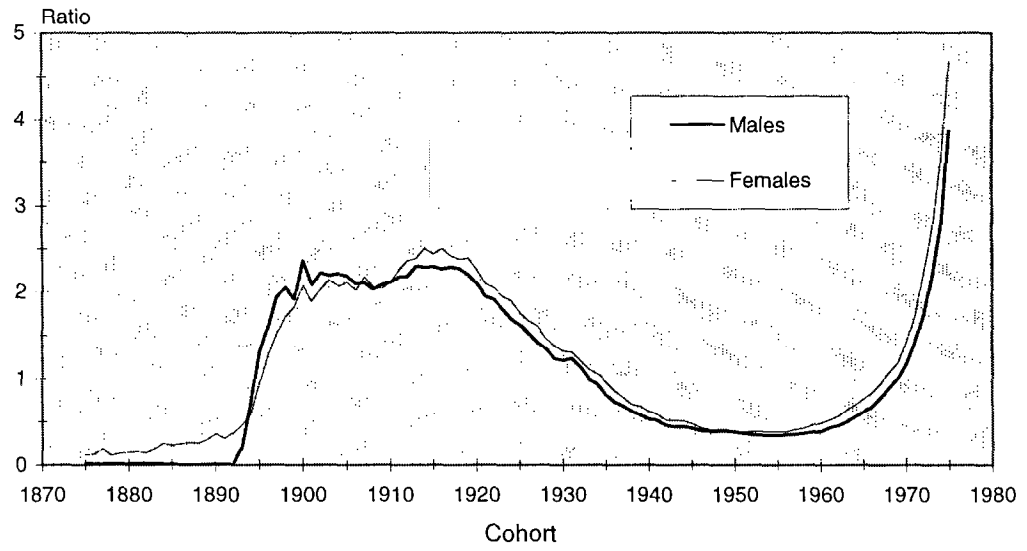


Chart 6 displays accumulated benefit/tax ratios separately for male and female members of each of the 1875-1975 birth cohorts. As shown, the benefit/tax ratio through 1995 for females exceeds that for males for the 1875-93 cohorts, is less than for males for the 1894-1906 and 1909 cohorts, and exceeds that for males again for the 1907-08 and 1910-75 cohorts. There are a number of factors working in opposite directions that combine to produce these net changes in gender outcomes over time. For example, the historically higher earnings of males would tend to be associated with less favorable treatment under the DI program, *ceteris paribus*, although the relationship between male and female earnings has generally been narrowing over time.[34] On the other hand, males have generally experienced higher disability incidence rates within specific age groups than females, although the relationship within each age group has narrowed and expanded over time.[35] The overall ratio of male to female disability worker award rates has also changed over time, generally increasing, for example, over the 1975-85 period, but then decreasing in each subsequent year.[36] The more continuous labor force attachment of males historically would

tend to be associated with higher insured rates and more favorable treatment under the DI program, *ceteris paribus*, but this relationship has also changed over time. The historically higher mortality rates of males for all but the oldest age groups[37] may be associated with less favorable treatment for males under the DI program, but the net effect of these mortality differentials is complicated by the cycles of positive and negative net transfer flows over the life cycle of each cohort and the correlation between disability and mortality.

Separate outcomes for the four race and gender groups are displayed in chart 7. The relationship among the race and gender outcomes varies across cohorts. The accumulated benefit/tax ratio ranking (from highest to lowest) among the race and gender groups that covers the largest number of cohorts by far, including the contiguous birth cohort ranges 1916-23 and 1925-59, is Nonwhite males, followed by Nonwhite females, followed by White females, followed by White males. As suggested in the earlier charts, the benefit/tax ratios exhibit less difference between males and females than between Whites and Nonwhites, as defined in this analysis, for the vast majority of cohorts, including all of the cohorts born from 1894 through 1962.

IV. Intertemporal Analysis

This section presents measures of current and cumulative redistribution over time under the DI program across members of specific race and gender groups; that is, while the previous section focused on measures of lifetime redistribution to date for members of specific birth cohorts, this section abandons the cohort perspective and focuses on measures of redistribution during each year and cumulatively across time for members of specific race and gender groups, without regard to cohort affiliation.[38] Chart 8 focuses on a measure of annual redistribution by race, displaying the ratio of aggregate DI benefits to aggregate DI taxes for members of each race group in each year from the inception of the program in 1957 through 1995, the last available data year.[39] As shown, the annual aggregate benefit/tax ratio for Nonwhites exceeded that for Whites in every year by generally substantial proportions.[40] Again, this suggests a clear redistribution from Whites to Nonwhites, as defined in this analysis, as the net result of systematic historical differences between the groups in such factors as earnings levels, disability rates, dependent beneficiary relationships, and survival probabilities.

The annual benefit/tax ratio for a given group can be decomposed into three multiplicative factors that might be referred to as the disability rate proxy (ratio of the number of DI primary beneficiaries to the number of DI taxpayers), the dependent benefits factor (ratio of total DI benefits to DI primary benefits), and the primary average benefit/tax factor (ratio of the average DI primary benefit to the average tax paid by DI taxpayers).[41] Estimates of each of these component factors of the annual benefit/tax ratio were generally lower for Whites than for Nonwhites over the analysis period; differentials between Whites and Nonwhites in disabled beneficiary to taxpayer ratios and in taxable earnings, coupled with the progressivity of the benefit formula, appear to be more important factors than differences in dependent beneficiary relationships in creating the annual aggregate benefit/tax ratio differentials displayed in chart 8.[42]

Chart 7.—DI accumulated benefit/tax ratio through 1995 for each race and gender group, accumulated at the trust fund interest rate, by cohort

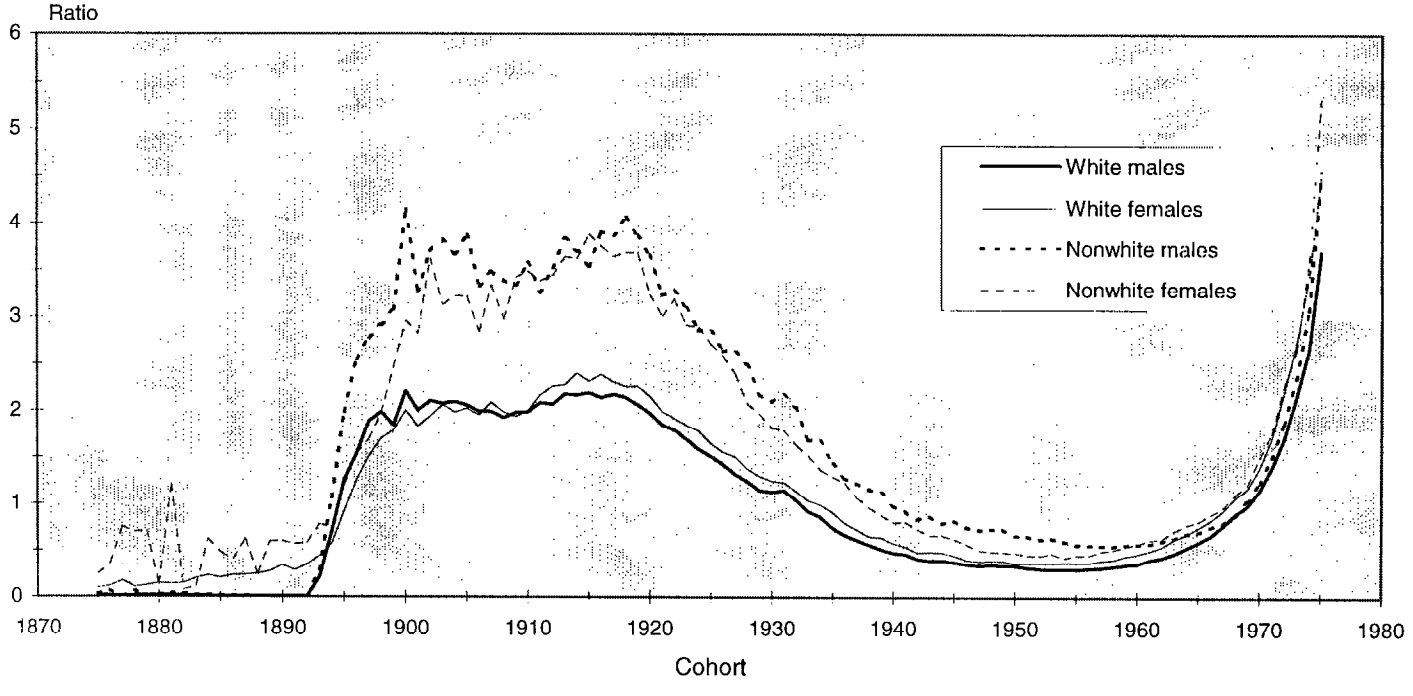


Chart 9 provides some additional information about the relative treatment of racial subgroups over the 1968-95 period, for which the benefit data used in this analysis support the three-way race categorization of White, Black, and Other, as defined earlier in this article. As shown, the annual aggregate benefit/tax ratio for Blacks exceeded that for Whites in every year by substantial proportions.[43] Moreover, Black annual benefit/tax ratios have been generally increasing relative to those for Whites over the 1968-95 period, rising from a low of 53 percent above the White ratio in 1973 to a high of 110 percent above the White ratio in 1994; the biggest factor in this increase appears to be the increase in Black disabled beneficiary to taxpayer ratios relative to those of Whites, although other factors, such as differential changes in dependent beneficiary relationships, also played a role.[44] Chart 9 also indicates that the annual aggregate benefit/tax ratio for Others was generally below that for Whites; although higher auxiliary benefits to primary benefits ratios and lower taxable earnings coupled with the progressivity of the benefit formula appear to work in favor of Others relative to Whites, Others also have disabled beneficiary to taxpayer ratios sufficiently below those of Whites to result in lower annual benefit/tax ratios in most years.[45]

Chart 10 focuses on a measure of annual redistribution by gender. As shown, the ratio of annual aggregate benefits to annual aggregate taxes for females exceeded that for males for most of the early years of the program, from 1959 through 1982, but fell below the ratio for males thereafter. This decline in relative outcomes for females over time is consistent with the generally narrowing relationship between male and female earnings, but runs counter to the rise in female disability award rates relative to males since 1985. In fact, the share of DI disabled worker benefits paid to females has generally been rising over time, increasing from an estimated low of about 17 percent in 1958 to more than 31 percent in 1995. This rise has been largely offset, however, by a generally falling share of DI auxiliary benefits paid to females and a general decline since the mid-1960s in the relative share of auxiliary benefits, most of which are paid to females.[46] On balance, the share of total DI benefits going to female beneficiaries has remained relatively stable since about 1965, fluctuating over that period from an estimated low of about 0.30 in 1986 to a high of about 0.34 in 1995. At the same time, however, the share of taxes paid by female workers has increased fairly steadily over time, ranging from an estimated low of about 0.23 in 1957 to a high of about 0.37 in 1995. Put another way, declines over time in the dependent beneficiary advantage of females and in the male/female taxable

Chart 8.—Aggregate benefit/tax ratio for the White and Nonwhite race groups, by year

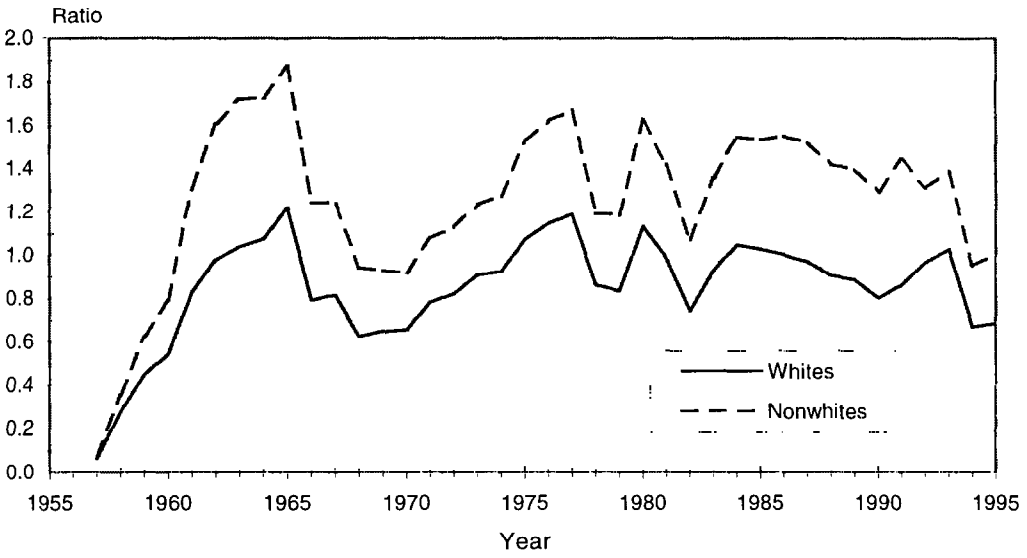
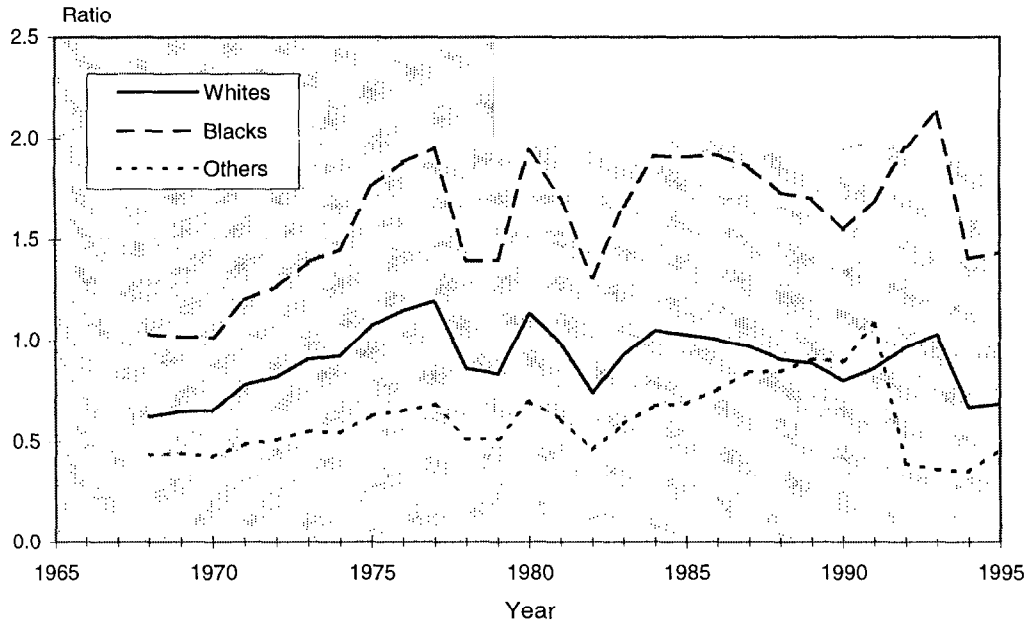


Chart 9.—Aggregate benefit/tax ratio for the White, Black, and Other race subgroups, by year



earnings differential, coupled with the progressivity of the benefit formula, appear to have more than offset declines in differential disabled beneficiary to taxpayer ratios between males and females.[47] To the extent that these trends continue, the favorable accumulated benefit/tax ratios experienced to date by females relative to males in the more recent cohorts, as depicted in chart 6, may be significantly eroded over time for present and future cohorts as they complete their life cycles under the program.

Chart 11 displays annual aggregate benefit/tax ratio outcomes for the four race and gender groups over the 1957-95 period. Except for the first two years of the program, the annual aggregate benefit/tax ratios for Nonwhite males and females exceeded those for White males and females, but the rankings of males and females within each race category have changed over time. Annual aggregate benefit/tax ratios for Nonwhite males exceeded those for Nonwhite females in all years except 1965-68; among Whites, annual aggregate benefit/tax ratios for females exceeded those for males during the 1959-82 period, but fell below those for males after that period. The relationship between White males and White females largely parallels that between males and females in general; that is, declines over time in White male/White female taxable earnings differentials, coupled with the progressivity of the benefit formula, and in the dependent beneficiary

Chart 10.—Aggregate benefit/tax ratio for each gender group, by year

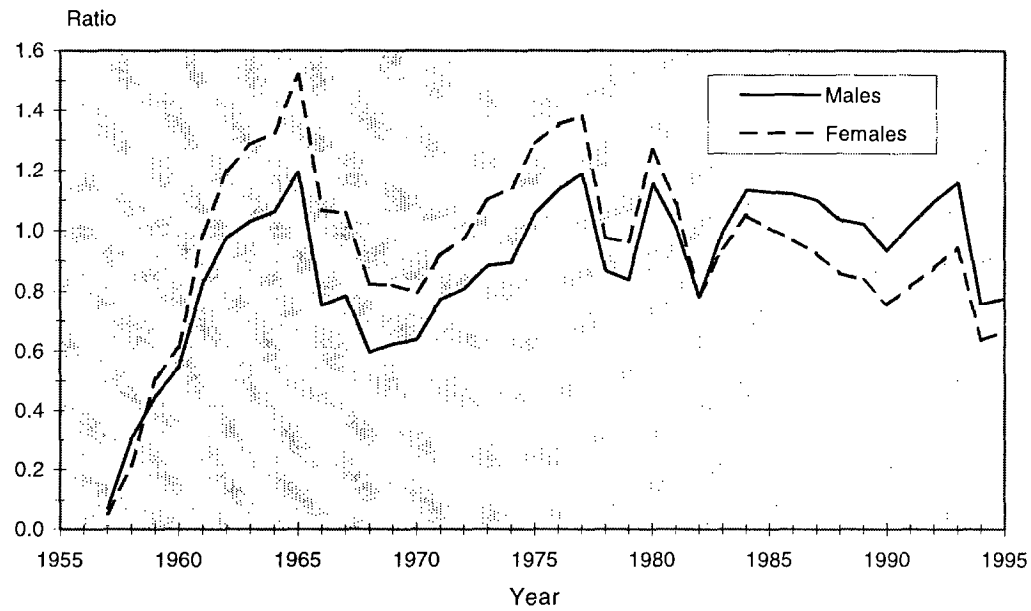
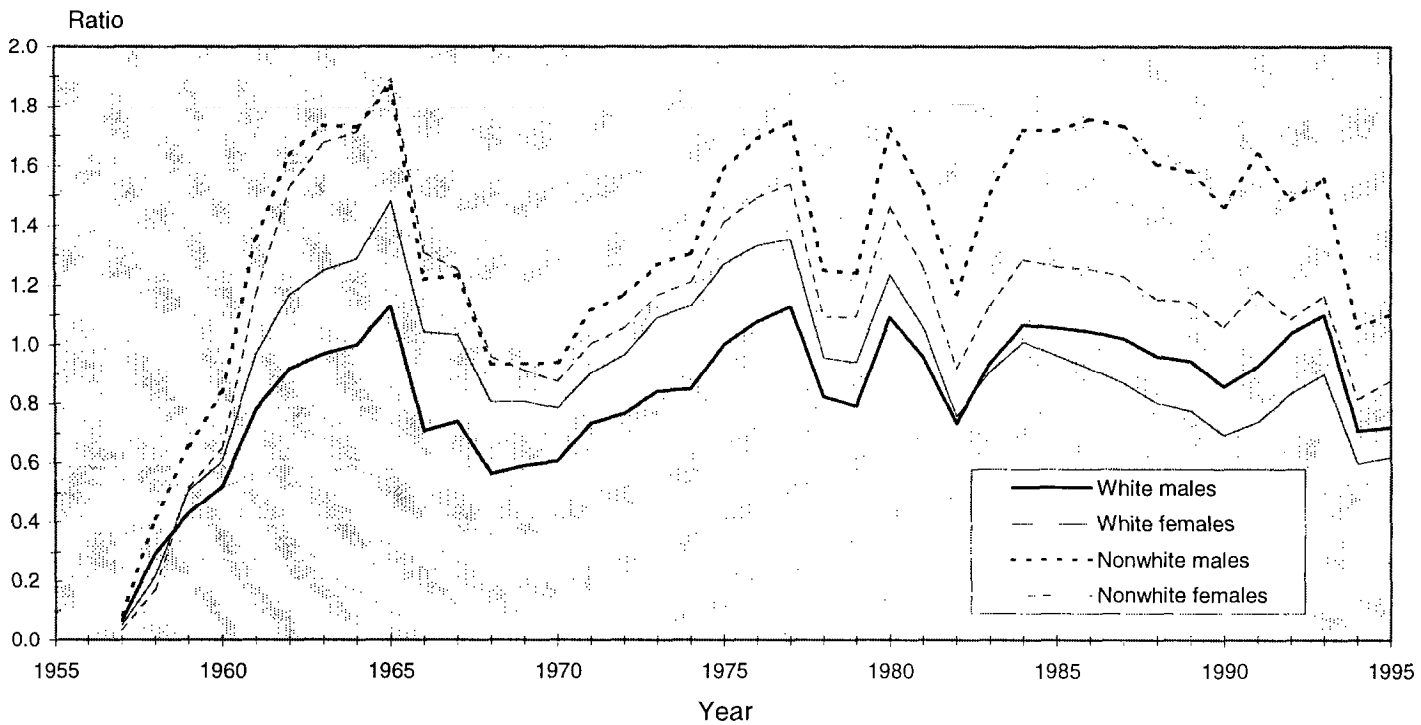


Chart 11.—Aggregate benefit/tax ratio for each race and gender group, by year



advantage of White females relative to White males appear to have more than offset declines in differential disabled beneficiary to taxpayer ratios between White males and White females.[48] The relationship between males and females for Nonwhites differs from that for Whites in that, on average, the Nonwhite male/female taxable earnings differential has been relatively smaller, and the Nonwhite male/female disabled beneficiary to taxpayer ratio differential appears to have been relatively larger, than for Whites;[49] in addition, changes over time in the dependent beneficiary advantage of females, the male/female disabled beneficiary to taxpayer ratio differential, and the male/female taxable earnings differential, coupled with the progressivity of the benefit formula, appear to have been largely offsetting factors for Nonwhite males and females since 1959, when substantial dependent benefits were first paid.[50]

The effect of these annual net transfers on cumulative redistribution under the DI program across members of the race and gender groups is summarized in table 1, which uses the DI Trust Fund interest rate to accumulate annual taxes and benefits for the various race and gender groups from the inception of the program through 1995.[51] Using this interest rate, accumulated benefit payments since the inception of the DI program were about 93 percent of, or $97 billion less than, accumulated tax payments, reflecting the effects of other trust fund activities, primarily administrative expenses and the buildup of the trust fund itself. On balance, the accumulated benefit/tax ratio measures suggest that the net effect of cumulative transfers across the race and gender groups since the start of the program has been a net redistribution from males to females and a more pronounced net redistribution from Whites to Nonwhites, as defined in this analysis; that is, the accumulated benefit/tax ratio for males is 0.9 percent below, for females is 2.1 percent above, for Whites is 5.1 percent below, and for Nonwhites is 39.1 percent above the corresponding ratio for all persons. The ranking of outcomes among the race and gender subgroups, from most favorable to least favorable, is Nonwhite males, followed by Nonwhite females, followed by White females, followed by White males; specifically, the accumulated benefit/tax ratio for Nonwhite males is 49.5 percent above, for Nonwhite females is 22.2 percent above, for White females is 1.3 percent below, and for White males is 6.8 percent below the corresponding ratio for all persons. Thus, while there has been a net redistribution from males to females, Nonwhite males have, on average, experienced more favorable outcomes to date than any other race and gender subgroup, including Nonwhite females.

Table 1.—Cumulative redistribution under the DI program, 1957-95

Race/gender group	Accumulated benefit/tax ratio	Accumulated net transfers (in billions)
All persons	0.931	-$97.160
All males	.922	-75.653
All females	.950	-21.508
All Whites	.883	-145.082
All Nonwhites	1.295	47.922
White males	.868	-115.086
White females	.919	-29.996
Nonwhite males	1.391	39.434
Nonwhite females	1.137	8.488

V. Conclusion

As indicated earlier in this article, this analysis makes no attempt to determine the extent to which workers have gotten their money's worth in disability insurance coverage from the DI program; in particular, the benefit/tax ratio and net transfer measures used in this analysis do not adjust for the administrative costs of providing the disability insurance. These measures do provide evidence, however, of substantial redistribution under the DI program across cohorts and across race and gender groups within cohorts and over time.

The article first analyzed *ex post* redistribution across cohorts. The earliest cohorts, born through 1894, have experienced negative, but relatively small, lifetime net transfers. Cohorts born from 1895 through 1933 have received positive lifetime net transfers, peaking for cohorts born roughly around 1920 and remaining positive for cohorts who attained at least age 62 by the end of the analysis period in 1995. Cohorts born from 1934 through 1968 have received negative accumulated net transfers through 1995, although outcomes should become more favorable for these cohorts as they move into the ages of most intense positive net transfers under the program. Finally, the youngest cohorts, born after 1968, have received positive accumulated net transfers through 1995, but these cohorts have many more years of negative and positive net transfers yet to experience during their remaining lifetimes. This pattern of redistribution across cohorts under the DI program differs from that found in previous studies for the OASI program, particularly for the earliest cohorts, who received positive net transfers and the highest benefit/tax ratios under the OASI program.

Across race and gender groups, the results differ somewhat within cohorts and across time. Benefit/tax ratios were generally higher for Nonwhites than for Whites, as defined in this analysis, both within cohorts and across time. Within cohorts, accumulated benefit/tax ratios through 1995 for females exceed those for males in the earliest cohorts, fall below those for males in a number of subsequent cohorts, and then exceed those for males again in cohorts born since about 1910. Across time, a different pattern emerges, with the annual benefit/tax ratio for females exceeding that for males for most of the early years of the program, but falling below that for males after 1982. This more recent trend in annual net transfers suggests that the favorable accumulated benefit/tax ratios experienced to date by females relative to males in the more recent cohorts may be eroded over time for present and future cohorts as they move through their working lives.

The distributional results across race and gender groups

presented in this article are consistent, for the most part, with studies of *ex post* redistribution under the OASI program. Under the OASI program, whites have generally been found to have received lower rates of return than nonwhites and males lower rates of return than females,[52] results that are consistent with the overall results for the DI program described in this article. The distributional results in the present article do differ somewhat from those typically found in OASI analyses, however, in their suggestion that outcomes for current and future female workers under the DI program may be less favorable relative to males than for earlier cohorts. The relative gender comparisons in this article would also tend to be less favorable for females if a "worker-account" approach had been used instead of the "individual-specific" approach, that is, if all benefits paid on the account of an insured worker, including those to dependents, were contrasted with the taxes paid by that worker.

Notes

[1] Other government programs that provide support for the disabled, such as the Supplemental Security Income program, are not considered in this analysis.

[2] Given adequate data and analysis, it is possible to construct tax and benefit streams using synthetic data that are actually representative of particular groups of workers. The more detailed the worker categorizations, however, the more deficient available data sources and the more difficult the attendant analyses become. See Leimer (1995) for a more thorough critique of the hypothetical worker approach, along with a discussion of the major assumptions, key analytical methods, and measures used in Social Security money's worth analyses.

[3] Monthly benefits payable to a spouse or child of a disabled worker are referred to as "auxiliary" benefits, while benefits payable to the insured worker on whose account the benefits were earned are referred to as "primary" benefits.

[4] The administrative benefit data underlying this analysis assume, however, that the race of a dependent receiving benefits is the same as that of the worker on whose account the benefits are paid.

[5] In addition to applicants who choose not to respond to the race question, a specific problem arose during the years 1962-65, when a special IRS registration of taxpayers without Social Security numbers employed an application form that did not require race information. Buckler and Smith (1978) report that the proportion of persons failing to provide race information when applying for a Social Security number rose as high as 34 percent in 1963 before falling back to 5 percent in 1965 and between 2 and 3 percent in subsequent years. A corresponding local peak can be observed in the proportion of unknown race records by birth cohort in the administrative file used to develop the tax data used in this analysis. The share of unknown race records in the 1993 version of this file was typically less than 1 percent through about the 1940 cohort for males and the 1943 cohort for females, then rose rapidly to local peaks of 7.1 percent for the 1948 male cohort and 4.2 percent for the 1950 female cohort, fell again to local troughs of 2.8 percent (males) and 2.4 percent (females) for the 1964 cohort, then resumed a general upward trend for later cohorts, reaching over 4 percent for both males and females by the cohorts born in the mid- to late-1970s, who were approaching labor force participation age by the end of the analysis period used in this article. Overall, 2.3 percent of male records and 2.1 percent of female records on this file were coded as unknown race. The problem of unknown race is likely to become more severe in the future as a result of the "enumeration at birth" program; this program, which began in 1987, provides a procedure for issuing Social Security cards to newborns without information on race becoming available to the Social Security Administration.

[6] While the inclusion of Unknowns with Whites was imposed by the administrative benefit data used in this analysis, there is some evidence that the vast majority of Unknowns would be categorized as white in survey data. An examination of the 1973 Exact Match File, which links the 1973 Current Population Survey (CPS) with Social Security administrative data, indicates that 95 percent of those with any Social Security covered earnings and whose Social Security Summary Earnings Record race was unknown were coded as whites in the CPS portion of the file. (See Kilss and Scheuren (1978) for an overview of the 1973 Exact Match File.)

[7] Because the most appropriate grouping of new SS-5 Hispanics in the tax data is not clear (as discussed in the Appendix), estimates were also developed under an alternative grouping that included new SS-5 Hispanics with Whites (rather than with Nonwhites) in the tax data; fortunately, none of the main conclusions of the analysis were sensitive to this alternative grouping.

[8] One other problem associated with the race variable is that the benefit data underlying this analysis incorporated an inconsistent change in the race categorization in 1992. Specifically, some of those erroneously coded as other or unknown were recategorized to specific race groups in the benefit tables for 1992 and later years. While the number of beneficiaries involved was relatively small, this recategorization created an inconsistency in the pre- and post-1992 race categories. The apparent net effect of this recategorization was to increase somewhat the share of benefits allocated to the White race category relative to the Nonwhite category beginning in 1992. As expected, the relatively small Other category in the three-way White/Black/Other grouping appears to be disproportionately affected by the recategorization, rendering estimated results for that group as suspect, particularly in the latter portion of the analysis period.

[9] While different studies have reached different conclusions, the assumption that the employer share of the tax is shifted directly or indirectly to workers is supported by a number of theoretical and empirical analyses. Based on a theoretical analysis, for example, Feldstein (1974) concludes that in the long run labor will bear at least 100 percent of the net burden of a tax on labor income. See Dye (1984) for a summary of a number of empirical analyses of payroll tax incidence.

[10] See Smith (1989) for a description of the CWHS.

[11] The aggregate DI tax liability for each year was derived by applying historical DI tax rates to taxable wage and salary earnings and self-employment earnings (tables 2.A3 and 4.B2 in the 1997 *Annual Statistical Supplement* to the *Social Security Bulletin*). Sample taxes were adjusted to aggregate controls because of evidence that individual wage records tend to underestimate actual taxable earnings each year based on employer reports. The specific adjustment adopted effectively assumes that the proportional underestimate in a given year is the same for each race, gender, and age group.

[12] This estimate of tax liability does not adjust for the income tax offsets accorded under the program to workers in all periods and to the self-employed after 1983. For example, the assumption that

payroll taxes are backward shifted (in the form of lower wages) implies that workers' true earnings are higher than actually observed, and this unobserved portion of true earnings avoids the personal income taxation applied to observed earnings. Explicit preferential income tax treatment has been accorded to self-employment earnings since 1984.

[13] Although the format and specific detail in these tables have varied over time, all of the summary tables report monthly benefits in current payment status by benefit type, age, and race as of year-end. As examples, see table 40 in the 1957 *Annual Statistical Supplement* and table 5.A1 in the 1996 *Annual Statistical Supplement.*

[14] Benefits to disabled widows, disabled widowers, and disabled children of retired or deceased workers are paid under the OASI program.

[15] Total annual benefits paid from the DI Trust Fund by beneficiary category were taken from table 92 in the 1963 *Annual Statistical Supplement* for the years 1957-63 and from table 4.A6 in the 1997 *Annual Statistical Supplement* for the years 1964-95. A summary table of benefits by beneficiary type, race, and age for 1981 was not published in the *Annual Statistical Supplement*, so the proportional distribution of benefits by race, gender, and age in that year was derived by interpolating between the 1980 and 1982 estimates.

[16] Additional details of the historical benefit estimation are provided in the Appendix.

[17] For example, U.S. Department of the Treasury (1997) reports estimates for calendar year 1992 based on an analysis of 1992 tax returns. Unpublished Treasury estimates were used for the calendar years 1993-95, with the estimate for 1995 being preliminary. No attempt was made to identify the additional state income tax liability associated with DI benefits.

[18] The estimated average effective taxation rate on DI benefits jumped from less than 0.8 percent in 1993 to about 1.2 percent in 1994, as provisions exposing a greater proportion of benefits to income taxation went into effect.

[19] The inflation rate series and the large company stock index series can be found in Ibbotson (1996) and correspond respectively to the Consumer Price Index for all urban consumers (not seasonally adjusted) and the S&P 500 Composite Index with dividends reinvested. The estimated effective annual interest rate earned by the DI Trust Fund is taken from Kunkel (1997).

[20] A discussion of this issue is beyond the scope of this article; Leimer (1994), especially pp. 18-19 and 27-28, and Leimer (1995), pp. 7-8, provide more complete discussions.

[21] A deficiency of nearly all "money's worth" analyses is that they ignore the administrative costs of the alternative to which the Social Security program implicitly is being compared, biasing the comparison against the Social Security program. The bias is larger as a percentage of benefits for the DI program than for the OASI program, since the cost of administering the DI program is relatively higher. Conceptually, the administrative costs of specific alternatives to the Social Security retirement or disability programs could be incorporated into money's worth analyses to the extent that the costs can be identified.

[22] Administrative expenses under the DI program, reported as 2.6 percent of benefit payments and 2.0 percent of net contributions in 1997, are relatively small by private insurance industry standards, although these reported administrative expenses for the DI program exclude some associated costs incurred by employers, the self-employed, and other government agencies in their transactions with the DI program. Nevertheless, administrative costs and operating expenses in the private insurance industry are generally much higher, reflecting marketing costs, adverse selection, and the inability to exploit the economies of scale enjoyed by a compulsory, nearly universal, public program. See Leimer (1991) for additional discussion.

[23] This inference, of course, requires the assumption that the cost of administering the program does not differ much across the groups of interest or, if it does, that these cost differences should be borne equally across all groups.

[24] The irregular patterns displayed in chart 1 for some of the graphs, including the sharp downward plunge in net transfers for some cohorts in the next-to-last year, generally reflect *ad hoc* benefit and tax changes that occurred in particular years.

[25] The data underlying this chart are provided in Appendix C of Leimer (1998). In the same reference, Appendices B and D, respectively, provide the corresponding data with benefits and taxes accumulated using a nominal rate equal to the rate of inflation (a zero real interest rate) and the rate of return to large company stocks. Care should be taken in using the individual cell estimates displayed in these and the following appendices for some of the cohort, race, and gender groups; sample cell counts are likely to be relatively small for some of these groups, particularly the Nonwhite groups in the earliest cohorts shown. Aggregates and general patterns across groups of cohorts should be more reliable.

[26] The data underlying this chart are provided in Appendix F of Leimer (1998). In the same reference, Appendices E and G, respectively, provide the corresponding data with benefits and taxes accumulated using a nominal rate equal to the rate of inflation (a zero real interest rate) and the rate of return to large company stocks.

[27] Data (provided by the Social Security Administration Office of the Chief Actuary) on the Social Security area population aged 0 in each year from 1941-95 was merged with data (from table 1-B in *Vital Statistics of the United States, 1960, Volume I—Natality*) on the number of live births in the United States for the years 1909-59 to form a series intended to roughly represent the relevant population aged 0 in each year from 1909-95.

[28] Aside from the rough adjustments used to develop the initial population estimates, the data displayed in chart 4 are not equivalent to expected lifetime transfers per initial cohort member because of net immigration over the cohort's life cycle. Even if these problems did not exist, the estimates would represent expected lifetime transfers per initial cohort member, not per program participant.

[29] Members of the 1931 birth cohort were aged 64 in 1995, the last year of taxes and benefits included in this analysis.

[30] See Leimer (1994) for a comprehensive analysis of intercohort redistribution under the OASI program for past, present, and future cohorts.

[31] It is interesting to note that the cohorts treated most favorably to date by the DI program include the so-called notch cohorts born between 1917 and 1921, whose members have sometimes argued that their treatment by the OASI program under the 1977 Social Security Amendments was unfair.

[32] These characterizations of lower earnings, higher disabled beneficiary to taxpayer ratios, and higher auxiliary beneficiary to disabled worker beneficiary ratios for Nonwhites relative to Whites,

as defined in this analysis, are supported by the data underlying this analysis. OASDI taxable earnings and number of taxpayers for each race and gender group were estimated from the CWHS, while the number of DI disabled and auxiliary beneficiaries for each race and gender group was estimated from the year-end summary benefit tables used to derive DI benefits. Based on these data, the average OASDI taxable earnings of Nonwhite workers were below those of White workers in each analysis year. The estimated ratio of DI disabled worker beneficiaries to OASDI taxpayers, a measure closely related to the DI disability rate, was higher for Nonwhites than Whites in each analysis year except the first, 1957. Similarly, the estimated ratio of auxiliary beneficiaries to disabled worker beneficiaries under the DI program was higher for Nonwhites than Whites in each analysis year that auxiliary benefits were paid except the first, 1958.

[33] For example, see table 6-4 in Public Health Service (1996). A number of studies (for example, Behrman *et al.* (1991), Rogers (1992), and Menchik (1993)) suggest that most of the differential mortality observed by race can be explained by differences in socioeconomic factors.

[34] In the administrative data underlying this analysis, the ratio of average OASDI taxable earnings for males and females generally fell over the analysis period, although the movement was quite erratic at points. For example, years with *ad hoc* increases in the OASDI maximum taxable earnings were frequently associated with increases in the male/female OASDI taxable earnings ratio, as might be expected.

[35] For example, see Kelley and Lopez (1984). The characterization of generally higher disability incidence rates for males is also supported by the data underlying the present analysis. The estimated ratio of DI disabled worker beneficiaries to OASDI taxpayers, a measure closely related to the DI disability rate, was substantially higher for males than females in each analysis year. The estimated ratio of DI disabled worker beneficiaries to OASDI taxpayers was also examined within generally 5-year age groups in the decennial years from 1960 through 1990; in each year examined, the ratio was higher for males than females within each age group.

[36] For example, see table III.A8 in Barrick and Zayatz (1996), which presents data on annual benefit awards to disabled workers relative to the disability insured population, by gender, age group, and year. Under the DI program, an award adds the individual to the benefit rolls, but does not necessarily result in the immediate payment of benefits; see the "Glossary of Program Terms" section in the *Annual Statistical Supplement* for additional detail. The data underlying the present analysis also provide information about changing patterns in disability incidence for males and females over time. The estimated ratio of male to female DI disabled worker beneficiary/taxpayer ratios, a measure closely related to the ratio of male to female disability rates, generally fell over the analysis period (from 2.1 in 1957 to 1.4 in 1995), but with multiple inflection points.

[37] Again, see table 6-4 in Public Health Service (1996).

[38] The data underlying the charts in this section are provided in appendices to Leimer (1998). Estimates of the annual aggregate DI benefit/tax ratio for each race and gender group from the start of the program in 1957 through 1995 are given in Appendix H of that reference. Estimates of the corresponding annual aggregate DI net transfers for each race and gender group are given in Appendix I of that reference.

[39] Again, the irregular patterns displayed in chart 8 generally reflect *ad hoc* benefit and tax changes that occurred in particular years. Because the benefit data underlying this analysis allocate dependents' benefits to the same race as the worker on whose account the benefits are paid, tables showing outcome by race in each historical year would be the same under the "worker-account" approach as under the "individual-specific" approach.

[40] The Nonwhite benefit/tax ratio exceeded the White ratio by an average of 47 percent over the 1957-95 period.

[41] The primary average benefit/tax factor might also be termed the progressivity factor because the progressivity of the benefit formula tends to generate higher average primary benefit/tax ratios for groups with persistently lower taxable earnings and tax payments.

[42] The estimated ratio of White to Nonwhite values over the period averaged 0.81 for the disability rate proxy, 0.98 for the dependent benefits factor, and 0.86 for the primary average benefit/tax factor.

[43] The Black benefit/tax ratio exceeded the White ratio by an average of 77 percent over the 1968-95 period.

[44] Again, using the decomposition of the annual benefit/tax ratio into its three component factors, the total growth in these factors for Blacks relative to Whites over the 1968-95 period was estimated to be 18 percent for the disability rate proxy, 3 percent for the dependent benefits factor, and 5 percent for the primary average benefit/tax factor.

[45] Using the decomposition of the annual benefit/tax ratio into its three component factors, the estimated ratio of Other to White values over the 1968-95 period averaged 0.58 for the disability rate proxy, 1.05 for the dependent benefits factor, and 1.12 for the primary average benefit/tax factor. Little confidence should be placed in estimates for the Other group in the latter portion of the analysis period, however, since this relatively small group was disproportionately affected by the recategorization of some Other and Unknown records to the White and Black groups, beginning with the 1992 benefit data. As indicated earlier in this article, the predominant effect of the recategorization appears to be an increase in the share of benefits allocated to the White category beginning in 1992.

[46] The estimated share of DI auxiliary benefits paid to females has fallen from about 73 percent in 1958 to about 55 percent in 1995. Estimated auxiliary benefits as a proportion of total DI benefits fell from about 22 percent in 1966 to less than 11 percent in the 1990s.

[47] In terms of the decomposition of the annual benefit/tax ratio into its three component factors, the total growth in these factors for males relative to females over the 1959-95 period was estimated to be 40 percent for the dependent benefits factor, 28 percent for the primary average benefit/tax factor, and -26 percent for the disability rate proxy. The 1959-95 period was chosen for comparison here instead of the 1957-95 period because 1959 was the first year of substantial auxiliary benefit payments under the DI program.

[48] In terms of the decomposition of the annual benefit/tax ratio into its three component factors, the total growth in these factors for White males relative to White females over the 1959-95 period was estimated to be 26 percent for the primary average benefit/tax factor, 39 percent for the dependent benefits factor, and -22 percent for the disability rate proxy.

[49] The estimated ratio of male to female average taxable earnings over the 1957-95 period averaged 1.45 for Nonwhites and 1.69 for Whites, while the estimated ratio of the male to female disability rate proxy component (of the annual benefit/tax ratio decomposition) averaged 1.87 for Nonwhites and 1.61 for Whites.

[50] Again, using the decomposition of the annual benefit/tax ratio

into its three component factors, the estimated decline in the disability rate proxy for Nonwhite males relative to Nonwhite females over the 1959-95 period largely offset the estimated increases in the primary average benefit/tax factor and the dependent benefits factor.

[51] Analogous tables using the inflation rate (a zero real interest rate) and the total return to large company stocks to accumulate taxes and benefits over time are included in Appendix J of Leimer (1998). These alternative tables lead to conclusions qualitatively similar to those discussed in the text of this article, with the exception that the accumulated benefit/tax ratio for males is somewhat higher than that for females under the zero real interest rate assumption; the zero real interest rate assumption gives more relative weight to outcomes in the latter portion of the analysis period (where annual benefit/tax ratios were less favorable for females than for males) than does the trust fund interest rate or the total rate of return to large company stocks.

[52] The most relevant empirical analyses suggest that whites have received lower rates of return than nonwhites under OASI, on average, due in part to the historically lower earnings of nonwhites coupled with the progressivity of the benefit formula; these factors appear to outweigh the generally lower survival probabilities observed for nonwhites when factors other than race are not held constant. Estimated rates of return and benefit/tax ratios have been more favorable for women than for men under OASI, in part because of the historically lower earnings of women and their lower mortality rates. See Leimer (1995) for a more extensive summary of analyses of lifetime redistribution under the OASI program.

References

Bakija, Jon and C. Eugene Steuerle. 1993. *Social Security Disability Insurance: Fiscal Imbalance and Lifetime Value*. Urban Institute Project Report. Washington, DC: Urban Institute (April).

Barrick, Nettie J. and Tim A. Zayatz. 1996. *Short-Range Actuarial Projections of the Old-Age, Survivors, and Disability Insurance Program, 1996*. Actuarial Study No. 111, Office of the Chief Actuary, Social Security Administration (December).

Behrman, Jere R.; Robin Sickles; Paul Taubman; and Abdo Yazbeck. 1991. "Black-White Mortality Inequalities." *Journal of Econometrics*, Vol. 50 (October/November), pp. 183-203.

Buckler, Warren and Creston Smith. 1978. "The Continuous Work History Sample: Description and Contents." *Policy Analysis with Social Security Research Files*, Research Report No. 52, Office of Research and Statistics, Social Security Administration, pp. 555-575.

Dye, Richard F. 1984. *Evidence On the Effects of Payroll Tax Changes on Wage Growth and Price Inflation: A Review and Reconciliation.* ORS Working Paper No. 34, Office of Research and Statistics, Social Security Administration (April). (This paper was subsequently published in abbreviated form as "Payroll Tax Effects On Wage Growth." 1985. *Eastern Economic Journal*, Vol. 11 (April-June), pp. 89-100.)

Feldstein, Martin S. 1974. "Tax Incidence In a Growing Economy With Variable Factor Supply." *Quarterly Journal of Economics*, Vol. 88 (November), pp. 551-573.

Ibbotson Associates. 1996. *Stocks, Bonds, Bills and Inflation: 1996 Yearbook.* Chicago, IL: Ibbotson Associates.

Kelley, William B. and Esperanza Lopez. 1984. *Disabled Worker Projections for OASDI Cost Estimates, 1984*. Actuarial Study No. 93, Office of the Actuary, Social Security Administration (September).

Kilss, Beth and Fritz Scheuren. 1978. "The 1973 CPS-IRS-SSA Exact Match Study." *Social Security Bulletin*, Vol. 41 (October), pp. 14-22.

Kunkel, Jeffrey L. 1997. *Effective Annual Interest Rates Earned by the OASI and DI Trust Funds, 1940-96.* Actuarial Note, No. 138, Office of the Chief Actuary, Social Security Administration (October).

Leimer, Dean R. 1991. *The Pareto Optimality of Existing Pay-As-You-Go Social Security Programs*. ORS Working Paper No. 47, Office of Research and Statistics, Social Security Administration (June).

_____. 1994. *Cohort-Specific Measures of Lifetime Net Social Security Transfers.* ORS Working Paper No. 59, Office of Research and Statistics, Social Security Administration (February).

_____. 1995. "A Guide to Social Security Money's Worth Issues." *Social Security Bulletin*, Vol. 58 (Summer), pp. 3-20.

_____. 1998. *Historical Redistribution Under the Social Security Disability Insurance Program.* ORS Working Paper No. 77, Office of Research, Evaluation and Statistics, Social Security Administration (July).

Menchik, Paul L. 1993. "Economic Status as a Determinant of Mortality Among Black and White Older Men: Does Poverty Kill?" *Population Studies*, Vol. 47 (November), pp. 427-436.

Public Health Service. Undated. *Vital Statistics of the United States, 1960, Volume I—Natality*. U.S. Department of Health, Education, and Welfare.

_____. 1996. *Vital Statistics of the United States, 1992, Life Tables*. Volume II, Section 6. U.S. Department of Health and Human Services (April).

Rogers, Richard G. 1992. "Living and Dying in the U.S.A.: Sociodemographic Determinants of Death Among Blacks and Whites." *Demography*, Vol. 29 (May), pp. 287-304.

Smith, Creston M. 1989. "The Social Security Administration's Continuous Work History Sample." *Social Security Bulletin*, Vol. 52 (October), pp. 20-28.

U.S. Department of the Treasury. 1997. "Report on the Taxation of Social Security and Railroad Retirement Benefits in Calendar Year 1992." Report to the Congress, the Secretary of Health and Human Services, and the Railroad Retirement Board (January).

Appendix: Data Details

This appendix provides additional details of data development problems and how they were addressed. Specifically, the discussion focuses on problems related to the administrative race variable and problems related to incomplete information in the detailed benefit tables that were used to develop estimates of benefits by age, race, and gender in each historical year.

Administrative Race Variable

A number of problems cloud the interpretation of the Social Security administrative data race variable. The most serious of these problems for the present analysis arises because the SS-5 form has changed over time. Prior to November 1980, the form allowed only three responses to the race question, corresponding to "White," "Black," and "Other." Beginning in November 1980, the race question was expanded to allow five race/ethnic responses: "White (not Hispanic)," "Black (not Hispanic)," "Hispanic," "Asian or Pacific Islander," and "American Indian or Alaskan Native."

This change in the race/ethnic question poses problems because there is no way to cleanly map the new SS-5 race categories into the old SS-5 categories. The situation is made worse because the benefit data underlying this analysis are derived from published tables that maintain a three-way white/black/other classification from 1968 on, but include those selecting "Hispanic" on the new SS-5 form with others, rather than with whites. This creates a potential problem because survey data matched to administrative records suggest that the vast majority of persons of Hispanic origin are coded as white in these surveys and selected the white category on the old SS-5 form.[1] A more consistent race categorization over time might have been created, then, if new SS-5 Hispanics had been placed in the white category instead of in the other category in the benefit tables.[2]

Social Security card applicants were first given the Hispanic race/ethnic response option in November 1980, suggesting that new SS-5 Hispanics are likely to be concentrated in the youngest cohorts. As such, the inconsistency introduced to date into the benefit table race classifications is probably not severe.

One approach, then, would be to group all new SS-5 Hispanics with whites in the tax data under the assumptions (1) that the vast majority of Hispanics are grouped with whites under the old SS-5 code in both the benefit tables and the tax data, (2) that the number of new SS-5 Hispanics included with others in the benefit tables is relatively low, and (3) that including new SS-5 Hispanics with others in the tax data, where new SS-5 Hispanics are more prevalent than in the benefit data, might introduce more of an inconsistency with the benefit data. An alternative approach would be to maintain consistency in the grouping of new SS-5 Hispanics with others in both the tax and benefit data despite the probability that the vast majority of Hispanics are grouped with whites under the old SS-5 code. Because the choice between these alternative race allocations is not clear, estimates were generated under both alternatives. Fortunately, none of the main conclusions of the analysis were sensitive to the grouping of new SS-5 Hispanics. The results presented in this article are for the second alternative, with new SS-5 Hispanics included with others in both the tax and benefit data. Under either alternative, it must be kept in mind that the administrative race allocations are somewhat muddled, with most Hispanics probably represented in the White race category regardless of the allocation of new SS-5 Hispanics.

Benefit Data

The degree of age detail in the summary benefit tables varies by detailed beneficiary type and year. For the most part, benefit payments are disaggregated by single year of age. For some quantitatively less important benefit types, generally 5-year age ranges or "age and under" or "age and over" age ranges are reported. In those cases where the tables specify an age range rather than a single year of age, the total number of beneficiaries for the age range was allocated among individual ages within the age range on the basis of a smoothing equation estimated from the beneficiaries by age data given in the benefit table for that specific beneficiary type, race, and year.[3]

Beginning in 1967, age detail is not provided separately in the summary benefit tables for the quantitatively minor subcategory of husbands of disabled workers. Consequently, beginning in 1967, the proportional age distribution of benefits for the husbands of disabled workers subcategory within each race group was assumed to be the same as for husbands of retired and disabled workers combined, for which age detail was reported.[4]

An additional problem is posed by the children of disabled workers beneficiary categories, which are not reported by gender of recipient in the benefit tables. To allocate these benefits by gender, the reported average benefit for each race and age group is assumed to apply equally to male and female child beneficiaries, and the proportion of male and female beneficiaries at each age is assumed equal to the proportion of males and females in the underlying population of that age.[5]

Appendix Notes

[1] Two CPS files were examined to identify the racial composition of persons of Hispanic origin in those surveys. In the 1994 CPS, 91 percent of persons of Hispanic origin are coded as white; the corresponding proportion in the 1973 CPS is 97 percent. An examination of the 1973 Exact Match File, which links the 1973 CPS with Social Security administrative data, indicates that 85 percent of persons identified as of Hispanic origin in the CPS part of that file were coded as white in the Social Security administrative data part of that file, indicating that these persons had selected the white race category on the old SS-5 form.

[2] This depends in part on the proportion of persons of Hispanic origin who select the Hispanic option on the new SS-5 form.

[3] The general approach adopted was to regress the number of beneficiaries by age as a cubic function of age (or as a lower-order polynomial function if the number of age groups was insufficient to

support a cubic estimation) for each beneficiary type, race, and year group. For an age range, the regression observation points were defined as the average number of beneficiaries at each age within the range and the average of the high and low age bounds for the age range. The resulting estimated equation was then used to allocate the number of beneficiaries to each individual age within each age range, resetting any negative beneficiary estimates to zero, and proportionally adjusting the resulting beneficiary estimates at each age within each age range so that their sum equaled the reported total number of beneficiaries for that age range. Special rules were adopted for special cases, including rules for allocating beneficiaries within open-ended "age and under" or "age and older" age ranges if a simple application of the smoothing equation was insufficient to exhaust the reported age range beneficiary total. The average benefit at each age within an age range for a given beneficiary type, race, and year was assumed equal to the average benefit for that beneficiary type, race, and age range in that year, as reported in the benefit table.

[4] For years prior to 1967, age detail was provided separately for the husbands of disabled workers category. Based on the age distributions of benefits for the various beneficiary categories during and after that period, no clearly superior basis for the age allocation of husbands of disabled workers benefits after 1966 was apparent. More sophisticated approaches were not pursued because of the relatively small size of this beneficiary category—in no year during the 1957-95 period did annual benefits to husbands of disabled workers comprise as much as 0.04 percent of all DI benefits or as much as 2.1 percent of DI benefits to husbands and wives combined.

[5] Data on the historical Social Security area population by year, age, and gender, provided by the Social Security Administration Office of the Chief Actuary, were used for this purpose. These data were not given by race, forcing the implicit assumption that the male/female composition at each age in each year was the same for the White and Nonwhite race categories. A check of selected decennial census data suggests that this is a reasonable, but obviously not a perfect, assumption for the early childhood ages that comprise the bulk of child benefits. The proportion of males in the 1980 decennial census population aged 0-19, for example, was 0.512 for whites and 0.506 for nonwhites. The corresponding figures for 1960 were 0.508 for whites and 0.499 for nonwhites. Differences between the gender compositions of the beneficiary and general child populations is another source of potential bias that is difficult to assess.