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Cohort-Specific Measures of Lifetime Net Social Security Transfers

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## **Cohort-Specific Measures of Lifetime Net Social Security Transfers**

### **Abstract**

This paper develops estimates of lifetime net transfers across cohorts under the Social Security Old Age and Survivors Insurance (OASI) program. Estimates are developed both from the perspective of individual cohorts, indicating the extent to which each cohort has received or can expect to receive its money's worth from the program, and from the perspective of the OASI program, indicating the extent of redistribution across cohorts. This paper also contrasts intercohort redistribution under the present OASI program with the redistribution that would have occurred under two counterfactual pay-as-you-go programs which incorporate different implicit standards of fairness. The data sources and techniques employed in this analysis provide a more accurate and extensive description of the treatment of different cohorts under the OASI program than has been available to date. Estimates based on past or projected data are presented for all cohorts participating in the OASI program since its inception through the cohort born in 2050.



## **I. Introduction**

The Social Security Old Age and Survivors Insurance (OASI) program is an unusual tax-transfer program in that most participants can expect to be on both sides of the tax-transfer exchange for extensive periods over the course of their lifetimes. This feature of the program provides the potential for redistribution both across and within cohorts<sup>1</sup> on the basis of lifetime measures of economic well-being. This paper focuses on measures of lifetime net transfers across cohorts under the OASI program. The data are examined both from the perspective of individual cohorts, indicating the extent to which each cohort has received or can expect to receive its money's worth from the program, and from the perspective of the program, indicating the extent of redistribution across cohorts. A primary distinction between these two perspectives is the discount rate used to evaluate the tax and benefit streams estimated for each cohort; discount rates relevant to the individuals within each cohort are used for the money's worth measures, while discount rates relevant to the OASI trust fund are used for the intercohort redistribution measures.<sup>2</sup> This paper also contrasts intercohort redistribution under the present OASI program with the redistribution that would have occurred under two counterfactual pay-as-you-go programs which incorporate different implicit standards of fairness.

In addition to these counterfactual comparisons and the distinction between money's worth and intercohort redistribution measures, this paper differs from previous money's worth analyses in its extensive use of historical administrative data and its use of a relatively detailed long-run

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<sup>1</sup> The term "cohort" is used in this paper to refer to the group of individuals born in a given year.

<sup>2</sup> The term "intercohort redistribution" is used in this paper to refer to differences across cohorts in the current trust fund equivalents of the net lifetime transfers experienced by each cohort under the OASI program. For example, it indicates the net effect on current trust fund assets of the historical net transfers experienced by past cohorts; alternatively, for future cohorts it indicates the current net present value of the future net transfers projected for those cohorts.

simulation model for projecting taxes and benefits in future years. As such, it should provide a more accurate and extensive description of the treatment of different cohorts under the OASI program than has been available to date.

Previous analyses have either used less accurate estimates of the historical taxes and benefits associated with each cohort or have been limited to a much narrower range of cohorts. Studies containing intercohort analyses based on longitudinal data for individual sample cases drawn from Social Security Administration files include Freiden *et al.* [1976], Burkhauser and Warlick [1981], Meyer and Wolff [1987], and Duggan *et al.* [1993]. Unfortunately, these administrative files generally contain data on taxes, benefits, or both over only partial lifetimes for most cohorts; these constraints limit the range of cohorts that can be analyzed and necessitate the simulation of missing tax or benefit data for included cohorts, even for historical periods.<sup>3</sup> Leimer and Petri [1981] used a relatively detailed long-run simulation model similar in concept to the model used in this paper, but used a less accurate accounting of historical taxes and benefits by cohort. Moffitt [1984] used historical administrative data on benefits by cohort, but estimated each cohort's historical taxes using median earnings by age and sex; in addition, the Moffitt study was limited to a relatively narrow range of cohorts (those born between 1875 and 1910), compared to the more extensive cohort range (all cohorts born through 2050) considered in this analysis.

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<sup>3</sup> Longitudinal benefit data for sample individuals in these files are available for only a relatively brief period. Although more historical years are available for the earnings records of sample individuals, annual taxable earnings data prior to 1951 are not available in current administrative files. Moreover, the life cycles of only the oldest cohorts have been completed, necessitating the explicit or implicit projection of incomplete tax and benefit streams for most individuals. This projection is implicit in some of these studies. Burkhauser and Warlick [1981] and Meyer and Wolff [1987], for example, compared benefits at a point in time with an annuity based on the accumulated value of past taxes. Such comparisons, of course, require an implicit assumption about the future (and possibly past) time path of the benefit stream relative to the annuity stream. The use of the annuity approach to analyze incomplete benefit streams does not obviate the need to project benefits, then, despite suggestions to the contrary sometimes found in the literature.

In the remainder of this paper, Section II describes the methods used to develop the money's worth and redistributive estimates that are presented in Sections III and IV. Section III identifies the effect of the present program on individual cohorts from a variety of perspectives, utilizing a number of alternative money's worth and redistributive measures and discount rates. For comparison, Section IV contrasts selected results under the present program with the outcomes that would have obtained under two alternative pay-as-you-go social insurance programs that incorporate different implicit standards of fairness. Section V presents some concluding remarks.

## II. Method

An "individual-specific" approach to the allocation of OASI taxes and benefits is adopted in this paper. This approach identifies, either through historical administrative data or through simulated prospective data, the tax payments made and the benefits received by persons of each age in each year of the analysis. The treatment of dependent and survivor benefits under this approach differs in concept from a "worker-account" approach, under which all benefits paid on the account of an insured worker would be contrasted with the taxes paid by that worker, and the relationship between those taxes and benefits would be counted as applicable to the cohort to which the worker belongs. With the exception of child benefits,<sup>4</sup> the present analysis assigns benefits received by dependents and survivors to the cohorts to which they belong, not to the cohort to which the worker on whose account the benefits are paid belongs. These two

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<sup>4</sup> Benefits paid to individuals under the age of 16 are allocated to their parents in this analysis, for consistency with the treatment of such benefits in the long-run simulation model used in this analysis. The allocation of children's benefits to parents is based on an empirical distribution of age differences between family heads and children derived from the 1982-83 Consumer Expenditure Survey. For simplicity, this distribution is assumed to remain constant over time and to be independent of the age and sex of the family head. OASI tax payments by children under age 16 are also allocated to family heads by the same method.

approaches offer different perspectives on redistributive and money's worth issues; 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.

The allocation of taxes in this paper assumes full backward shifting of the employer portion of the payroll tax to workers in the form of lower wages. Although there is not unanimity among economists about the incidence of the payroll tax, full backward shifting is by far the most common tax incidence assumption in Social Security money's worth analyses and is consistent with a number of theoretical and empirical analyses.<sup>5</sup>

Administrative data were used to develop estimates of taxes and benefits by single year of age for the years 1937-88. Analogous tax and benefit data were simulated for the years 1989-2150, which allowed cohorts born through the year 2050 to be included in the analysis.<sup>6</sup> Specific methods used in the estimation of historical taxes, historical benefits, and projected taxes and benefits are described below.

### **Historical Taxes**

The aggregate OASI taxes paid by persons of each age for each year from 1937 through 1988 were derived from a combination of the Social Security Administration's 0.1% and 1% Continuous Work History Sample (CWHS) data files.<sup>7</sup> These files respectively represent 0.1 percent and 1.0 percent samples of all Social Security numbers ever issued and contain information on the annual taxable earnings associated with each sample account for a range of

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<sup>5</sup> Based on a theoretical analysis, 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 even if there is a substantial positive elasticity of labor supply. See Dye [1984] for a summary of a number of empirical analyses of payroll tax incidence.

<sup>6</sup> The simulation model used to develop future tax and benefits streams assumes a maximum age of 100 for all cohorts.

<sup>7</sup> See Smith [1989] for a description of the CWHS.



historical years. The 1989 version of the 1% CWHS was used to develop taxes by age for the period 1951-88. Earnings data for individual years prior to 1951 are not available on the 1% CWHS file. Consequently, the 1977 version of the 0.1% CWHS, a subsample of the 1% CWHS, was used to develop tax data for the years 1937-50.<sup>8</sup>

For each file, the general approach adopted was to identify the OASI taxable wages or self-employment income for each valid record in each year and compute the associated OASI tax payment using the OASI 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 sample tax payments by age in each year were calculated and then adjusted proportionally to sum to actual aggregate OASI tax payments for that year; in effect, then, the sample data were used to define the proportional distribution of aggregate OASI tax payments by age in each year. Finally, aggregate taxes by age in each year were converted to constant (1989) dollars using the implicit price deflator for personal consumption expenditures from the National Income and Product Accounts (NIPA).<sup>9</sup>

### **Historical Benefits**

A similar approach was adopted for identifying historical benefit payments by age and year, except that summary tables on OASI benefits payments by beneficiary type, age, and year from

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<sup>8</sup> The 0.1% CWHS is no longer produced by the Social Security Administration, and the 1977 file is the most recent version available.

<sup>9</sup> Aggregate taxes by age in each year were also adjusted for consistency with the NIPA population concept, rather than the Social Security area population concept, by assuming that taxes per capita were identical under both concepts. The Social Security area population refers to the population covered by the OASI program. In addition to residents of the fifty States and the District of Columbia, this population currently includes civilian residents of Puerto Rico, the Virgin Islands, Guam, and American Samoa; Federal civilian employees and Armed Forces and their dependents overseas; crew members of merchant vessels; other citizens overseas; and an adjustment for net census undercount. The NIPA population refers to the population of the United States including Armed Forces overseas. Aggregate historical taxes by age and year were converted to the NIPA concept because the long-run simulation model used in this analysis outputs future OASI taxes and benefits by age for the NIPA population.

the *Social Security Yearbook* and the *Annual Statistical Supplement to the Social Security Bulletin* were used in place of individual sample data.<sup>10</sup> The use of summary tables was necessitated by the lack of complete historical benefit data in the individual sample data files, as discussed above.

From 1937-39, only lump-sum payments at age 65 or death were made under the 1935 Social Security Act.<sup>11</sup> Monthly cash benefit payments began in 1940 under legislation passed in 1939;<sup>12</sup> lump sum death payments continued, but were dwarfed, in the aggregate, by monthly cash benefit payments in all but the earliest years. Monthly cash benefit payments fall within eight major beneficiary categories: retired workers, spouses, children of retired workers, children of deceased workers, widowed mothers and fathers, widows and widowers, parents of deceased workers, and special age-72 beneficiaries. Within each of these eight monthly beneficiary categories, the proportional distribution by age of the corresponding type of benefits from the summary benefit table for that year was used to allocate across ages the aggregate benefit payments during the year for that beneficiary category;<sup>13</sup> e.g., the proportional

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<sup>10</sup> The specific summary benefit tables used for each year are listed in Appendix A.

<sup>11</sup> In addition to lump-sum death payments based on cumulative wage credits for decedents of any age, the 1935 Act also provided for lump-sum refunds based on cumulative wage credits for persons who had not attained insured status at age 65. The lump-sum refund provision was eliminated, beginning in 1940, under the 1939 Act. See the *Annual Statistical Supplement to the Social Security Bulletin* for a summary history of program provisions.

<sup>12</sup> The summary monthly cash benefit tables for all of the years except 1940-42 report monthly benefits in current payment status by age as of the end of the year. The summary benefit tables for 1940 report only benefits awarded during the year, and the tables for 1941 and 1942 report benefits in force at year-end. Benefit awards may result in immediate payment of benefits (current-payment status) or they may be withheld for a definite period (deferred-payment status) or an indefinite period (conditional-payment status). Benefits in force represent total benefits awarded (including benefits in current, deferred, and conditional-payment status) after adjustment for subsequent changes due to terminations or the effect of maximum and minimum provisions, recomputations, and administrative actions. See various issues of the *Social Security Yearbook* and the *Annual Statistical Supplement to the Social Security Bulletin* for further detail.

<sup>13</sup> A summary table of benefits by age in 1981 was not published in the *Annual Statistical Supplement to the Social Security Bulletin*. Consequently, the proportional distribution of benefits by age in 1981 was derived by interpolating between the 1980 and 1982 values.

distribution by age of retired worker benefits in current-payment status at the end of 1988, as reported in the summary benefit table for that year, was used to allocate aggregate retired worker benefit payments by age during 1988. Because information is not available concerning the ages of the recipients of lump-sum death payments, these payments were allocated by age in each year by assuming the same proportional distribution by age as for the widows and widowers beneficiary category in that year.<sup>14</sup>

The degree of age detail in the summary benefit tables varies by year. In the vast majority of years, benefit payments are disaggregated for the most part by single year of age, with generally five-year age ranges reported for the less numerous benefit types and ages. For four years, 1946-49, benefit payments are not available by single year of age, but are disaggregated generally by five-year groups. In those cases where the tables specify an age range rather than a single year of age, benefits were allocated to ages within the age range on an equal proportional basis; i.e., each age within the age range was assigned an equal share of the total benefits for the age range.<sup>15</sup> Age detail is not provided separately in the summary benefit tables for the numerically-minor subcategory of husbands of retired workers; consequently, the

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<sup>14</sup> The widows and widowers beneficiary category was limited to persons aged 65 and older during the early years of the program. Because this monthly beneficiary category did not exist during the 1937-39 period, lump-sum death payments during that period were allocated in the same proportional distribution by age as for the widows beneficiary category in 1940. The adopted treatment of lump-sum death payments introduces some error, especially for the 1937-39 period, since about 60 percent of all lump-sum payments during that period appear to be associated with decedents under age 65. These lump-sum death payments were relatively small compared to total benefit payments in later years, however, and the relative importance of lump-sum death payments diminished rapidly after 1939, falling from about 26 percent of annual benefits in 1940 to 11 percent in 1942 and eventually to less than 0.1 percent in 1989.

<sup>15</sup> The last age range specified in the summary benefit tables for some of the beneficiary categories is open-ended, e.g., age 95 and over. In these instances, an arbitrary end age for the age group was chosen, based roughly on program provisions and the pattern of beneficiary populations across ages. A more sophisticated approach was not adopted because of the relatively small size of these beneficiary groups.

proportional age distribution of benefits for this subcategory was assumed to be the same as for husbands of retired and disabled workers combined, for which age detail was reported.

A number of additional adjustments were made to these estimates of OASI benefits by age and year. The first adjustment converted the estimates to benefits net of the income taxation of benefits that was initiated in 1984; this conversion assumed that the effective rate of benefit taxation was constant across ages in any given year. As with historical taxes, benefits by age in each year were converted to constant dollars using the NIPA implicit price deflator for personal consumption expenditures.<sup>16</sup>

### **Projected Taxes and Benefits**

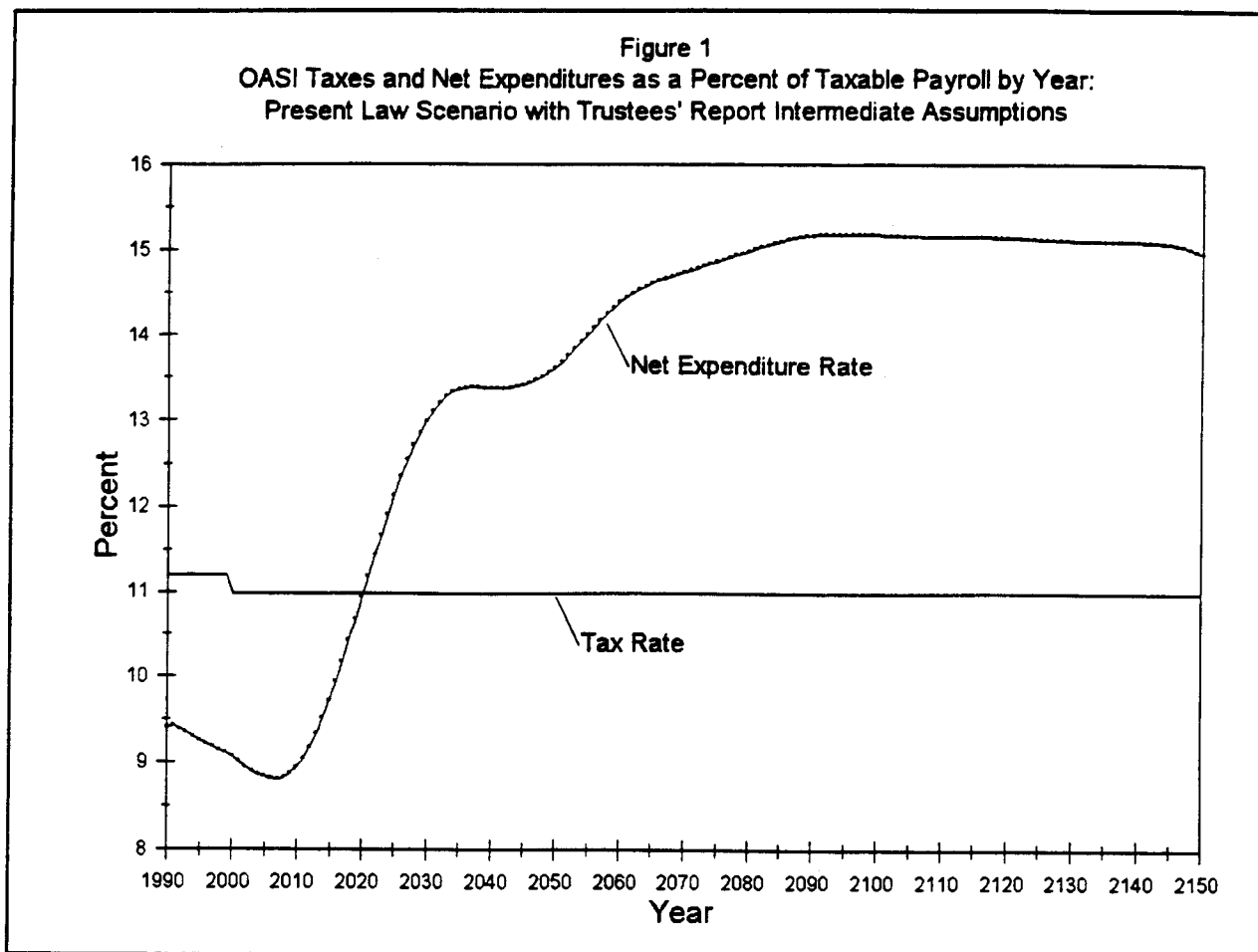
OASI taxes and benefits by age were projected for future years using a long-run simulation model of the U.S. economy and its interrelationships with the Social Security program. This model, hereafter referred to as the LRM, is documented in Leimer [1992]; for the present purpose, the most noteworthy feature of the LRM is its relatively detailed simulation of OASI taxes and benefits by age during each simulation year.<sup>17</sup> As with historical benefits, projected benefits were calculated net of the taxation of OASI benefits, assuming the same effective benefit taxation rate across all ages in any given year.<sup>18</sup>

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<sup>16</sup> Aggregate benefits by age in each year were also adjusted for consistency with the NIPA population concept, rather than the Social Security area population concept, by assuming that benefits per capita were identical under both concepts.

<sup>17</sup> As indicated above, the LRM projects future OASI taxes and benefits by age for the NIPA population.

<sup>18</sup> Another feature of the LRM which has some effect on the estimates presented in this paper is the linkage assumed between individual perceptions of social security wealth and private consumption behavior; through this linkage, changes in OASI taxes and benefits can have secondary effects on aggregate economic growth through their effects on private consumption, saving, and capital formation. These effects are moderated to some extent in the present analysis by the initial calibration of key economic variables in the baseline simulations, as discussed in the following paragraphs.



The LRM was used to simulate future OASI taxes and benefits under four alternative parameter assumption sets. The first of the simulations corresponds roughly to the intermediate projections of the 1991 Trustees' Report<sup>19</sup> and is referred to in this paper as the "present law" scenario.<sup>20</sup> The relationship between OASI taxes and expenditures net of general revenue

<sup>19</sup> See Board of Trustees [1991]. The annual report to Congress by the Board of Trustees of the Old-Age and Survivors Insurance and Disability Insurance (OASDI) trust funds is referred to in this paper as the annual Trustees' Report.

<sup>20</sup> The process by which the LRM is calibrated to a particular Trustees' Report is described in Leimer [1992]. Because of fundamental differences between the projection and simulation methods used in Trustees' Report and the LRM, an exact correspondence between the two projections cannot be achieved. The LRM input parameters are adjusted to achieve as high a degree of correspondence as possible in the long-run growth rates of key economic and demographic variables, including population aggregates and age distributions, the retired population, inflation rates, average covered earnings, OASI taxable payroll, gross domestic output, trust fund interest rates, OASI expenditures, and the OASI trust fund.

transfers (including benefit taxation revenues) under the present law scenario is depicted in Figure 1.<sup>21</sup>

As under the Trustees' Report intermediate projections, the LRM present law scenario projects that the OASI trust fund will become negative around the middle of the next century unless tax increases or benefit cuts are instituted. Since a scenario with a large negative trust fund is unrealistic and clouds the interpretation of money's worth estimates, a second LRM simulation incorporates a series of OASI tax increases beginning after 2020, when the pay-as-you-go tax rate first approximates the legislated 10.98 percent combined employer+employee OASI tax rate.<sup>22</sup> The combined OASI tax rate is assumed to gradually increase each year after 2020 until reaching 14.74 percent in 2099, after which the tax rate is assumed to remain constant. This second scenario is referred to in this paper as the "intermediate balanced budget" scenario. The relationship between OASI taxes and expenditures net of general revenue transfers under this scenario is depicted as the middle set of tax rate and net expenditure graphs in Figure 2.

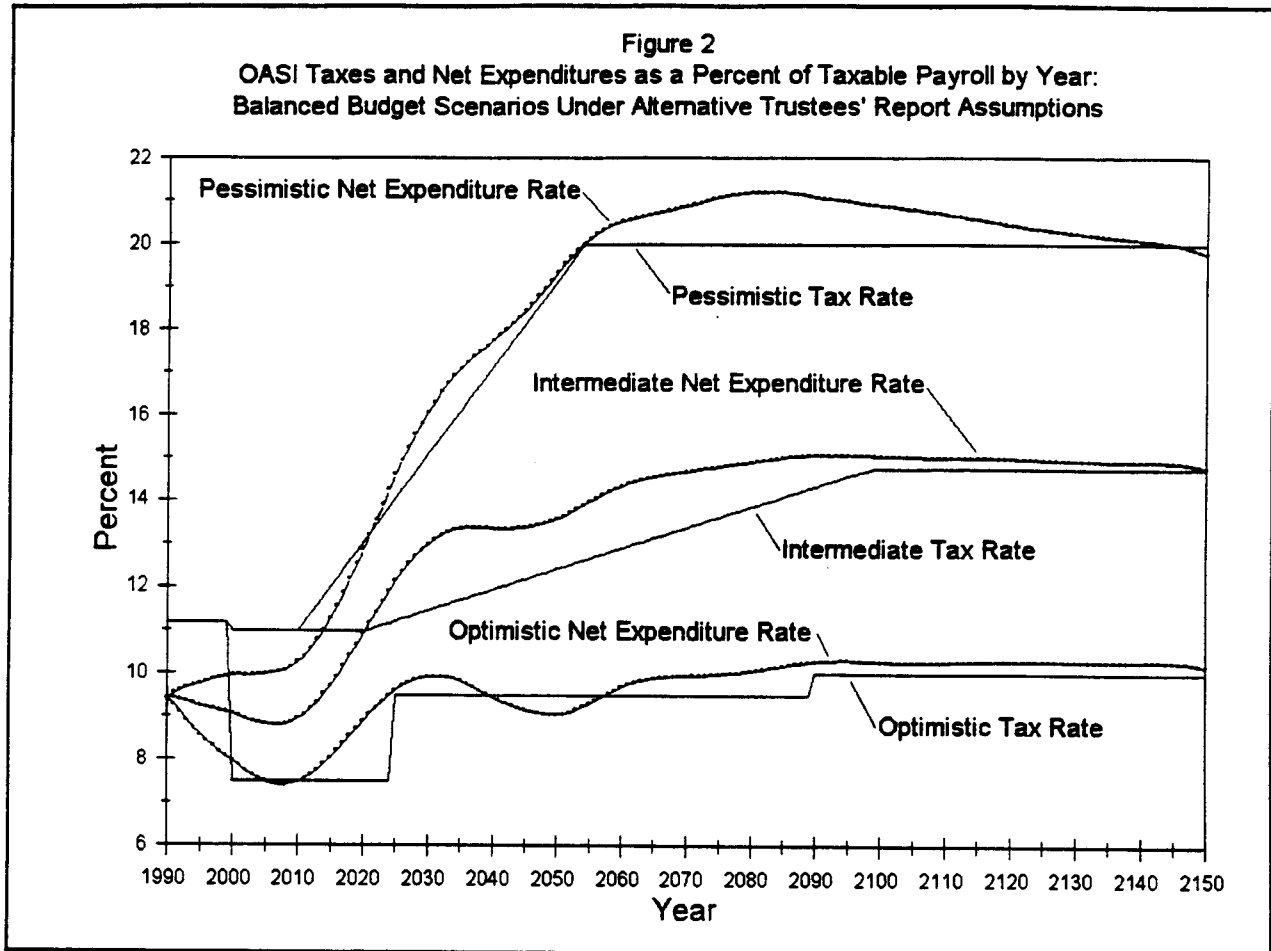
Under this scenario, the new tax rate remains below the pay-as-you-go tax rate after 2020, when the tax increase is initiated. Nevertheless, these tax rate increases bring the OASI program into rough actuarial balance over the full Trustees' Report projection period, as well as over the

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<sup>21</sup> Specifically, OASI expenditures net of general revenue transfers are defined here to include benefit payments, net administrative expenses, and net transfers to the Railroad Retirement program, less income from the taxation of benefits and net reimbursements from the general fund of the U.S. Treasury associated with military service wage credits. In conjunction with OASI taxes, then, these elements comprise all of the normal income and expenditure components of the OASI trust fund except for net interest income on trust fund holdings.

<sup>22</sup> In the present context, the pay-as-you-go tax rate is identical to the net expenditure rate depicted in Figures 1 and 2; i.e., the pay-as-you-go tax rate is defined as net OASI expenditures divided by taxable payroll, where net OASI expenditures refer to expenditures net of general revenue transfers, including benefit taxation revenues. Consistent with the current OASI trust fund buildup, the pay-as-you-go tax rate is now lower than the legislated tax rate, but will begin to rise rapidly and overtake the legislated tax rate after the turn of the century as the baby boom cohorts begin to retire.

full simulation period through 2150, with an OASI trust fund/expenditure ratio of about one at the end of the simulation period. In effect, this scenario prolongs the original trust fund drawdown period with gradual tax increases to a level that keeps the program in actuarial balance beyond the simulation period.



Two additional balanced budget scenarios are considered in this paper. These scenarios differ from the intermediate balanced budget scenario by respectively representing the optimistic and pessimistic 1991 Trustees' Report projections instead of the intermediate projection. Each scenario was developed by first roughly calibrating key LRM simulation variables to the

corresponding Trustees' Report projections under present law tax and benefit provisions.<sup>23</sup> OASI tax rate changes were then imposed on the simulations to bring them into actuarial balance over the full simulation period with an OASI trust fund/expenditure ratio of about one in the final simulation year. In the balanced budget scenario using the optimistic assumption set, the adopted tax changes involve a reduction of the OASI combined employer+employee tax rate to 7.5 percent in 2000, an increase to 9.5 percent in 2025, and a final increase to 10.02 percent in 2090. In the balanced budget scenario using the pessimistic assumption set, the adopted tax changes involve a gradual series of annual tax increases beginning in 2010 and ending in 2054 at a combined employer+employee rate of 19.98 percent. The relationships between OASI taxes and expenditures net of general revenue transfers under the optimistic and pessimistic assumption sets are depicted in Figure 2.

Obviously, many other tax and benefit adjustments could have been used to bring the OASI program into actuarial balance over the full simulation period, but those described above appear to be reasonable and will serve to illustrate the potential money's worth and intercohort redistributive effects of required program changes in the long run under assumption sets ranging from optimistic to pessimistic. For comparison, many of the tables and figures in this paper are repeated in Appendix B under an alternative balanced budget scenario that uses a series

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<sup>23</sup> The calibration of the LRM simulations to the optimistic and pessimistic Trustees' Report projections used in this paper was relatively crude compared to the more detailed calibration to the intermediate projection. As described in Leimer [1992], the LRM relies in part on an underlying data base of various exogenous rates and relationships that are consistent with the intermediate assumption set of the Trustees' Report. This data base includes such elements as fertility, mortality, and immigration rates, labor force participation and unemployment rates, OASI covered, insured, and retiring rates, and so forth. The optimistic and pessimistic LRM simulations in this paper use this same data base, but modify some of the underlying relationships to replicate, to the extent possible, the long-run growth rates in key economic and demographic variables under the optimistic and pessimistic Trustees' Report projections. The exogenous LRM rates that were adjusted to this end included fertility and mortality rates, the rate of Hicks-neutral technical progress, benefit recomputation adjustments, and the assumed OASI trust fund interest rate at the end of the initial transition period. See Leimer [1992] for more detail on the structure of the LRM.



of gradual reductions in benefit awards, rather than a series of gradual tax increases, to bring the OASI program into actuarial balance over the simulation period. Although this alternative scenario affects the details of the money's worth and intercohort redistributive measures for many of the later cohorts, the general qualitative conclusions of this paper remain unaffected.

Another key assumption underlying the LRM simulations reported in this paper is the adoption of a "validation" fiscal policy rule for government expenditures and revenues other than those associated with the OASI program; i.e., the government deficit reflecting all other government expenditures and revenues is maintained as a relatively constant proportion of gross domestic output, if necessary, by other government tax changes. As such, an increase in OASI trust fund saving, for example, is not offset by increased dissaving in the other government account.<sup>24</sup>

As a final note, the OASI taxes and benefits allocated to cohorts in this paper correspond to actual trust fund transactions; i.e., they represent revenues or expenditures realized by the OASI trust fund. This approach ignores some of the income tax offsets accorded to workers in all periods and to the self-employed after 1983. Implicit in the assumption that payroll taxes are backward shifted is the preferential personal income tax treatment of the employer share of the payroll tax; i.e., under this assumption, workers' true earnings are higher than actually observed by the amount of the employer share of the tax, and this portion of earnings avoids the personal income taxation applied to observed earnings. Explicit preferential tax treatment has been

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<sup>24</sup> The effect of this assumption is moderated by the initial calibration of key economic and demographic variables for each present law scenario to the corresponding Trustees' Report projections. The validation assumption affects the estimates presented in this paper, then, only through effects associated with the OASI tax rate or benefit award adjustments designed to bring the program into actuarial balance over the full simulation period. This effect is relatively small; as an example, both the tax increase and award reduction balanced budget scenarios exhibit a geometric mean growth rate in gross domestic product of 1.11 percent over the last two decades of the simulation period (2130-2150), compared to a growth rate of 1.03 percent under the present law scenario over the corresponding period.

accorded to self-employment earnings since 1984.<sup>25</sup> A rigorous treatment of such preferential income tax treatment would require information on the marginal income tax rates applicable to individuals in each period and is beyond the scope of this analysis. Consequently, the money's worth and intercohort redistributive estimates presented in this paper reflect only the balance between OASI taxes and benefits net of benefit taxation for individual cohorts, but ignore any personal income tax offsets associated with their OASI taxes.

### III. Money's Worth and Redistributive Estimates

#### Money's Worth Estimates

Figure . displays the real OASI internal rates of return calculated for included cohorts under the present law and intermediate balanced budget scenarios. Table 1 lists the corresponding data for quinquennial cohorts from 1880 through 2050.<sup>26</sup> The most striking feature of Figure 3 is the steep decline in internal rates of return across the early cohorts, following the expected general pattern for a maturing pay-as-you-go social insurance program. Under the present law scenario, the projected real rate of return for the most distant cohorts flattens out at a little over 1.7 percent. This projected rate is reduced to slightly less than one percent under the intermediate balanced budget scenario, illustrating the effect of the tax increases required to

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<sup>25</sup> The history of the treatment of self-employment earnings under Social Security is summarized in the *Annual Statistical Supplement to the Social Security Bulletin*.

<sup>26</sup> The quinquennial cohort data presented in Table 1 and subsequent tables in this paper represent estimates for individual (single year) cohorts whose birth years are evenly divisible by 5, not data for 5-year birth cohorts. The figures in this paper depict estimates for individual cohorts, with linear connections between the individual cohort data points. Cohorts born prior to 1876 are not included in the tables and figures because of small sample counts in the tax data for the individual cohorts in that range; these cohorts were aged 61 and older in 1937, when OASI taxes were first collected. The collective real internal rate of return across all cohorts born prior to 1876 was calculated as 75.0 percent. Selected estimates for every individual birth cohort from 1876 through 2050 are presented in Appendices E through G under the present law, tax increase balanced budget, and award reduction balanced budget scenarios.

bring the OASI program into long-run financial balance. The internal rates of return do not begin to systematically diverge between the present law and intermediate balanced budget scenario until about the 1965 cohort, since the gradual tax increases under the intermediate balanced budget scenario do not begin until after 2020, when the work lives of earlier cohorts have largely been completed.

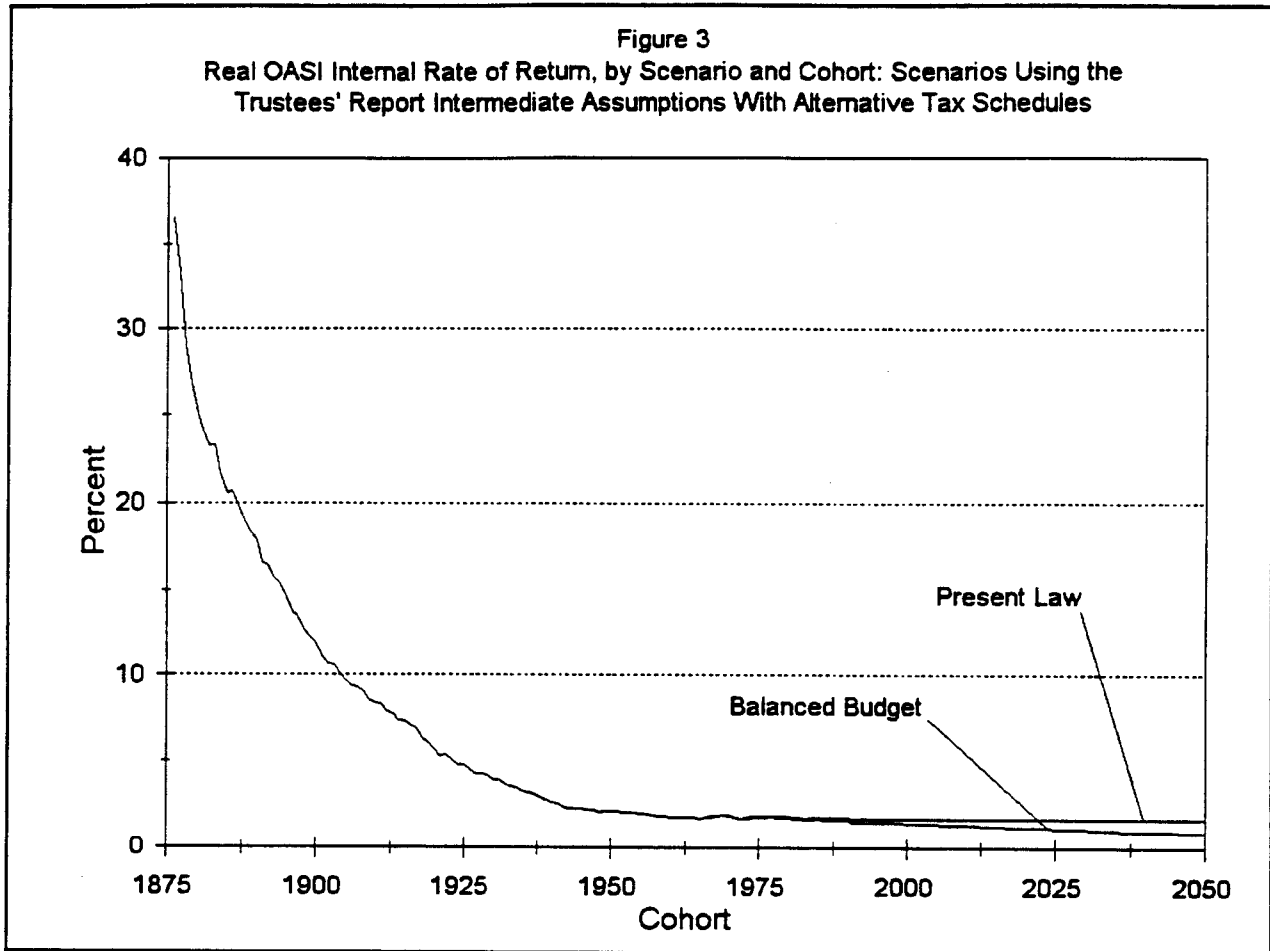


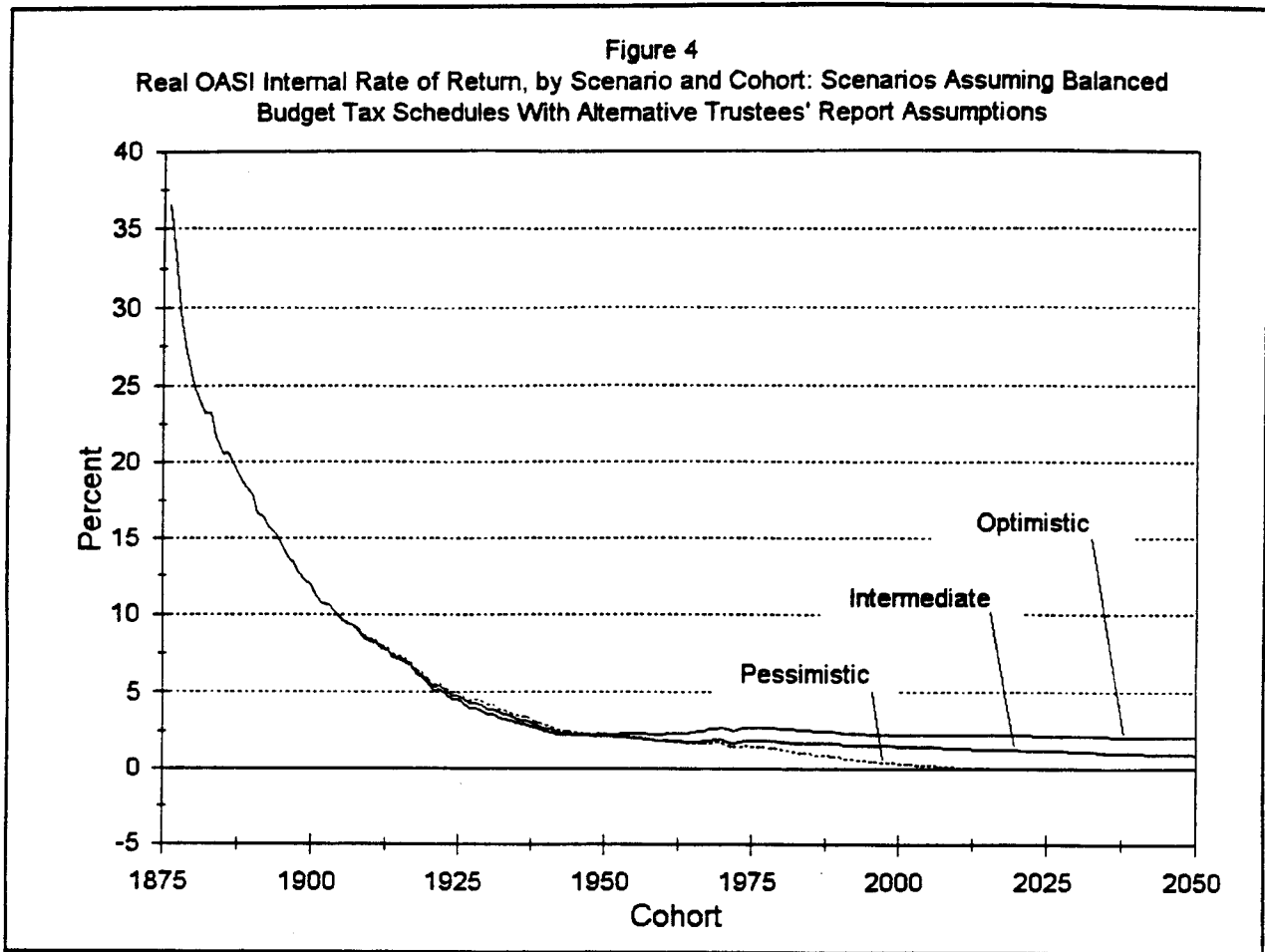
Figure 4 and the corresponding columns in Table 1 illustrate the potential effect of the optimistic and pessimistic assumption alternatives on expected internal rates of return by cohort. Table 1 indicates that the internal rates begin to diverge among the balanced budget scenarios around the 1900 cohort. For the 1899-1946 cohorts, internal rates of return are actually slightly lower under the optimistic scenario than under the intermediate scenario; for the most part, this

Table 1. Real OASI Internal Rate of Return (%), by Scenario and Cohort

Cohort	Tax Schedule / Trustees' Assumption Set:			
	--- Present Law Taxes ---	----- Balanced Budget Taxes -----		
	Intermediate	Optimistic	Intermediate	Pessimistic
1880	25.03	25.03	25.03	25.03
1885	20.55	20.55	20.55	20.55
1890	17.89	17.89	17.89	17.89
1895	14.58	14.58	14.58	14.58
1900	11.90	11.89	11.90	11.91
1905	9.80	9.78	9.80	9.83
1910	8.38	8.33	8.38	8.44
1915	7.30	7.20	7.30	7.40
1920	5.68	5.49	5.68	5.83
1925	4.82	4.55	4.81	5.00
1930	3.95	3.59	3.95	4.20
1935	3.33	3.02	3.33	3.56
1940	2.68	2.46	2.68	2.87
1945	2.29	2.24	2.29	2.44
1950	2.18	2.29	2.18	2.30
1955	2.04	2.30	2.04	2.12
1960	1.84	2.27	1.84	1.85
1965	1.78	2.39	1.77	1.69
1970	1.94	2.70	1.92	1.71
1975	1.87	2.69	1.83	1.47
1980	1.87	2.68	1.80	1.28
1985	1.82	2.56	1.72	1.02
1990	1.80	2.44	1.65	0.79
1995	1.73	2.28	1.53	0.52
2000	1.74	2.24	1.48	0.36
2005	1.75	2.22	1.43	0.23
2010	1.75	2.22	1.38	0.13
2015	1.75	2.21	1.32	0.06
2020	1.74	2.20	1.26	0.02
2025	1.74	2.19	1.19	-0.01
2030	1.73	2.17	1.13	-0.03
2035	1.73	2.14	1.08	-0.03
2040	1.72	2.12	1.02	-0.02
2045	1.72	2.08	0.99	-0.02
2050	1.71	2.06	0.94	-0.01

is due to higher assumed mortality rates under this scenario, which outweigh other effects for these early cohorts.<sup>27</sup> The effects of higher wage growth and lower tax rates outweigh higher

<sup>27</sup> Obviously, the "optimistic" and "pessimistic" characterizations of these assumption sets, although appropriate from the perspective of the financial status of the OASI trust fund, are not necessarily appropriate from the perspective of the program participants.



mortality rates for later cohorts, and rates of return under the optimistic scenario exceed those under the intermediate scenario for cohorts born after 1947, with the difference rising to as much as 1.12 percentage points for the most distant cohorts. Opposite effects are evident under the pessimistic scenario, with lower mortality rates leading to higher rates of return than under the intermediate scenario for the 1897-1960 cohorts, but lower wage growth and higher tax rates eventually leading to lower rates of return than under the intermediate scenario for later cohorts; relative to the intermediate scenario, the largest reduction of 1.26 percentage points is experienced by the 2014 and 2015 cohorts.

Clearly, the earliest cohorts have gotten much more than their money's worth from the OASI program. The large rates of return received by these cohorts reflect the natural result of

a pay-as-you-go social insurance program, where early cohorts pay taxes over little, if any, of their working lives, but receive benefits over a full retirement period. The question of whether later cohorts will continue to receive their money's worth from the OASI program is much more difficult to answer because of disagreement over the appropriate rate of interest to use for comparison. The real interest rates used in social security money's worth analyses typically range from 0 to 6 percent, with 2 or 3 percent the most common. If a real interest rate close to zero or negative is deemed appropriate, then Table 1 implies that even the most distant cohorts are likely to get positive net lifetime transfers from the OASI program, possibly even under the pessimistic balanced budget scenario. If, instead, a real interest rate of 6 percent is considered appropriate, then no cohorts after about the 1920 cohort are likely to get their money's worth from the program under any of the scenarios depicted in Table 1.

The conceptually appropriate interest rate depends, of course, on the particular question being asked. If the program is compared to market alternatives from the perspective of the individual, for example, an after-tax rate of return is appropriate, but there is disagreement among analysts concerning the appropriate market alternative. One argument is that a fair comparison should incorporate the same assurance of non-default and stability of return as in the present program, suggesting that the rate of return on long-term Federal government bonds is an appropriate market alternative; otherwise, the present program would be compared to an inherently different program in terms of the risks faced by participants.<sup>28</sup> While a complete discussion of this issue is beyond the scope of this paper,<sup>29</sup> it should be noted that some recent

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<sup>28</sup> Other risk-reducing characteristics of the OASI program, such as the automatic inflation-adjustment of benefits, argue for using an even lower rate than the rate of return on long-term Federal government bonds. See Leimer and Richardson [1992] for a theoretical discussion and empirical estimates.

<sup>29</sup> See Leimer [1991] for a more complete discussion.

analyses provide support for the view that the appropriate rate for money's worth analyses from the perspective of the individual is lower than the rates typically used.<sup>30</sup> To satisfy alternative views about the appropriate interest rate, this study provides estimates of the internal rate of return, which does not require the assumption of a particular interest rate, and presents other money's worth measures, which do incorporate particular interest rate assumptions, for a variety of interest rates ranging from 0 to 6 percent.

Table 2 depicts one such money's worth measure, the aggregate OASI lifetime wealth increment, discounted to the birth year of each cohort, under the intermediate balanced budget scenario. These estimates reflect the discounted net present value at birth of historical and projected OASI benefits less taxes for each cohort as a whole. The first two columns respectively use the simulated real after-tax government bond rate and real after-tax rate of return to capital to discount simulated taxes and benefits.<sup>31</sup> The government bond rate represents a conservative private investment alternative, while the rate of return to capital represents a riskier investment with higher expected return. Since historical series consistent with the LRM projections are not available for the government bond rate and the rate of return to capital, the lifetime wealth increment estimates under these simulated rates are limited to cohorts born after the base year of the LRM simulation (1989). As shown, the OASI lifetime wealth increment remains positive for all simulated cohorts when compared to the conservative private investment alternative, but is negative for all simulated cohorts when compared to the

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<sup>30</sup> Hurd [1989] finds that most persons value their social security wealth more highly than is indicated by standard present value calculations of social security wealth using a discount rate of 3 percent. Leimer and Richardson [1992] find evidence that the appropriate interest rate from the perspective of the individual may be close to zero or negative.

<sup>31</sup> The real after-tax government bond rate is relatively close to zero over most of the simulation; falling from 0.54 percent in the year 2000 to 0.13 percent in 2150. The real after-tax rate of return to capital declined from 5.55 percent in 2000 to 3.92 percent in 2150.

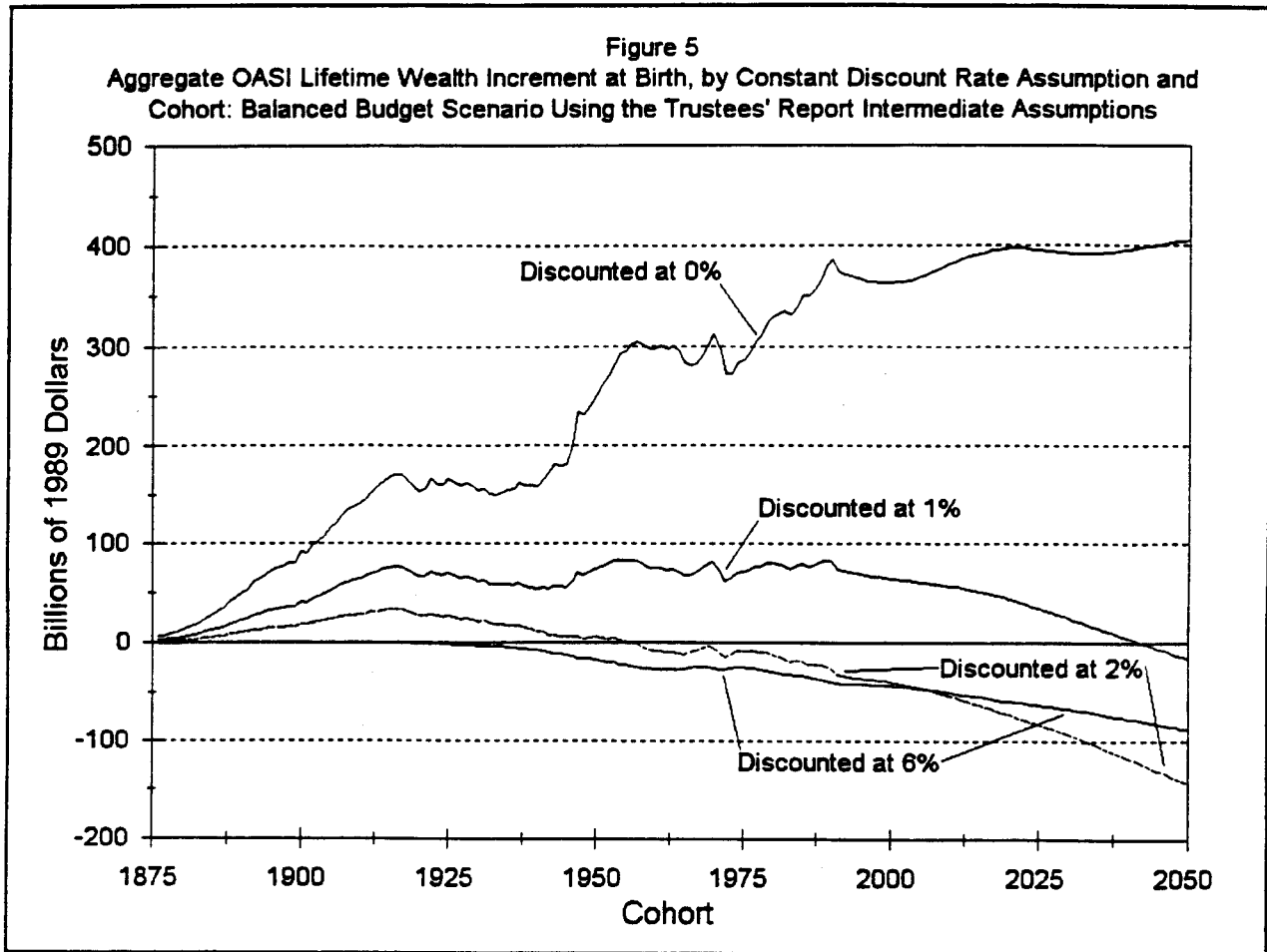
Table 2. Aggregate OASI Lifetime Wealth Increment at Birth, by Simulated After-Tax or Assumed Discount Rate and Cohort: Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions, in Billions of 1989 Dollars

Cohort	----- Simulated Discount Rates -----		----- Assumed Constant Discount Rates -----			
	Government Bond Rate	Rate of Return to Capital	0%	1%	2%	6%
1880	.....	.....	12.954	5.824	2.648	0.125
1885	.....	.....	27.834	12.714	5.872	0.294
1890	.....	.....	49.182	22.619	10.517	0.538
1895	.....	.....	71.475	32.849	15.249	0.759
1900	.....	.....	90.882	41.628	19.221	0.896
1905	.....	.....	116.017	52.953	24.271	1.000
1910	.....	.....	141.544	64.262	29.172	0.991
1915	.....	.....	168.476	75.644	33.755	0.794
1920	.....	.....	152.839	66.251	27.962	-0.251
1925	.....	.....	167.065	70.181	28.044	-1.244
1930	.....	.....	154.669	61.752	22.309	-2.573
1935	.....	.....	154.562	58.318	18.374	-4.232
1940	.....	.....	158.020	53.746	12.056	-7.084
1945	.....	.....	180.375	55.508	7.064	-10.865
1950	.....	.....	250.115	74.150	6.470	-16.622
1955	.....	.....	294.844	82.431	1.872	-22.077
1960	.....	.....	297.529	74.515	-7.916	-26.144
1965	.....	.....	283.831	67.631	-11.298	-26.152
1970	.....	.....	312.056	81.818	-3.721	-24.956
1975	.....	.....	286.805	71.024	-8.059	-24.641
1980	.....	.....	331.213	80.194	-11.323	-29.184
1985	.....	.....	351.316	80.094	-17.644	-33.181
1990	290.650	-41.856	386.684	83.034	-25.264	-38.908
1995	287.512	-48.371	366.311	68.564	-35.426	-41.475
2000	293.149	-54.564	363.482	64.402	-39.309	-42.878
2005	301.561	-62.814	369.211	61.016	-44.962	-45.626
2010	313.458	-73.168	381.678	57.100	-53.299	-49.931
2015	322.337	-83.474	392.134	51.642	-62.760	-54.514
2020	325.820	-92.740	397.276	44.301	-72.719	-58.893
2025	322.807	-100.259	395.374	35.282	-82.404	-62.631
2030	318.267	-107.402	392.151	25.517	-92.531	-66.452
2035	316.171	-115.781	392.288	15.379	-104.126	-71.124
2040	316.744	-125.546	395.903	5.030	-117.057	-76.606
2045	318.231	-135.660	400.634	-5.159	-130.166	-82.273
2050	319.786	-145.222	405.300	-14.708	-142.550	-87.687

riskier alternative.

The final four columns of Table 2 depict the corresponding aggregate lifetime wealth increment for historical as well as simulated cohorts under the assumption of a constant real





discount rate. These estimates are presented graphically in Figure 5. The aggregate lifetime wealth increment is positive for all cohorts under the 0 percent discount rate assumption and positive for all but the most distant cohorts under the 1 percent discount rate assumption. The net lifetime wealth increment turns negative for all cohorts born after 1956 under the 2 percent discount rate assumption, and for all cohorts born after 1919 under the 6 percent discount rate assumption.

These results suggest that current new labor force entrants are unlikely to receive positive net lifetime wealth increments from the program under either the 2 percent or 6 percent discount rate assumptions, although the exact cohorts for which the lifetime wealth increments turn negative will depend on the specific tax and benefit adjustments actually adopted to bring the

OASI program into long-run financial balance. In contrast, cohorts born well into the future are likely to continue to receive positive net lifetime transfers from the program under the 0 percent discount rate assumption, regardless of the tax and benefit adjustments required to bring the program into balance.

While the sign of the net lifetime wealth increment for future cohorts under the 0, 2, or 6 percent discount rates does not appear to be sensitive to the specific tax and benefit adjustments adopted to bring the OASI program into long-run financial balance, the same cannot be said of the 1 percent discount rate.<sup>32</sup> This greater sensitivity follows from the fact that, under the balanced budget simulations incorporating the intermediate Trustees' Report assumptions, the 1 percent discount rate is below the internal rates of return projected for cohorts currently participating in the Social Security program but slightly above the eventual long run growth rate projected for taxable payroll, so that a crossover from positive to negative net lifetime transfers is likely to occur for some future cohorts;<sup>33</sup> the exact cohorts for which the net lifetime wealth increments turn negative will depend on the particular tax or benefit adjustments adopted to bring the program into balance. In contrast, internal rates of return for future cohorts are unlikely to rise as high as 2 percent or fall as low as 0 percent under any reasonable changes in program provisions, so that a change in the sign of the net lifetime transfer is unlikely to

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<sup>32</sup> See Figure B2 and Table B2 in Appendix B for analogous results under an alternative balanced budget simulation in which award reductions, rather than tax increases, are used to bring the OASI program into actuarial balance over the full simulation period.

<sup>33</sup> The internal rate of return in a mature pay-as-you-go social insurance program will eventually approach the rate of growth in taxable payroll, assuming that tax and benefit provisions remain constant and that fertility, mortality, and economic growth rates remain stable. (See Aaron [1966] for a demonstration of this result.) While the simulations in this paper were not extended to achieve steady state solutions, the long run growth rate in OASI taxable payroll appears to be slightly under 1 percent for the tax increase or award reduction balanced budget scenarios using the Trustees' Report intermediate assumptions; the geometric mean growth rate in taxable payroll over each of last five decades of both simulations, for example, varied between 0.92 and 0.93 percent.

occur for future cohorts using discount rates of 0 percent or lower or discount rates of 2 percent or higher under the intermediate Trustees' Report assumptions.

The 0 percent column of Table 2 also illustrates the extent to which undiscounted aggregate real net lifetime transfers under the OASI program have tended to grow over successive cohorts, despite the fact that earlier cohorts did better in a rate of return sense. This trend, which is evident over the early cohorts even in the discounted columns, reflects a number of factors, including program maturation, the episodic expansion of program coverage and provisions, an expanding population, and productivity gains.

An interesting feature of Figure 5 is the crossover that occurs between the 2 percent and 6 percent graphs; i.e., projected net lifetime transfers under the 2 percent discount rate assumption lie above those under the 6 percent assumption for early cohorts, but below the 6 percent projections for distant cohorts. Such crossovers can occur when streams that are characterized by early predominantly negative elements and later predominantly positive elements have negative present values, as is the case in Figure 5 at the point of the crossover.<sup>34</sup>

To get a feel for the level of expected net lifetime transfers per person, Table 3 displays the aggregate OASI lifetime wealth increments for quinquennial simulated cohorts divided by each cohort's population at birth.<sup>35</sup> Figures C1 and C2 in Appendix C display these data graphically. These estimates indicate that net lifetime transfers per person under the OASI

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<sup>34</sup> For streams with uniformly negative early elements followed by uniformly positive elements, the derivative of the present value function with respect to the discount rate is negative so long as the present value itself is positive; consequently, increasing the discount rate applied to such a stream always reduces its present value, so crossovers do not occur. The derivative of the present value function of such streams is of indeterminate sign, however, when the present value itself is negative, so that crossovers can occur, as in Figure 5.

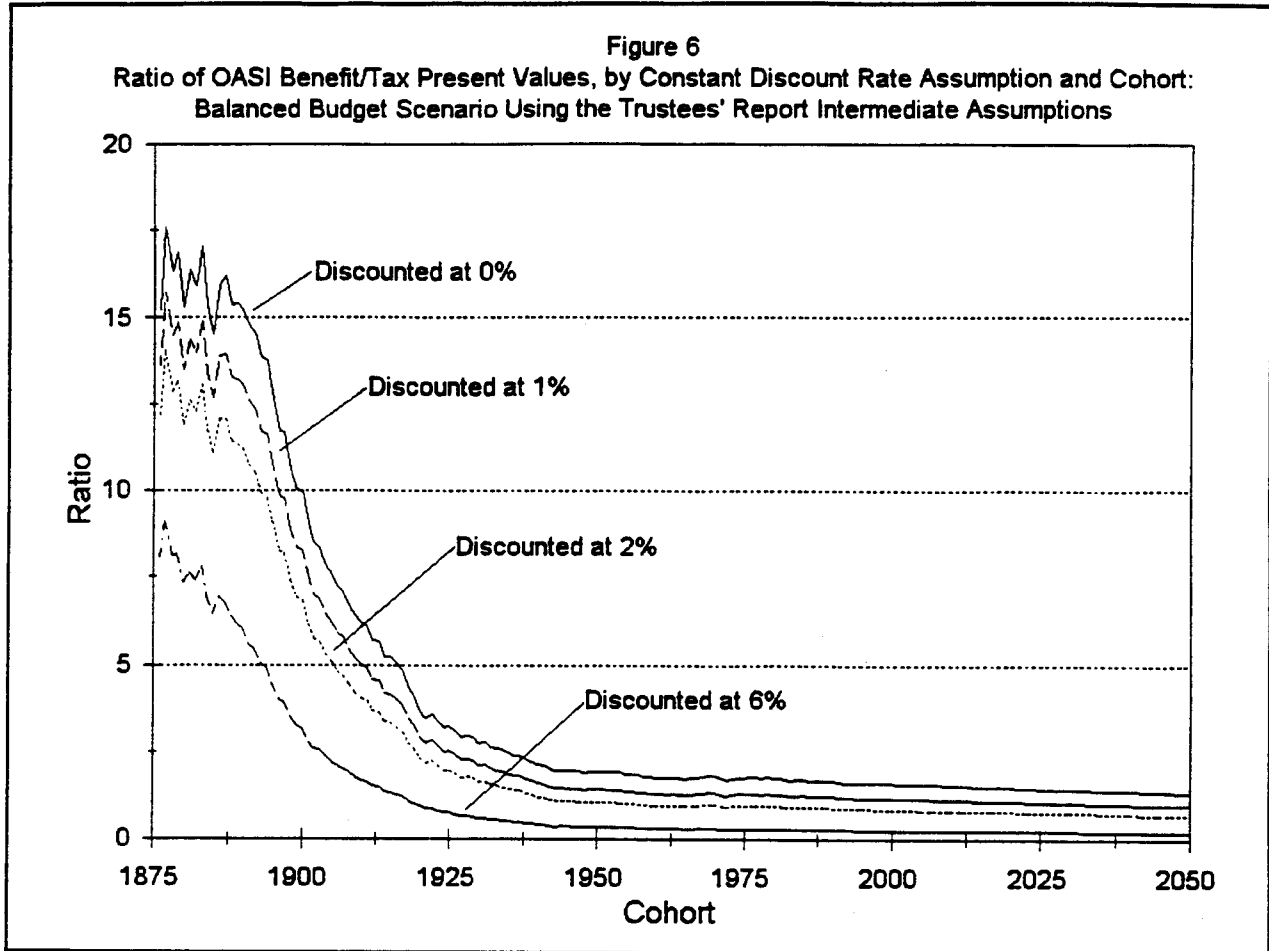
<sup>35</sup> These estimates are not equivalent to expected lifetime transfers per initial cohort member because of net immigration over the cohort's life cycle. The estimates in Table 3 are limited to cohorts born after 1940, even for the assumed constant discount rate columns, because of the limited availability of a historical birth population series consistent with the birth population series generated by the LRM.

Table 3. OASI Lifetime Wealth Increment at Birth per Initial Cohort Member, by Simulated After-Tax or Assumed Discount Rate and Cohort: Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions, in 1989 Dollars

Cohort	---- Simulated Discount Rates ----		----- Assumed Constant Discount Rates -----			
	Government Bond Rate	Rate of Return to Capital	0%	1%	2%	6%
1945	.....	.....	65,636	20,199	2,570	-3,954
1950	.....	.....	72,709	21,556	1,881	-4,832
1955	.....	.....	75,188	21,021	0,477	-5,630
1960	.....	.....	71,937	18,016	-1,914	-6,321
1965	.....	.....	72,823	17,352	-2,899	-6,710
1970	.....	.....	88,899	23,308	-1,060	-7,110
1975	.....	.....	91,304	22,611	-2,566	-7,844
1980	.....	.....	94,872	22,971	-3,243	-8,359
1985	.....	.....	95,571	21,789	-4,800	-9,026
1990	73,001	-10,513	97,122	20,855	-6,345	-9,772
1995	74,254	-12,492	94,605	17,707	-9,149	-10,711
2000	79,550	-14,807	98,636	17,477	-10,667	-11,636
2005	82,974	-17,283	101,588	16,789	-12,371	-12,554
2010	84,483	-19,720	102,869	15,390	-14,365	-13,457
2015	85,195	-22,062	103,642	13,649	-16,588	-14,408
2020	85,430	-24,316	104,166	11,616	-19,067	-15,442
2025	85,448	-26,539	104,657	9,339	-21,813	-16,579
2030	85,212	-28,755	104,993	6,832	-24,774	-17,792
2035	84,679	-31,009	105,066	4,119	-27,888	-19,049
2040	84,129	-33,346	105,154	1,336	-31,091	-20,347
2045	83,948	-35,787	105,686	-1,361	-34,337	-21,703
2050	84,335	-38,298	106,887	-3,879	-37,594	-23,125

program are substantial, amounting to a positive present value of nearly \$100,000 for recent birth cohorts under the 0 percent discount rate assumption or a negative present value of nearly \$10,000 for those cohorts under the 6 percent discount rate assumption. These results highlight the extreme sensitivity of money's worth evaluations to the discount rate assumption. For example, future cohorts can expect to continue to receive substantial positive net lifetime transfers under the OASI program, worth over \$70,000 per member at birth, if the program is compared with a conservative investment alternative such as government bonds; comparing the program to a riskier investment alternative with higher expected yield, such as capital

investment, suggests that future cohorts will continue to suffer substantial losses in lifetime income from their participation in the program, equivalent to inheriting an average debt obligation at birth of about \$10,000 to \$40,000 per member, depending on the cohort.



An alternative money's worth measure used in some analyses is the ratio of the present value of benefits to the present value of taxes. For purposes of comparison, Figure 6 and Table 4 present such benefit/tax ratio estimates for the cohorts included in this analysis.<sup>36</sup> A benefit/tax ratio of 1 corresponds to a lifetime wealth increment of 0; i.e., it defines the point at which the present value of lifetime benefits is equal to the present value of lifetime taxes.

<sup>36</sup> The collective benefit/tax ratio across all cohorts born prior to 1876 was calculated as 16.99, 15.47, 14.12, and 10.06, respectively, under the 0, 1, 2, and 6 percent constant discount rate assumptions.

Table 4. Ratio of OASI Benefit/Tax Present Values, by Simulated After-Tax or Assumed Discount Rate and Cohort: Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions

Cohort	----- Simulated Discount Rates -----		----- Assumed Constant Discount Rates -----			
	Government Bond Rate	Rate of Return to Capital	0%	1%	2%	6%
1880	.....	.....	15.29	13.50	11.92	7.34
1885	.....	.....	14.54	12.69	11.07	6.45
1890	.....	.....	15.24	13.08	11.22	6.07
1895	.....	.....	12.87	10.81	9.09	4.51
1900	.....	.....	9.98	8.27	6.84	3.18
1905	.....	.....	7.58	6.21	5.08	2.24
1910	.....	.....	6.21	5.03	4.06	1.70
1915	.....	.....	5.23	4.19	3.35	1.35
1920	.....	.....	3.70	2.94	2.33	0.93
1925	.....	.....	3.26	2.55	1.99	0.75
1930	.....	.....	2.76	2.13	1.65	0.61
1935	.....	.....	2.47	1.88	1.43	0.51
1940	.....	.....	2.15	1.61	1.21	0.41
1945	.....	.....	1.97	1.47	1.09	0.37
1950	.....	.....	1.95	1.43	1.06	0.34
1955	.....	.....	1.89	1.38	1.01	0.33
1960	.....	.....	1.78	1.30	0.95	0.31
1965	.....	.....	1.74	1.27	0.93	0.29
1970	.....	.....	1.83	1.34	0.98	0.30
1975	.....	.....	1.78	1.30	0.95	0.29
1980	.....	.....	1.77	1.29	0.94	0.28
1985	.....	.....	1.73	1.26	0.91	0.27
1990	1.62	0.49	1.69	1.23	0.89	0.27
1995	1.56	0.47	1.63	1.18	0.86	0.25
2000	1.54	0.47	1.61	1.17	0.85	0.25
2005	1.52	0.46	1.59	1.15	0.83	0.24
2010	1.49	0.45	1.56	1.13	0.82	0.24
2015	1.46	0.44	1.53	1.11	0.80	0.23
2020	1.44	0.43	1.50	1.09	0.79	0.23
2025	1.41	0.42	1.47	1.06	0.77	0.22
2030	1.38	0.41	1.44	1.04	0.76	0.22
2035	1.36	0.40	1.42	1.03	0.74	0.21
2040	1.33	0.39	1.39	1.01	0.73	0.21
2045	1.31	0.39	1.37	0.99	0.72	0.20
2050	1.30	0.38	1.36	0.98	0.71	0.20

Benefit/tax ratios greater than 1 and lifetime wealth increments greater than 0, for example, indicate lifetime benefits in excess of lifetime taxes. A comparison of figures 5 and 6 illustrates, however, that the different money's worth measures do not necessarily produce equivalent

results; e.g., the crossover that occurs between the 2 percent and 6 percent graphs in Figure 5 is not evident in Figure 6. This observation also applies to the internal rate of return measure, which is useful from an expositional standpoint, since it invites comparison with any interest rate of the reader's choosing, while other money's worth measures incorporate a particular interest rate assumption into the estimates. Both the benefit/tax ratio and internal rate of return, however, can indicate a different ranking of program outcomes than is indicated by the lifetime wealth increment measure;<sup>37</sup> a number of such cases appear in the estimates developed for this paper.

### **Redistributional Estimates**

With the exception of the 0 percent discount rate case, the money's worth estimates presented thus far do not actually measure intercohort redistribution under the program, as defined in this paper, because the present values are evaluated at different points in time, i.e., at birth for each cohort, and because the discount rates used thus far have been interpreted as appropriate from the perspective of the individual, rather than from the perspective of the program.<sup>38</sup> The appropriate interest rate for measuring intercohort redistribution still depends on the particular question being asked, but different considerations apply. The key consideration is the rate at which the trust fund is able to transform funds over time consistent with judgements

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<sup>37</sup> The lifetime wealth increment measure is generally the preferred measure for ranking redistribution across or within cohorts under the program, because the extent of intercohort redistribution, by definition, depends on the amount by which the present value of benefits exceeds the present value of taxes, regardless of what their ratio happens to be. Of course, the amount of redistribution effected by the program across or within cohorts may not be a reliable indicator of the preferences of program participants, due to market imperfections or general equilibrium effects, aside from the obvious distinction between lifetime wealth and lifetime utility. For example, borrowing constraints may make program size a critical element. Similarly, the effect of the program on consumption and labor supply may reduce the generality of the lifetime wealth increment measure as an indicator of the effect of the program on total lifetime income.

<sup>38</sup> Recall that the term "intercohort redistribution" is used in this paper to refer to differences across cohorts in the current trust fund equivalents of the net lifetime transfers experienced by each cohort under the OASI program.

concerning responsible management of trust fund assets. Because of disagreement over what constitutes responsible management, this interest rate may be perceived as different from the rate that the trust fund actually experiences. Interest earned by the OASI trust fund, for instance, reflects an internal government transaction and is viewed by some as not accurately reflecting the appropriate rate of return for a fiscally responsible social insurance program. Some analysts have argued, for example, that the Social Security trust funds should invest directly in commercial stocks and bonds to increase returns, while others have argued that such investments are too risky for a fiscally responsible program.

Table 5 presents estimates of intercohort redistribution under several alternative real interest rate assumptions. These estimates reflect the net present value of historical and projected OASI benefits less taxes for each cohort as a whole, accumulated or discounted to 1989. Under each interest rate assumption, then, this table indicates the net transfers effected by the OASI program across the various cohorts in terms of their 1989 present values. Under the 6 percent real discount rate assumption, for example, the lifetime net transfer given to the 1880 cohort would correspond to a reduction of about \$72 billion in the 1989 OASI trust fund if the fund had historically experienced a 6 percent real return on its assets. In contrast, the 1989 present value of the gain in trust fund assets associated with the net OASI transfers projected over the lifetime of the 2050 cohort is about \$2.5 billion under the same discount rate assumption.

The first column of Table 5 is of particular interest, as it presents estimates of intercohort redistribution under the OASI program using the effective rates of return actually earned



Table 5. Aggregate OASI Lifetime Net Intercohort Transfer, Evaluated in 1989, by Discount Rate Assumption and Cohort: Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions, in Billions of 1989 Dollars

Cohort	OASI Trust Fund Discount Rate	----- Assumed Constant Discount Rates -----			
		0%	1%	2%	6%
1880	22.167	12.954	17.229	22.926	71.655
1885	46.866	27.834	35.785	46.047	125.938
1890	80.661	49.182	60.574	74.698	172.212
1895	113.022	71.475	83.701	98.097	181.549
1900	136.254	90.882	100.922	111.993	160.151
1905	161.506	116.017	122.148	128.086	133.565
1910	173.683	141.544	141.040	139.438	98.909
1915	165.140	168.476	157.963	146.134	59.218
1920	96.964	152.839	131.634	109.643	-13.989
1925	62.579	167.065	132.675	99.598	-51.808
1930	27.496	154.669	111.074	71.761	-80.073
1935	7.100	154.562	99.806	53.532	-98.415
1940	-17.115	158.020	87.517	31.814	-123.102
1945	-35.609	180.375	86.000	16.883	-141.087
1950	-47.044	250.115	109.306	14.006	-161.292
1955	-52.482	294.844	115.616	3.670	-160.081
1960	-49.995	297.529	99.441	-14.058	-141.658
1965	-34.179	283.831	85.873	-18.172	-105.888
1970	-16.857	312.056	98.845	-5.421	-75.507
1975	-17.191	286.805	81.640	-10.634	-55.711
1980	-18.885	331.213	87.707	-13.532	-49.306
1985	-22.438	351.316	83.346	-19.098	-41.890
1990	-26.497	386.684	82.212	-24.769	-36.706
1995	-30.479	366.311	64.590	-31.457	-29.238
2000	-29.749	363.482	57.725	-31.615	-22.588
2005	-29.988	369.211	52.036	-32.752	-17.961
2010	-31.326	381.678	46.333	-35.165	-14.687
2015	-32.586	392.134	39.870	-37.504	-11.983
2020	-33.434	397.276	32.543	-39.359	-9.673
2025	-33.622	395.374	24.659	-40.396	-7.687
2030	-33.566	392.151	16.969	-41.085	-6.095
2035	-33.633	392.288	9.731	-41.875	-4.875
2040	-33.718	395.903	3.028	-42.637	-3.923
2045	-33.485	400.634	-2.955	-42.943	-3.149
2050	-32.792	405.300	-8.016	-42.595	-2.508

historically and simulated prospectively on trust fund assets.<sup>39</sup> Under this discount rate assumption, lifetime net transfers under the OASI program remain positive through the 1937 cohort, but become negative for later cohorts. From this perspective, then, the OASI program effected transfers from later, generally richer, cohorts to earlier, generally poorer, cohorts. Despite this general pattern of transfers from post-1937 cohorts to earlier cohorts, however, the pattern of aggregate lifetime transfers across individual cohorts exhibits multiple inflection points, raising questions of intercohort fairness that will be addressed further in the following section.

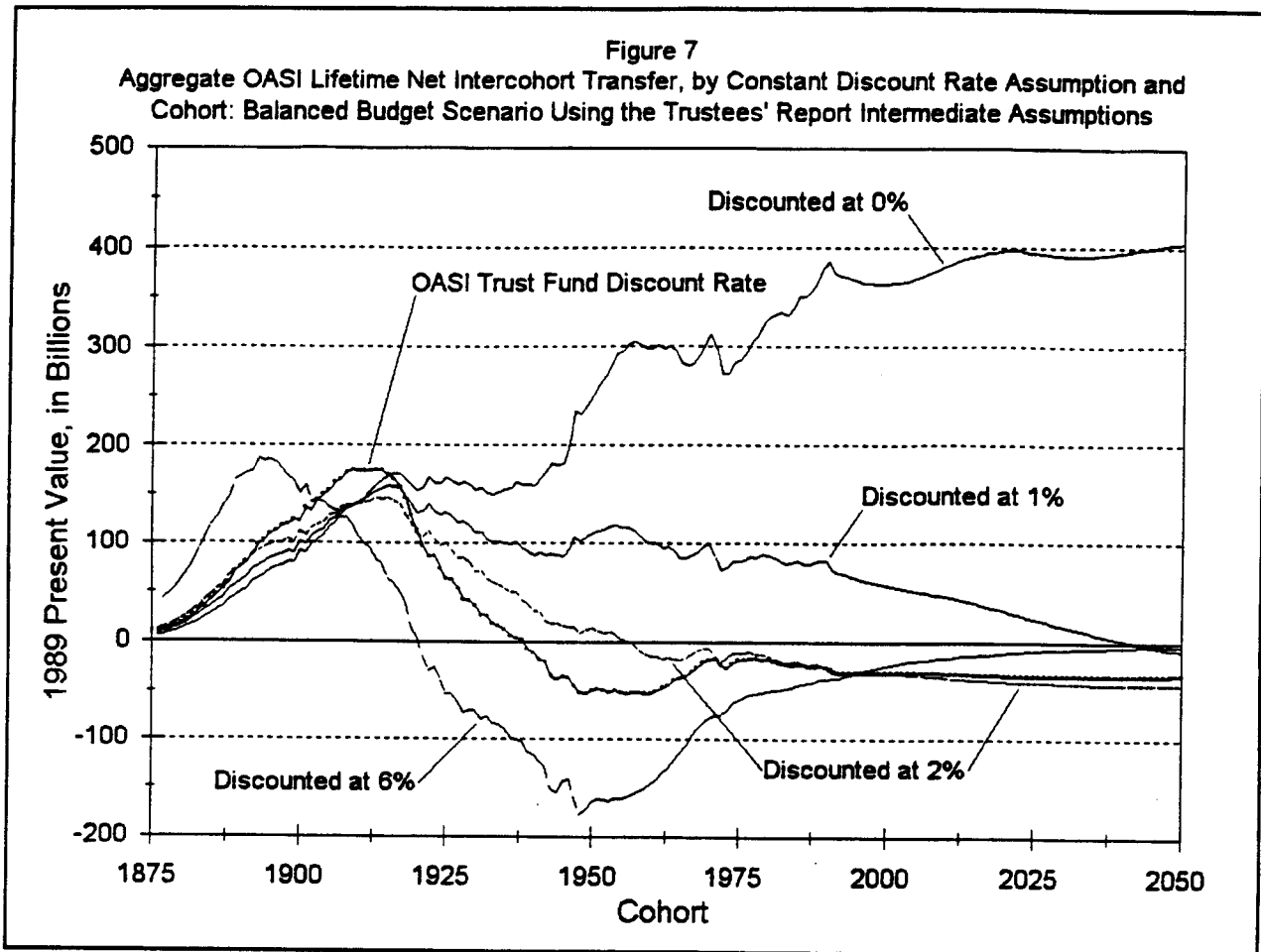
As illustrated by the 0 percent column in Table 5, the present value of net transfers under the program can be positive for all cohorts if the discount rate used to compute the present values is generally lower than the rate of growth in taxable payroll, which determines the implicit rate of return in a mature pay-as-you-go social insurance program.<sup>40</sup> In the intermediate balanced budget simulation underlying the estimates in Table 5, for example, the rate of growth in the payroll tax base averages a little over 0.9 percent after the tax rate stabilizes in 2099; under higher discount rates, then, the positive net lifetime transfers to earlier cohorts come at the expense of negative lifetime transfers to later cohorts. These results are depicted graphically in Figure 7.

Figure C3 in Appendix C depicts the corresponding estimates per initial cohort member for cohorts with available initial population estimates. These "per capita" results are qualitatively

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<sup>39</sup> The effective annual real rate of return to OASI trust fund assets was relatively low over most of the 1937-89 period, averaging 0.6 percent over that period, but rising to its highest levels toward the end of the period. Prospectively, the real OASI trust fund interest rate in the intermediate balanced budget simulation was assumed to fall from 6.4 percent in 1989 to 2.6 percent in 2000; subsequently, the simulated rate declined gradually to 2.2 percent in 2030 and remained essentially constant thereafter.

<sup>40</sup> Again, see Aaron [1966] for a demonstration of this result under steady state assumptions.



similar for available cohorts to the cohort aggregate results displayed in Figure 7, except for the diminution of the positive and negative "humps" associated with the baby boom cohorts.

#### IV. Counterfactual Pay-As-You-Go Program Alternatives

The net lifetime transfer estimates developed thus far implicitly incorporate a market alternative as the standard of fairness; i.e., these estimates indicate how well each cohort fares under the OASI program compared to how well it would fare under a funded public or private program assuming a particular interest rate. While the market alternative is a valid standard of comparison for some purposes, it ignores the fundamental character of a pay-as-you-go social insurance program, which by nature pays higher rates of return to earlier, generally poorer,

cohorts and lower rates of return to later, generally richer, cohorts. Put another way, if the market alternative were the only relevant standard of fairness, a pay-as-you-go program could be considered inherently unfair if even one cohort received a negative net lifetime transfer.

The popularity of pay-as-you-go social insurance programs suggests the desirability of developing alternative standards of fairness that incorporate the inherent characteristics of pay-as-you-go programs. The previous estimates presented in this paper are difficult to evaluate from the standpoint of fairness within the context of a pay-as-you-go program, because it is not obvious what the results should look like across cohorts. The rates of return depicted in Figure 4, for example, decline rapidly over the early cohorts and tend to flatten out over the later cohorts, but it is difficult to judge whether the rates should have declined more or less quickly or flattened out at a different level relative to some standard of intercohort fairness.

One way to deal with this problem is to pose a counterfactual pay-as-you-go program that incorporates explicit definitions of equal or fair treatment across cohorts and evaluate actual OASI program results relative to the results that would have occurred under the counterfactual program. Obviously, such comparisons only have relevance if one accepts the definitions of equal or fair treatment incorporated into the counterfactual program, but this condition is no different conceptually than the condition attached to money's worth measures, such as the lifetime wealth increment, which have relevance only if one accepts the particular discount rate incorporated into the measures. Just as different discount rates can be used to develop alternative money's worth estimates for those with different preferences, different definitions of equal or fair treatment can be incorporated into alternative counterfactual programs for comparison to the OASI program.

This section compares OASI program results with two counterfactual social insurance programs<sup>41</sup> that are intended to represent opposite judgements concerning the appropriate distribution of the pay-as-you-go start-up dividend across cohorts.<sup>42</sup> Total tax and benefit payments are each constrained under both counterfactual programs to have the same present values as under the present OASI program using the effective rate of return actually earned on trust fund assets.<sup>43</sup> The combination of historical taxes and benefits with simulated taxes and benefits under the intermediate balanced budget scenario is assumed to define present program results for the purpose of this illustration.

Both counterfactual programs avoid the episodic changes in tax rates and coverage characteristic of the present program; both counterfactual programs also attempt to smooth the effects of demographic cycles and irregularities on the treatment of different cohorts in the specification of their benefit provisions, which are discussed below, and in the specification of a constant tax rate over time, a constant definition of taxable payroll, and a constant definition of eligibility for retirement benefits. For simplicity in this illustration, taxable payroll under the counterfactual programs is defined as all labor income,<sup>44</sup> and eligibility for retirement benefits

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<sup>41</sup> For ease of exposition, the term "counterfactual" is applied here to deviations from projected future program provisions as well as to deviations from historical provisions under the present program.

<sup>42</sup> The term "start-up dividend" is used here to refer to the excess of the early benefits paid under a pay-as-you-go program compared to the smaller benefits that would be paid under an actuarially fair program.

<sup>43</sup> The present values were constrained over the 1937-2150 period, representing all years from the beginning of the OASI program through the end of the LRM simulation period.

<sup>44</sup> Following the approach adopted in the LRM simulations, labor income was derived historically under the assumption that the share of proprietors' income attributable to labor was the same as labor's share of output in the remainder of the economy.

is defined as attainment of age 65.<sup>45</sup> The proportional distribution of taxable payroll by age in each year under the counterfactual programs is assumed to be the same as under the present program, and the constant tax rate is derived under the condition that the present value of tax revenues be the same under both counterfactual programs as under the present program. For this exercise, the counterfactual changes in OASI tax and benefit provisions are assumed to have no broader economic effects on such variables as the rate of return to trust fund assets or the labor income of any cohort.<sup>46</sup>

Benefits under both counterfactual programs are assumed to start in 1940, analogous to the initiation of monthly cash benefit payments in that year under the present program. While taxes by age and year are identical under the two counterfactual programs, benefits are determined differently under alternative concepts of intercohort fairness.<sup>47</sup> The first counterfactual program adopts a "single start-up" definition of fairness, with average benefits each year adjusted for changes in average labor income and with the level of benefits determined by the condition that the present value of benefit payments be the same under the counterfactual and present programs. With the exception of the demographic smoothing noted above, this counterfactual program corresponds to a common definition of a pay-as-you-go program, with a single start-up, a constant ratio between average benefits and average earnings, and retirees sharing in

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<sup>45</sup> The historical Social Security area population by age in each year was adjusted proportionately to sum to the NIPA population aggregate in that year for use in conjunction with projections of the future NIPA population by year and age, as simulated by the LRM.

<sup>46</sup> As such, results under the counterfactual programs are derived from the OASI tax and benefit, labor income, population, and interest rate projections generated by the intermediate balanced budget simulation, rather than from separate LRM simulations.

<sup>47</sup> The intercohort distribution of the pay-as-you-go start-up dividend is the only aspect of fairness considered in this example. Other aspects or principles of fairness could be introduced by simulating outcomes under counterfactual programs embodying those aspects or principles. One aspect of fairness not considered here, for example, is the distribution of outcomes within cohorts.

productivity gains during the retirement period.<sup>48</sup> The single start-up feature of this program is likely to treat the earliest cohorts more favorably than the present program, whose episodic expansions are equivalent to multiple start-ups favoring later cohorts.

The second counterfactual program adopts a "shared start-up" definition of intercohort fairness, with the start-up dividend shared equally on a per capita basis over all years for which benefits are paid (1940-2150) during the analysis period.<sup>49</sup> Rather than distributing a positive dividend only to cohorts already working or retired when the program is instituted, as in the single start-up case, the shared start-up program distributes a positive dividend across all cohorts considered in the analysis. In this sense, these two counterfactual programs might be viewed as polar examples of pay-as-you-go programs in terms of their distribution of the start-up dividend. The shared start-up program is a pay-as-you-go program in the long-run sense that it ends up with the same unfunded liability as the single start-up program.<sup>50</sup> The shared start-up program, however, can also be viewed as a funded program that is gradually converted to a pay-as-you-go basis by a systematic distribution of the start-up dividend over the analysis period. By virtue of its design, the shared start-up program is likely to treat the earliest cohorts

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<sup>48</sup> For simplicity, the average benefit in each year is assumed to be constant across retirees of all ages.

<sup>49</sup> For simplicity, an extended definition of the "start-up dividend" is adopted in this exercise, equal to the present value of the difference over the full analysis period (1937-2150) between benefits under the pay-as-you-go program and benefits under an actuarially fair program with the same present value of taxes. Under this definition, the start-up dividend may contain both a positive component, for early cohorts with positive lifetime net transfers, and a negative component, for late cohorts with negative lifetime net transfers under the pay-as-you-go program.

<sup>50</sup> The unfunded liability measure is generally defined as the present value of prospective benefits less taxes for present (and, in the open group measure, future) program participants, evaluated using expected trust fund interest rates, less the present value of the trust fund. The two counterfactual programs should have similar unfunded liabilities at the end of the analysis period (2150), then, since taxes are the same under the two programs, benefit promises under both programs after that point are consistent with an internal rate of return determined by identical growth rates in taxable payroll, and both programs are constrained to have identical trust funds at that point.

less favorably and the latest cohorts more favorably than either the present program or the single start-up counterfactual program.

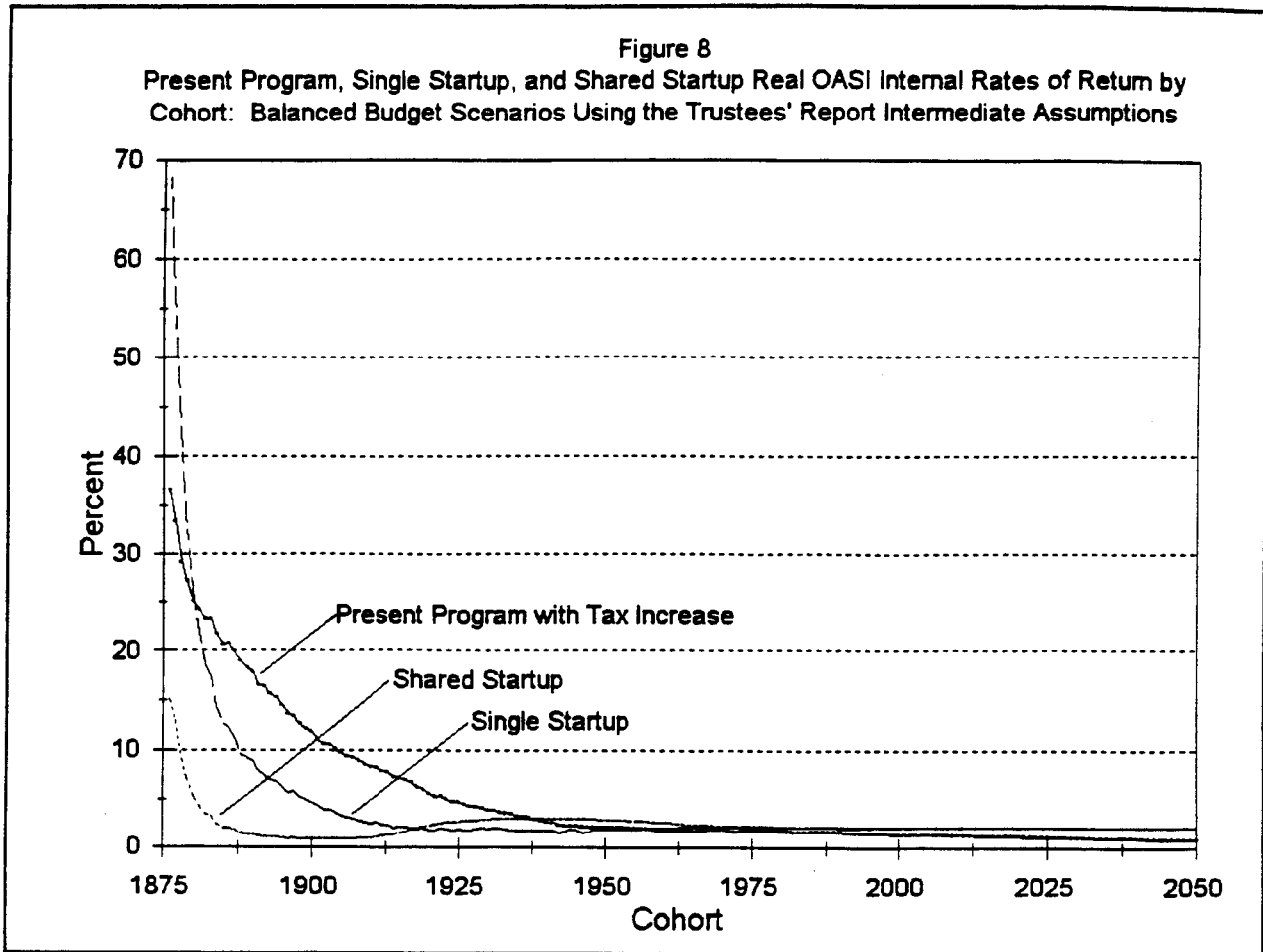
The shared start-up program is implemented by first computing a fair real annuity for each cohort at age 65, using the effective rate of return to OASI trust fund assets<sup>51</sup> and accounting for the differential mortality experienced by each cohort. In addition to this fair annuity, a shared start-up benefit dividend is distributed across all retirees in all years of the analysis period; this shared dividend, which is constant in real terms across all retirees and included years, is calculated under the constraint that the present value of total benefits under the counterfactual program must be the same as under the present program.

Real internal rates of return by cohort under the present program and the two counterfactual programs are depicted graphically in Figure 8 and listed for quinquennial cohorts in Table 6. As expected, rates of return for the earliest cohorts under the single start-up program exceed those under either the shared start-up or present program. Rates of return for many of the early cohorts under the shared start-up program lie below those of later cohorts due to the relatively low real rates of return earned by OASI trust fund assets prior to about 1983; these low rates of return reduce the fair annuity component of benefits for those cohorts under the shared start-up program. For current new labor force entrants and later cohorts, rates of return under either of the counterfactual programs lie above the rates of return projected under the present program. The conclusion suggested by Table 6 and Figure 8 is that most of the early cohorts have fared better and most of the late cohorts have fared worse in a rate of return sense under the present program than they would have under either counterfactual program. Relative to the

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<sup>51</sup> Since distributions of the start-up dividend under the shared start-up counterfactual program are assumed to terminate after 2150, the "fair" discount rate for years beyond 2150 is set equal to the growth rate in taxable payroll.



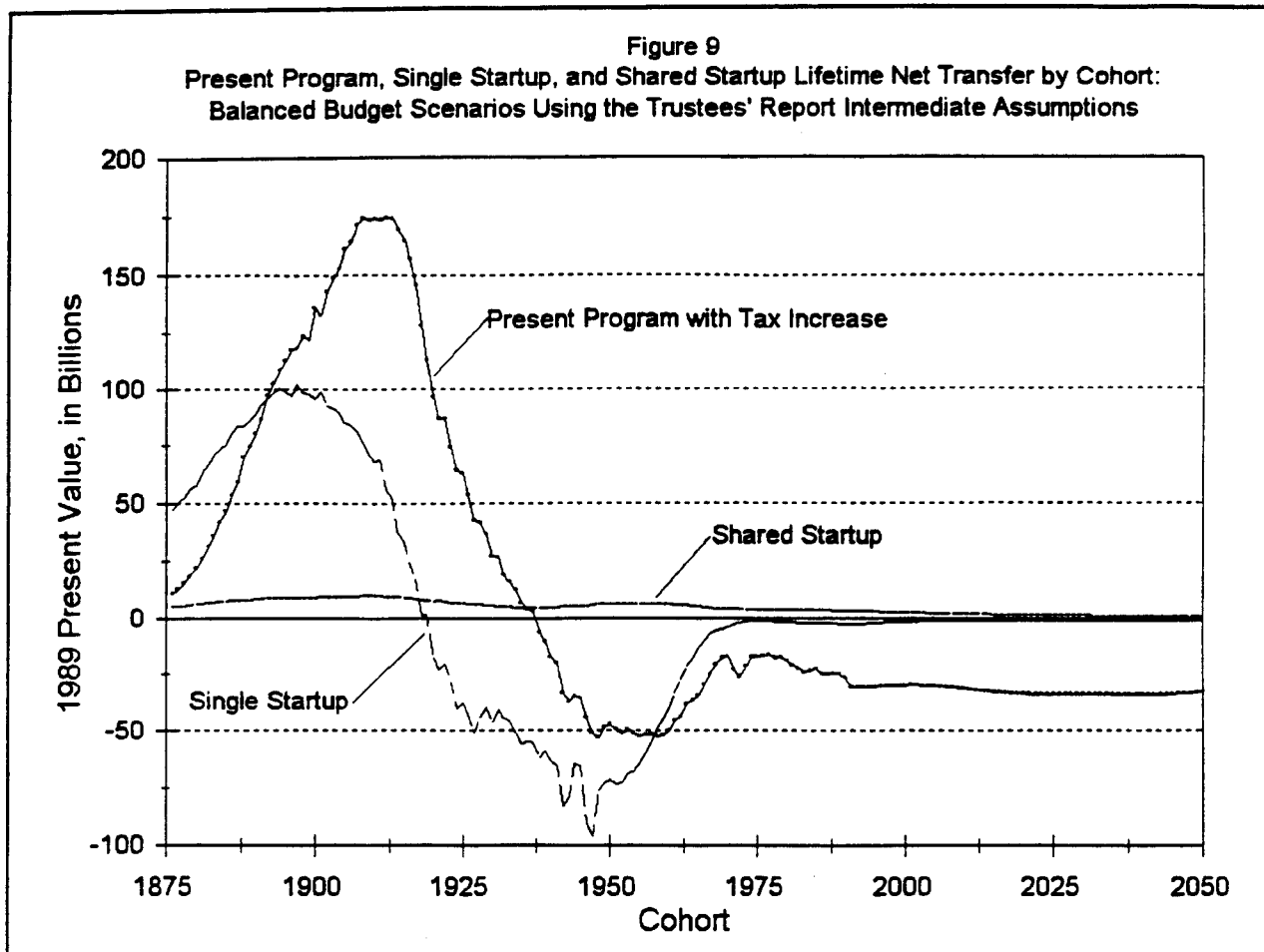


standard of fairness implicit in either counterfactual program, then, these results suggest that these early cohorts have been treated more generously under the present program at the expense of later cohorts, by virtue of the episodic expansions characteristic of the program in previous years.

These inferences are confirmed in Figure 9 and Table 7, which present estimates of the 1989 present value of the aggregate net lifetime transfer received by each included cohort under the present and counterfactual programs, using the historical and projected rates of return to the

Table 6. Real OASI Internal Rate of Return by Cohort, Present Program with Tax Increase and Counterfactual Social Insurance Programs: Balanced Budget Scenarios Using the Trustees' Report Intermediate Assumptions

Cohort	Present Program Rate (%)	Single Start-up Rate (%)	Single Start-up Deviation (%)	Shared Start-up Rate (%)	Shared Start-up Deviation (%)
1880	25.03	25.19	0.16	5.28	-19.75
1885	20.55	12.67	-7.88	2.10	-18.45
1890	17.89	8.90	-8.99	1.45	-16.44
1895	14.58	6.35	-8.23	1.07	-13.51
1900	11.90	4.64	-7.26	0.91	-10.99
1905	9.80	3.31	-6.49	0.90	-8.90
1910	8.38	2.56	-5.82	1.09	-7.29
1915	7.30	2.15	-5.15	1.59	-5.71
1920	5.68	1.82	-3.86	2.30	-3.38
1925	4.81	1.90	-2.92	2.73	-2.09
1930	3.95	1.95	-2.00	2.98	-0.97
1935	3.33	1.81	-1.52	3.05	-0.28
1940	2.68	1.79	-0.89	3.06	0.38
1945	2.29	1.88	-0.41	3.03	0.74
1950	2.18	1.91	-0.27	2.96	0.78
1955	2.04	1.96	-0.08	2.84	0.80
1960	1.84	2.04	0.20	2.65	0.81
1965	1.77	2.15	0.38	2.43	0.66
1970	1.92	2.18	0.26	2.32	0.40
1975	1.83	2.17	0.34	2.27	0.44
1980	1.80	2.14	0.34	2.25	0.45
1985	1.72	2.13	0.41	2.24	0.52
1990	1.65	2.11	0.46	2.23	0.58
1995	1.53	2.11	0.59	2.22	0.70
2000	1.48	2.13	0.65	2.22	0.74
2005	1.43	2.13	0.70	2.21	0.78
2010	1.38	2.13	0.76	2.21	0.84
2015	1.32	2.13	0.81	2.21	0.89
2020	1.26	2.13	0.88	2.21	0.96
2025	1.19	2.12	0.93	2.21	1.02
2030	1.13	2.13	1.00	2.20	1.07
2035	1.08	2.12	1.05	2.20	1.13
2040	1.02	2.13	1.11	2.20	1.18
2045	0.99	2.13	1.15	2.20	1.22
2050	0.94	2.14	1.20	2.20	1.26



OASI trust fund to compute the present values.<sup>52</sup> By design, the 1989 present value of net transfers under the shared start-up program is relatively flat across cohorts, reflecting the fair annuity augmented by an equal per capita distribution of the start-up dividend. In contrast, the present and single start-up programs evidence marked redistribution from later cohorts to earlier cohorts. The "U" shape of the negative portions of the aggregate lifetime transfer graphs for the single start-up and present programs partially reflects the relative sizes of the cohorts and the effect of the discount factor which increasingly discounts the lifetime transfers of more

<sup>52</sup> Since all three of these programs distribute the pay-as-you-go start-up dividend in some fashion among the early cohorts included in this analysis, more distant cohorts not shown in Table 7 or Figure 9 will suffer negative net lifetime transfers; this follows since the rate of return to later cohorts is limited by the rate of growth in taxable payroll, which is lower than the projected trust fund rate of return. Again, this result is characteristic of all pay-as-you-go social insurance programs in the typical case where the trust fund rate of return exceeds the rate of growth in taxable payroll under the program.

**Table 7. Present Value in 1989 of the Lifetime Net Transfer for Each Cohort, Present Program with Tax Increase and Counterfactual Social Insurance Programs: Balanced Budget Scenarios Using the Trustees' Report Intermediate Assumptions, in Billions of 1989 Dollars**

Cohort	Present Program	Single Start-up	Single Start-up Deviation	Shared Start-up	Shared Start-up Deviation
1880	22.167	58.234	36.067	6.226	-15.940
1885	46.866	75.486	28.620	7.563	-39.303
1890	80.661	89.669	9.008	8.409	-72.252
1895	113.022	99.420	-13.602	9.150	-103.872
1900	136.254	96.150	-40.104	9.253	-127.001
1905	161.506	85.418	-76.088	9.743	-151.762
1910	173.683	68.221	-105.463	10.043	-163.640
1915	165.140	33.111	-132.029	9.237	-155.903
1920	96.964	-17.383	-114.348	7.541	-89.423
1925	62.579	-37.582	-100.161	6.937	-55.643
1930	27.496	-45.949	-73.445	5.881	-21.615
1935	7.100	-56.020	-63.120	4.989	-2.111
1940	-17.115	-63.378	-46.262	4.958	22.073
1945	-35.609	-65.228	-29.620	5.353	40.962
1950	-47.044	-71.523	-24.480	6.137	53.181
1955	-52.482	-63.969	-11.487	6.367	58.849
1960	-49.995	-40.000	9.995	6.185	56.180
1965	-34.179	-12.877	21.301	5.355	39.534
1970	-16.857	-3.505	13.352	4.518	21.375
1975	-17.191	-1.201	15.991	3.751	20.942
1980	-18.885	-1.717	17.167	3.717	22.601
1985	-22.438	-2.039	20.399	3.512	25.950
1990	-26.497	-2.545	23.952	3.419	29.916
1995	-30.479	-2.102	28.378	3.026	33.505
2000	-29.749	-1.492	28.257	2.624	32.372
2005	-29.988	-1.166	28.822	2.340	32.328
2010	-31.326	-1.120	30.205	2.144	33.470
2015	-32.586	-1.173	31.413	1.961	34.548
2020	-33.434	-1.225	32.209	1.776	35.210
2025	-33.622	-1.194	32.427	1.584	35.205
2030	-33.566	-1.116	32.449	1.410	34.975
2035	-33.633	-1.041	32.592	1.266	34.900
2040	-33.718	-0.967	32.751	1.146	34.864
2045	-33.485	-0.870	32.615	1.037	34.522
2050	-32.792	-0.748	32.044	0.932	33.724

distant cohorts. The 1989 present value of these negative net lifetime transfers diminishes fairly rapidly under the single start-up program for cohorts born after about 1950. The relatively small present values depicted for the most distant cohorts under the single start-up program largely

reflect differences between the growth rates in average labor income and the trust fund interest rate; i.e., in a system with stable tax and replacement rates, the present value of the lifetime net transfer, evaluated in a fixed base year, will tend toward zero for distant cohorts if the discount rate used to compute the present values exceeds the rate of growth in average taxable earnings per worker.<sup>53</sup> The simulation of the single start-up program is generally characterized by these conditions.<sup>54</sup> If the simulations were extended, the same effect would eventually drive the present values of the lifetime net transfer for more distant cohorts toward zero in the present program scenario. This effect is offset in Figure 9 for the present program because of the annual tax rate increases assumed between 2020 and 2099.

The 1989 present value of the redistribution to some of the early cohorts is most pronounced under the present program. Redistribution under the present program is higher than under the single start-up program for cohorts born between 1892 and 1957 and positive for cohorts born through 1937. The larger redistribution to these cohorts under the present program comes largely at the expense of later cohorts, who are faced with substantially higher tax rates than under the single start-up or shared start-up programs.<sup>55</sup>

One cohort group of particular interest is the "notch" cohorts, born between 1917 and 1921. The decline in the lifetime transfer across the notch and surrounding cohorts does not appear atypical in the present program graph depicted in Figure 9. Figure 9 also suggests that these

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<sup>53</sup> This effect can be demonstrated analytically under steady state assumptions.

<sup>54</sup> The OASI trust fund interest rate exceeds the rate of growth in average labor income in all but 10 of the historical and projected years from 1941 through 2050 under the balanced budget simulation.

<sup>55</sup> As noted above, the tax rate under the intermediate balanced budget scenario is assumed to increase from 10.98 percent in 2020 to 14.74 percent by 2099 and remain constant thereafter. In contrast, the constant (and broader) definition of covered earnings under the counterfactual programs allows a constant tax rate of only 6.37 percent for all periods to generate the same present value of tax payments over the analysis period from 1937 to 2150. A constant tax rate of 10.41 percent would be required under the counterfactual programs if taxable payroll were defined as under the present program.

cohorts have fared quite well under the present program whether evaluated relative to the market alternative or relative to the standard of fairness implicit in either counterfactual program.<sup>56</sup>

Figure C4 in Appendix C depicts corresponding estimates per initial cohort member for cohorts with available initial population estimates; i.e., for cohorts born after 1940. These "per capita" results are qualitatively similar for available cohorts to the cohort aggregate results displayed in Figure 9, except for some diminution of the positive or negative "humps" associated with the baby boom cohorts. As with the aggregate results, for example, the "per capita" results for available cohorts suggest that the present value of lifetime transfers will be larger (less negative) under the present program than under the single start-up program for cohorts born from 1941 through 1957, and the present value of lifetime transfers will be smaller (more negative) under either the single start-up or present programs for cohorts born from the early 1940's to mid 1960's than for cohorts born earlier or later.

This pattern of change in the present value of lifetime transfers across these cohorts under either the single start-up or present programs illustrates that, in the absence of stable productivity and population growth rates, a pay-as-you-go social insurance program may generate a nonprogressive distribution of outcomes across certain cohorts; i.e., variations in productivity and population growth over time may result in redistributions from poorer to richer cohorts, since a strict pay-as-you-go program contains no mechanism for distributing the start-up dividend on the basis of cohort (or individual) well-being. Although Figures 9 and C4 suggest the likelihood that the present program has engendered nonprogressive redistributions, identifying

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<sup>56</sup> Further information on the treatment of the notch and surrounding cohorts under the present law scenario is presented in Appendix D.

their extent would require additional information on the lifetime wealth of the affected cohorts.<sup>57</sup>

In addition to the implication of nonprogressive redistributions, these results suggest that, relative to the standard of fairness implicit in either counterfactual program, the frequent expansions of the present program in prior years had the effect of granting generous transfers to some early cohorts at the expense of later cohorts, even within the context of a pay-as-you-go program. Relative to the single start-up program, cohorts born between 1892 and 1957 gained at the expense of cohorts born both earlier and later. Relative to the shared start-up program, cohorts born through 1935 gained at the expense of cohorts born after that year. Whether such comparisons are relevant, of course, depends on whether the implicit standards of fairness incorporated into the counterfactual programs are considered appropriate.

## V. Concluding Remarks

In conclusion, a few words of caution are in order concerning the interpretation of the money's worth and intercohort redistribution estimates presented in this paper. Some analysts believe that the intercohort transfers effected by the Social Security program simply substitute public transfers for private transfers that would have occurred otherwise; e.g., children or, more generally, the working community would privately support the aged population if Social Security did not. To the extent that transfers under Social Security exceed those that would have occurred privately, these analysts argue that much of the excess would be privately transferred to heirs to compensate for the increased unfunded liability of the program which the heirs also

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<sup>57</sup> The LRM projects the lifetime wealth of cohorts born during the simulation period, but earlier cohorts require historical data.

inherit as a form of government indebtedness. To the extent that these arguments hold, the money's worth and intercohort redistribution estimates presented in this paper become an accounting artifice with little policy relevance; i.e., if these arguments hold, then the "redistribution" measured in this paper either would have occurred in the absence of the OASI program or would have been negated by offsetting private transfers.

On the other hand, if these arguments do not hold, the intercohort redistribution identified in this paper is likely to have altered the labor supply and saving behavior of the net transfer recipients. Depending on the intensity of such behavioral effects, their economic consequences may be substantial. For example, cohorts receiving positive net lifetime transfers would likely have increased their lifetime consumption to some extent, reducing saving and capital formation, and thereby reducing the rate of economic growth. In this sense, the money's worth and redistributive measures presented in this paper may give only a narrow and possibly distorted view of the total economic effects of the OASI program on the lifetime incomes of affected cohorts.

With these cautions in mind, the results presented in this paper do nevertheless provide valuable insights into the redistributive nature of the OASI program across past and future cohorts. The estimates presented are both more extensive and accurate than earlier estimates. These results have important implications for such policy issues as the choice among alternative approaches for dealing with projected imbalances in the long-run financial status of the OASI program. For example, the implication of nonprogressive redistributions across present and future cohorts of workers under the present program may suggest the desirability of changes in the intercohort pattern of replacement rates for future retirees. More generally, the standards of fairness implicit in either of the counterfactual pay-as-you-go social insurance programs



considered in this paper suggest that gradual reductions in real benefits for at least some current retirees through, say, lower cost-of-living adjustments might be preferable to reducing benefit awards for future retirees or increasing taxes for present and future workers. The analysis in this paper does not necessarily support any particular policy, of course, because different standards of fairness lead to different policy prescriptions.

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## Appendix A. Data Sources for Historical Benefits.

The annual benefit control aggregates for lump-sum payments and each of the eight major monthly cash benefit categories are taken from Table 4.A5 in the 1990 *Annual Statistical Supplement to the Social Security Bulletin*. Within each of the major benefit categories, the allocation of benefits by single year of age is based on the summary benefit tables indicated in the list below.

<u>Year</u>	<u>Source</u>
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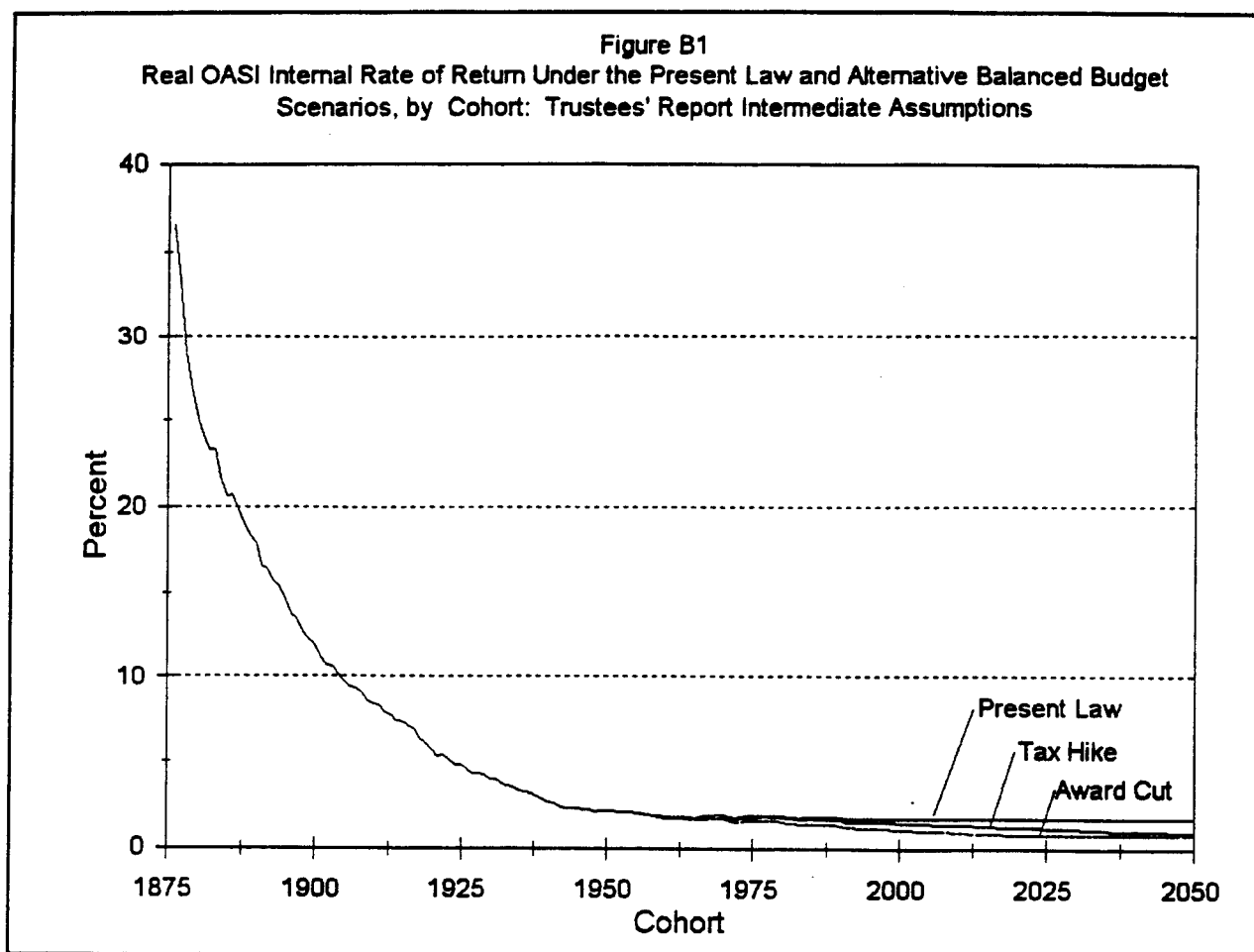
1937-39:	Table 5 in 1939 <i>Social Security Yearbook</i>
1940:	Tables 25-29 in 1940 <i>Social Security Yearbook</i>
1941:	Tables 23-27 in 1941 <i>Social Security Yearbook</i>
1942:	Tables 88-92 in 1942 <i>Social Security Yearbook</i>
1943:	Tables 99-103 in 1943 <i>Social Security Yearbook</i>
1944:	Table 79 in 1944 <i>Social Security Yearbook</i>
1945:	Table 58 in 1945 <i>Social Security Yearbook</i>
1946:	Table 28 in 1946 <i>Social Security Yearbook</i>
1947:	Table 28 in 1947 <i>Social Security Yearbook</i>
1948:	Table 28 in 1948 <i>Social Security Yearbook</i>
1949:	Table 25 in 1949 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1950:	Table 22 in 1950 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1951:	Table 21 in 1951 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1952:	Table 23 in 1952 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1953:	Table 28 in 1953 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1954:	Table 33 in 1954 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1955:	Table 33 in 1955 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1956:	Table 35 in 1956 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1957:	Table 40 in 1957 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1958:	Table 42 in 1958 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1959:	Table 45 in 1959 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1960:	Table 50 in 1960 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1961:	Table 62 in 1961 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1962:	Table 57 in 1962 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1963:	Table 58 in 1963 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1964:	Table 61 in 1964 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1965:	Table 64 in 1965 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1966:	Table 65 in 1966 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1967:	Table 68 in 1967 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1968:	Table 69 in 1968 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1969:	Table 69 in 1969 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1970:	Table 67 in 1970 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1971:	Table 67 in 1971 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1972:	Table 67 in 1972 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1973:	Table 66 in 1973 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1974:	Table 67 in 1974 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1975:	Table 70 in 1975 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1976:	Table 68 in 1976 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1977:	Table 65 in 1977-79 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1978:	Table 65 in 1980 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1979:	Table 66 in 1981 <i>Annual Statistical Supplement to the Social Security Bulletin</i>
1980:	Table 54 in 1982 <i>Annual Statistical Supplement to the Social Security Bulletin</i>

- 1981: Not published in the *Annual Statistical Supplement to the Social Security Bulletin* – values for each age interpolated between the 1980 and 1982 values for the corresponding age
- 1982: Table 59 in 1983 *Annual Statistical Supplement to the Social Security Bulletin*
- 1983: Table 60 in 1984-85 *Annual Statistical Supplement to the Social Security Bulletin*
- 1984: Table 67 in 1986 *Annual Statistical Supplement to the Social Security Bulletin*
- 1985: Table 70 in 1987 *Annual Statistical Supplement to the Social Security Bulletin*
- 1986: Table 5.A1 in 1988 *Annual Statistical Supplement to the Social Security Bulletin*
- 1987: Table 5.A1 (1987) in 1989 *Annual Statistical Supplement to the Social Security Bulletin*
- 1988: Table 5.A1 (1988) in 1989 *Annual Statistical Supplement to the Social Security Bulletin*  
(based on a 10 percent sample)
- 1989: Table 5.A1 in 1990 *Annual Statistical Supplement to the Social Security Bulletin*  
(based on a 10 percent sample)

**Appendix B. Award Reduction Balanced Budget Scenario.**

This appendix displays selected tables and figures reflecting the results of an alternative balanced budget scenario that uses a series of gradual reductions in benefit awards, rather than a series of gradual tax increases, to bring the OASI program into actuarial balance over the simulation period (through 2150) under the intermediate assumptions of the 1991 Trustees' Report. Under the tax increase balanced budget scenario discussed in the main body of this paper, the OASI tax rate increases linearly from 10.98 percent in 2020 to 14.74 percent in 2099. Under the award reduction balanced budget scenario presented in this appendix, benefit awards to new retirees are gradually reduced (relative to their levels under the present law scenario) by a factor falling linearly from 1.0 in 2020 to 0.73 in 2082; benefit awards prior to 2020 are not affected, and the award reduction factor remains constant at 0.73 after 2082. Real benefits remain constant after retirement under both scenarios.

Figure B1 displays the real OASI internal rates of return calculated for each included cohort under the present law and the two balanced budget alternatives. Table B1 lists the corresponding data for included quinquennial cohorts. Internal rates of return under the award reduction scenario begin to fall below internal rates under the present law scenario for earlier cohorts than under the tax increase scenario, because the award reductions are initiated in the same year as the tax increases, but apply to retiring cohorts, rather than only to younger, working, cohorts, at that time. Although internal rates of return were not simulated for cohorts born after 2050, internal rates under both balanced budget scenarios should eventually approach the rate of



growth in taxable payroll,<sup>58</sup> assuming that tax and benefit provisions remain constant and that fertility, mortality, and economic growth rates remain stable.

Figure B2 and Table B2 depict the aggregate OASI lifetime wealth increment, discounted to the birth year of each cohort using alternative constant real discount rates, under the award reduction scenario. The absolute values of these wealth increments are generally lower for the most distant cohorts under the award reduction scenario than under the tax increase scenario, because of the smaller relative size of the award reduction program; i.e., for these cohorts, both taxes and benefits are smaller under the award reduction scenario. This effect is not uniform

<sup>58</sup> The projected geometric mean growth rate in real OASI taxable payroll over each of the last five decades (2100-2150) of both balanced budget simulations varied between 0.92 and 0.93 percent; this suggests that the real internal rate of return for later birth cohorts would approximate that value under both scenarios if the simulations were extended.

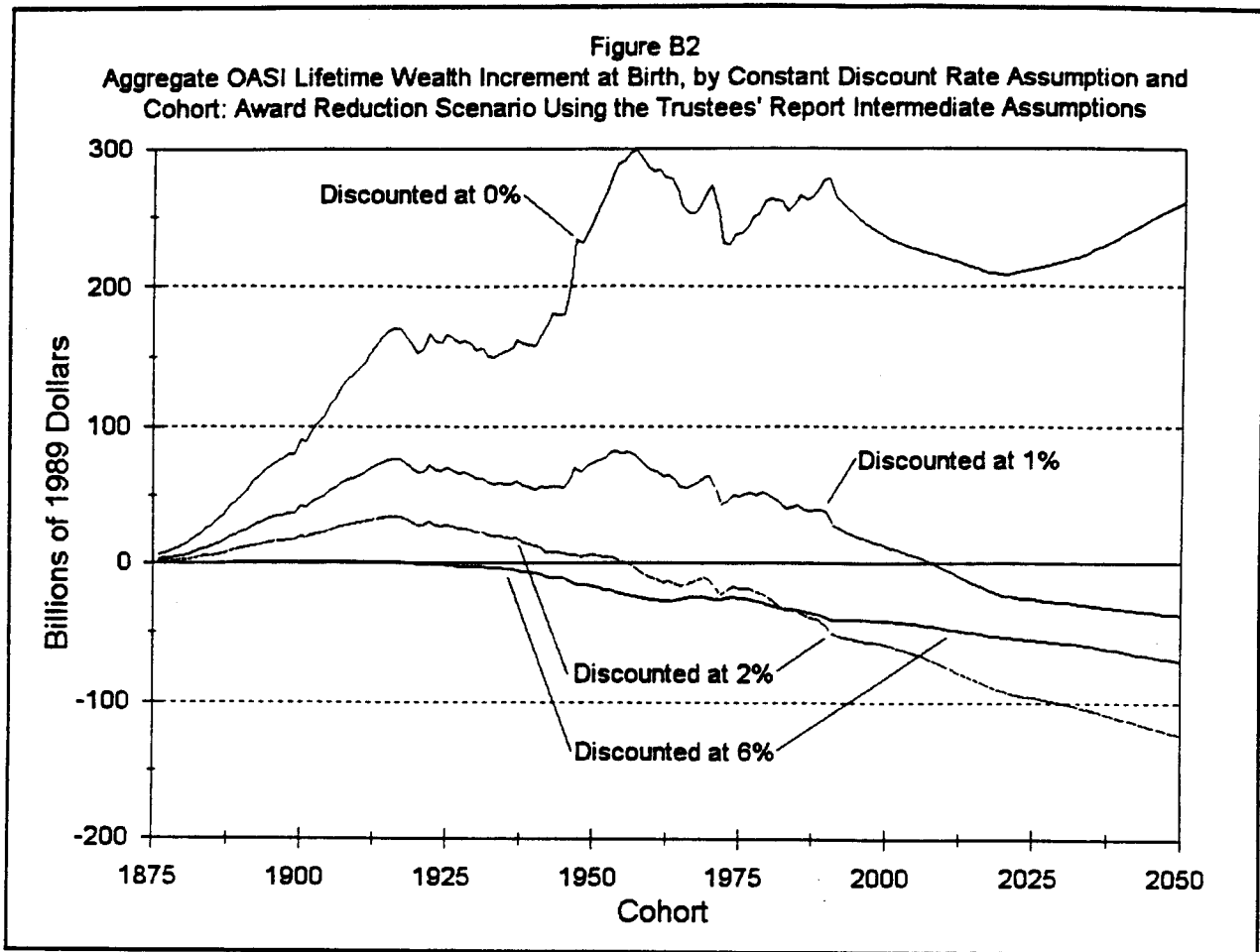
Table B1. Real OASI Internal Rate of Return (%), by Scenario and Cohort, Using the Trustees' Report Intermediate Assumptions

Cohort	Present Law	Tax Increase	Award Reduction
1880	25.03	25.03	25.03
1885	20.55	20.55	20.55
1890	17.89	17.89	17.89
1895	14.58	14.58	14.58
1900	11.90	11.90	11.90
1905	9.80	9.80	9.80
1910	8.38	8.38	8.38
1915	7.30	7.30	7.30
1920	5.68	5.68	5.68
1925	4.82	4.81	4.82
1930	3.95	3.95	3.95
1935	3.33	3.33	3.33
1940	2.68	2.68	2.68
1945	2.29	2.29	2.29
1950	2.18	2.18	2.18
1955	2.04	2.04	2.03
1960	1.84	1.84	1.78
1965	1.78	1.77	1.65
1970	1.94	1.92	1.75
1975	1.87	1.83	1.61
1980	1.87	1.80	1.53
1985	1.82	1.72	1.42
1990	1.80	1.65	1.32
1995	1.73	1.53	1.17
2000	1.74	1.48	1.11
2005	1.75	1.43	1.04
2010	1.75	1.38	0.97
2015	1.75	1.32	0.89
2020	1.74	1.26	0.84
2025	1.74	1.19	0.83
2030	1.73	1.13	0.81
2035	1.73	1.08	0.81
2040	1.72	1.02	0.81
2045	1.72	0.99	0.80
2050	1.71	0.94	0.80

across all cohorts and discount rates because of differences in the timing of the two scenarios.

As under the tax increase scenario, the projected aggregate lifetime wealth increment under the award reduction scenario is positive for all cohorts under the 0 percent discount rate assumption and negative for current labor force entrants, some earlier cohorts, and all





subsequent cohorts under the 2 and 6 percent discount rate assumptions. The transition from positive to negative wealth increments under the 2 and 6 percent discount rate assumptions occurs at nearly the same cohorts under the award reduction and tax increase scenarios, because the real internal rates of return are still slightly above 2 percent when they begin to diverge between the two scenarios after about the 1955 cohort. Using the 2 percent discount rate, the projected lifetime wealth increment turns negative for all cohorts born after 1955 under the award reduction scenario and for all cohorts born after 1956 under the tax increase scenario. Using the 6 percent discount rate, the projected wealth increment turns negative for all cohorts born after 1919 under both the award reduction and the tax increase scenarios.

**Table B2. Aggregate OASI Lifetime Wealth Increment at Birth, by Assumed Discount Rate and Cohort: Award Reduction Scenario Using the Trustees' Report Intermediate Assumptions, in Billions of 1989 Dollars**

Cohort	----- Assumed Constant Discount Rates -----			
	0%	1%	2%	6%
1880	12.954	5.824	2.648	0.125
1885	27.834	12.714	5.872	0.294
1890	49.182	22.619	10.517	0.538
1895	71.475	32.849	15.249	0.759
1900	90.882	41.628	19.221	0.896
1905	116.017	52.953	24.271	1.000
1910	141.545	64.262	29.172	0.991
1915	168.478	75.645	33.755	0.794
1920	152.843	66.253	27.963	-0.251
1925	167.073	70.184	28.045	-1.243
1930	154.669	61.753	22.310	-2.573
1935	154.522	58.303	18.369	-4.232
1940	157.959	53.730	12.053	-7.084
1945	180.068	55.394	7.022	-10.865
1950	249.168	73.770	6.315	-16.627
1955	291.079	80.792	1.145	-22.111
1960	284.067	68.406	-10.736	-26.295
1965	258.058	55.844	-16.774	-26.449
1970	272.943	63.984	-11.965	-25.385
1975	238.710	49.331	-17.945	-25.100
1980	263.463	50.066	-24.783	-29.692
1985	265.989	42.869	-33.802	-33.566
1990	278.869	37.077	-44.476	-38.967
1995	248.782	19.958	-54.680	-40.901
2000	235.256	12.835	-58.621	-41.540
2005	226.773	5.257	-64.635	-43.360
2010	220.745	-4.316	-73.680	-46.560
2015	213.301	-14.874	-83.391	-49.896
2020	208.293	-23.584	-91.749	-52.859
2025	213.157	-26.040	-96.059	-54.966
2030	218.444	-28.245	-100.217	-57.053
2035	226.611	-30.530	-105.365	-59.767
2040	237.535	-32.821	-111.390	-63.052
2045	249.227	-34.911	-117.425	-66.398
2050	260.213	-36.802	-123.003	-69.502

The positive/negative transition point cohorts are more widely separated between the award reduction and tax increase scenarios under the 1 percent discount rate assumption, because internal rates of return approach the 1 percent level well beyond the point at which internal rates begin to diverge between the two scenarios. Using the 1 percent discount rate assumption,

projected lifetime wealth increments turn negative for all cohorts born after 2007 under the award reduction scenario and for all cohorts born after 2042 under the tax increase scenario. Figure C5 in Appendix C depicts the corresponding estimates of the OASI lifetime wealth increment at birth per initial cohort member for cohorts with available initial population estimates, i.e., for cohorts born after 1940.

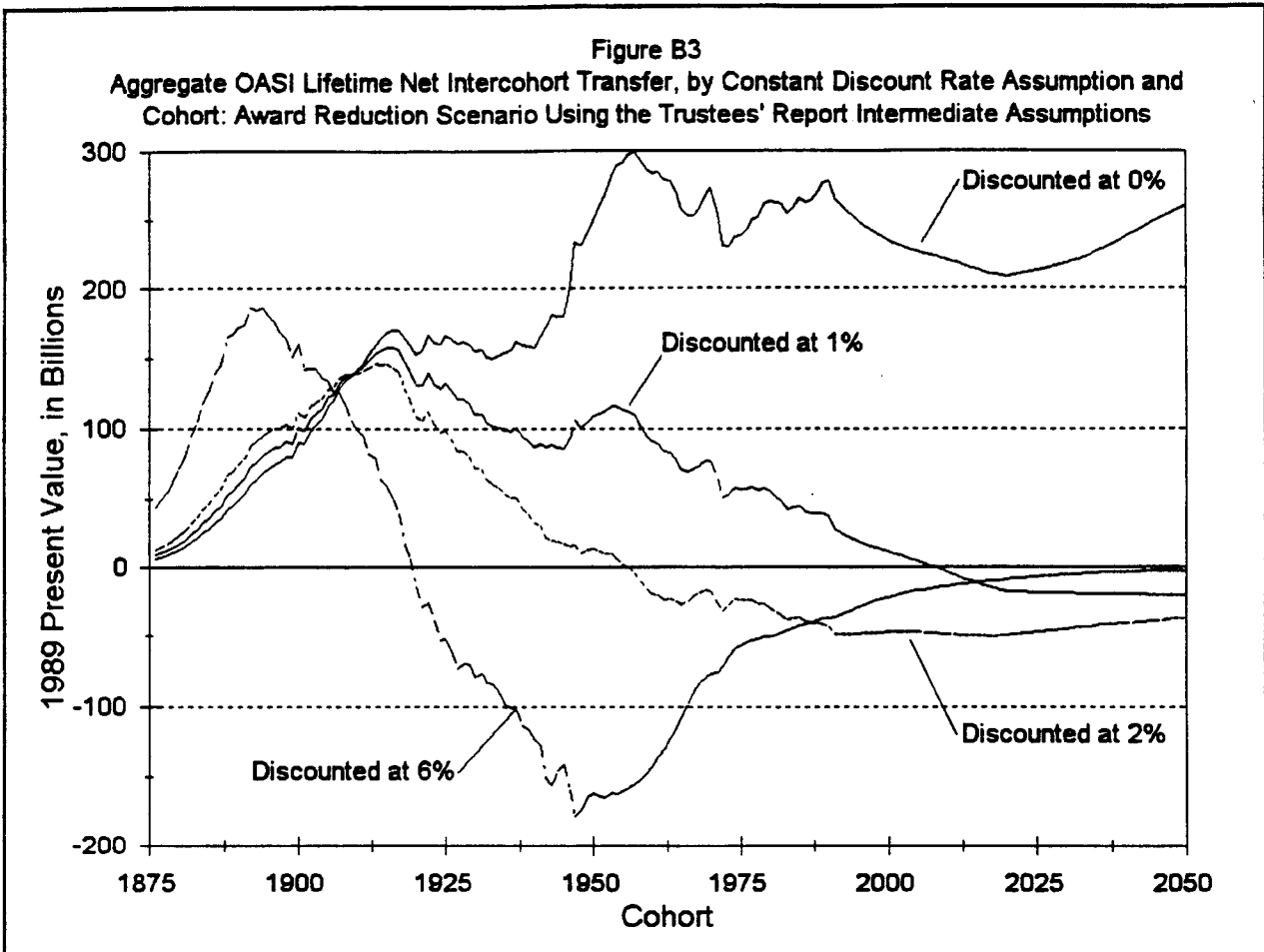


Figure B3 and Table B3 present estimates of net intercohort transfers under the award reduction scenario for the alternative constant real discount rate assumptions. These estimates reflect the net present value of OASI benefits less taxes for each cohort, accumulated or discounted to 1989. Differences between these results and those for the tax increase scenario, of course, are analogous to the differences discussed above for the net lifetime wealth

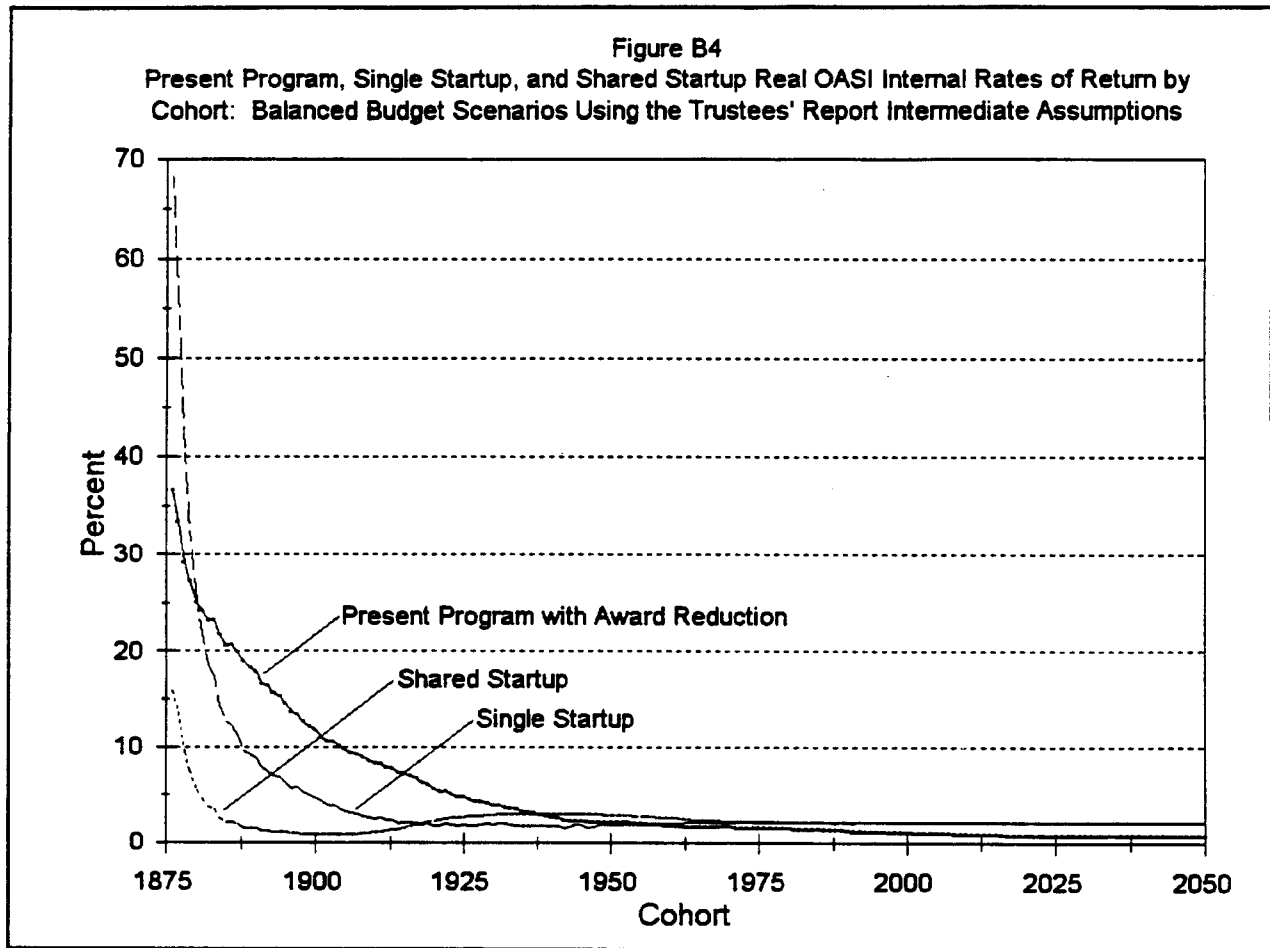
Table B3. Aggregate OASI Lifetime Net Intercohort Transfer, Evaluated in 1989, by Assumed Discount Rate and Cohort: Award Reduction Scenario Using the Trustees' Report Intermediate Assumptions, in Billions of 1989 Dollars

Cohort	----- Assumed Constant Discount Rates -----			
	0%	1%	2%	6%
1880	12.954	17.229	22.926	71.655
1885	27.834	35.785	46.047	125.938
1890	49.182	60.574	74.698	172.212
1895	71.475	83.701	98.097	181.549
1900	90.882	100.922	111.993	160.151
1905	116.017	122.148	128.086	133.565
1910	141.545	141.040	139.438	98.909
1915	168.478	157.965	146.134	59.218
1920	152.843	131.638	109.647	-13.989
1925	167.073	132.680	99.602	-51.766
1930	154.669	111.076	71.765	-80.073
1935	154.522	99.780	53.517	-98.415
1940	157.959	87.491	31.806	-123.102
1945	180.068	85.823	16.783	-141.087
1950	249.168	108.746	13.670	-161.340
1955	291.079	113.317	2.245	-160.327
1960	284.067	91.288	-19.065	-142.477
1965	258.058	70.907	-26.980	-107.090
1970	272.943	77.300	-17.431	-76.805
1975	238.710	56.705	-23.678	-56.749
1980	263.463	54.756	-29.618	-50.164
1985	265.989	44.610	-36.588	-42.376
1990	278.869	36.710	-43.604	-36.761
1995	248.782	18.801	-48.554	-28.834
2000	235.256	11.504	-47.147	-21.883
2005	226.773	4.483	-47.083	-17.069
2010	220.745	-3.502	-48.612	-13.696
2015	213.301	-11.483	-49.833	-10.968
2020	208.293	-17.324	-49.659	-8.682
2025	213.157	-18.200	-47.090	-6.747
2030	218.444	-18.783	-44.497	-5.233
2035	226.611	-19.317	-42.373	-4.096
2040	237.535	-19.759	-40.573	-3.229
2045	249.227	-19.997	-38.739	-2.541
2050	260.213	-20.057	-36.754	-1.988

increments. Figure C6 in Appendix C depicts the corresponding estimates of the net intercohort transfer per initial cohort member for cohorts with available initial population estimates. These "per capita" results are qualitatively similar for available cohorts to the cohort aggregate results

displayed in Figure B3, except for the diminution of the positive and negative "humps" associated with the baby boom cohorts.

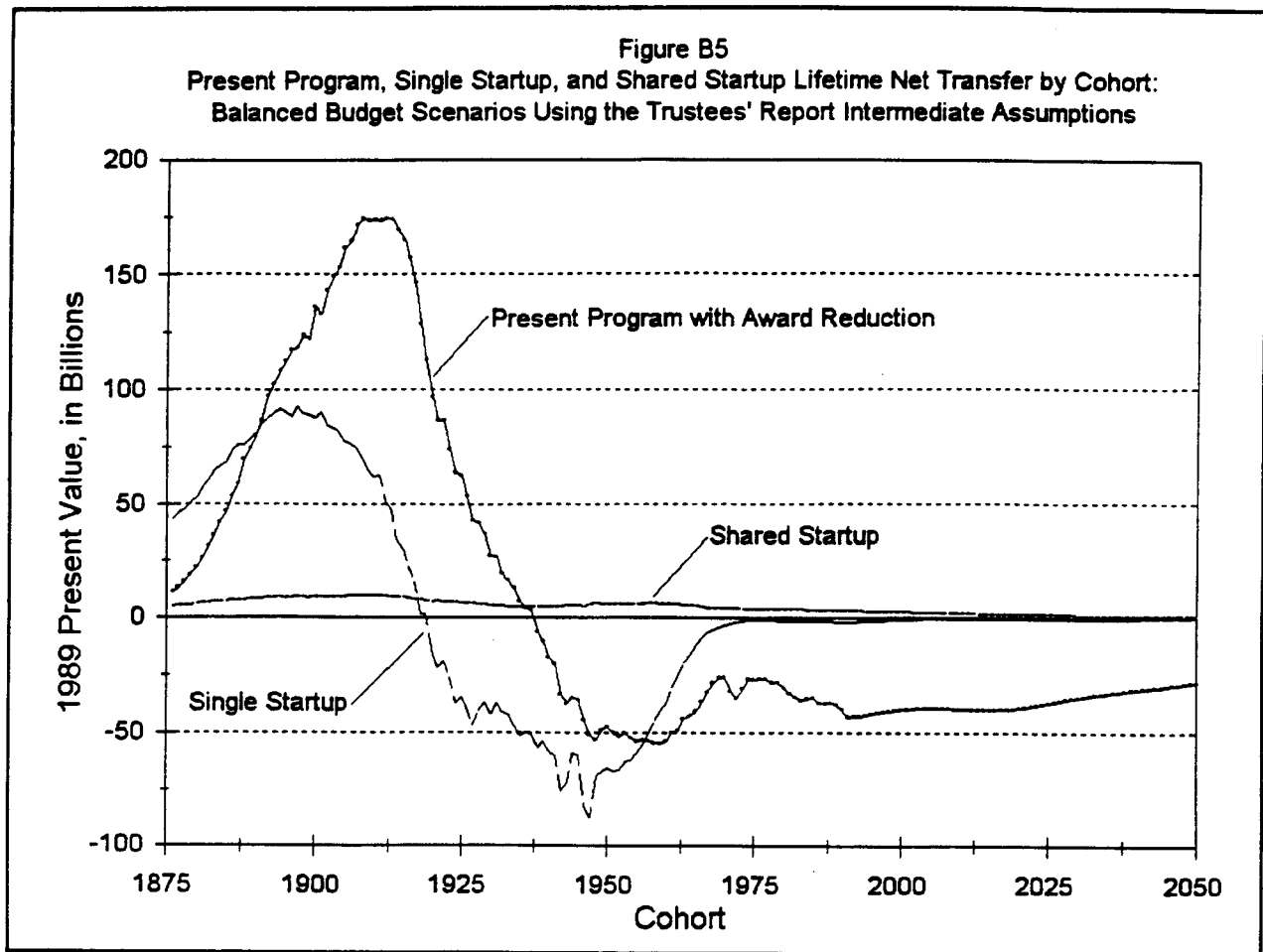
The remaining figures and tables in this appendix compare OASI program results under the award reduction scenario with single start-up and shared start-up counterfactual pay-as-you-go social insurance programs analogous to those considered in Section IV of this paper. Both of these counterfactual programs are constrained to have the same present values over the 1937-2150 period as under the award reduction scenario using the effective rate of return actually earned on trust fund assets. The provisions of the counterfactual programs are identical to those described in Section IV.



**Table B4. Real OASI Internal Rate of Return by Cohort, Present Program with Award Reduction and Counterfactual Social Insurance Programs: Balanced Budget Scenarios Using the Trustees' Report Intermediate Assumptions**

Cohort	Present Program Rate (%)	Single Start-up Rate (%)	Single Start-up Deviation (%)	Shared Start-up Rate (%)	Shared Start-up Deviation (%)
1880	25.03	25.18	0.15	5.55	-19.48
1885	20.55	12.66	-7.89	2.22	-18.33
1890	17.89	8.90	-8.99	1.53	-16.36
1895	14.58	6.34	-8.24	1.11	-13.47
1900	11.90	4.63	-7.26	0.94	-10.95
1905	9.80	3.31	-6.49	0.93	-8.87
1910	8.38	2.56	-5.82	1.11	-7.27
1915	7.30	2.15	-5.15	1.60	-5.70
1920	5.68	1.82	-3.86	2.31	-3.37
1925	4.82	1.90	-2.92	2.73	-2.09
1930	3.95	1.95	-2.00	2.98	-0.97
1935	3.33	1.81	-1.52	3.05	-0.28
1940	2.68	1.80	-0.88	3.07	0.39
1945	2.29	1.88	-0.41	3.03	0.74
1950	2.18	1.91	-0.27	2.97	0.79
1955	2.03	1.96	-0.07	2.85	0.82
1960	1.78	2.04	0.26	2.65	0.87
1965	1.65	2.15	0.50	2.44	0.79
1970	1.75	2.18	0.43	2.32	0.57
1975	1.61	2.17	0.56	2.28	0.67
1980	1.53	2.14	0.61	2.25	0.72
1985	1.42	2.13	0.71	2.24	0.82
1990	1.32	2.12	0.80	2.23	0.91
1995	1.17	2.12	0.95	2.22	1.05
2000	1.11	2.13	1.02	2.21	1.10
2005	1.04	2.14	1.10	2.21	1.17
2010	0.97	2.14	1.17	2.20	1.23
2015	0.89	2.14	1.25	2.20	1.31
2020	0.84	2.13	1.30	2.20	1.37
2025	0.83	2.13	1.31	2.19	1.37
2030	0.81	2.13	1.32	2.19	1.38
2035	0.81	2.14	1.34	2.19	1.39
2040	0.81	2.14	1.34	2.19	1.39
2045	0.80	2.14	1.34	2.19	1.39
2050	0.80	2.14	1.34	2.18	1.38

Real internal rates of return by cohort projected under the award reduction and under the two counterfactual programs are depicted in Figure B4 and Table B4. Figure B5 and Table B5 present estimates of the 1989 present value of the aggregate net lifetime transfer received by



each cohort under the award reduction and the counterfactual programs, using the historical and projected rates of return to OASI trust fund assets to compute the present values.<sup>59</sup> These results are quite similar to the results obtained assuming the tax increase balanced budget scenario discussed in Section IV. In particular, rates of return and net lifetime transfers for current new labor force entrants and later cohorts under either of the counterfactual programs lie above the corresponding measures projected under the present program, as represented by the award reduction scenario. The main inference of Section IV is unaffected, then, by the substitution of the award reduction for the tax increase scenario; i.e., relative to the standard of

<sup>59</sup> Figure C7 in Appendix C depicts corresponding estimates per initial cohort member for cohorts with available initial population estimates.

**Table B5. Present Value in 1989 of the Lifetime Net Transfer for Each Cohort, Present Program with Award Reduction and Counterfactual Social Insurance Programs: Balanced Budget Scenarios Using the Trustees' Report Intermediate Assumptions, in Billions of 1989 Dollars**

Cohort	Present Program	Single Start-up	Single Start-up Deviation	Shared Start-up	Shared Start-up Deviation
1880	22.167	53.178	31.012	5.961	-16.205
1885	46.866	68.929	22.064	7.241	-39.624
1890	80.661	81.878	1.217	8.052	-72.609
1895	113.022	90.776	-22.246	8.761	-104.261
1900	136.254	87.780	-48.474	8.860	-127.394
1905	161.506	77.965	-83.541	9.329	-152.177
1910	173.684	62.248	-111.436	9.616	-164.068
1915	165.141	30.178	-134.963	8.844	-156.297
1920	96.967	-15.938	-112.905	7.220	-89.747
1925	62.585	-34.368	-96.953	6.641	-55.944
1930	27.500	-41.980	-69.480	5.632	-21.869
1935	7.093	-51.156	-58.248	4.776	-2.317
1940	-17.109	-57.857	-40.747	4.747	21.856
1945	-35.665	-59.524	-23.859	5.126	40.792
1950	-47.261	-65.254	-17.993	5.877	53.138
1955	-53.499	-58.350	-4.851	6.097	59.596
1960	-53.662	-36.471	17.191	5.923	59.585
1965	-40.618	-11.719	28.898	5.130	45.748
1970	-25.573	-3.171	22.402	4.328	29.901
1975	-26.564	-1.057	25.507	3.594	30.158
1980	-30.305	-1.488	28.817	3.562	33.867
1985	-34.676	-1.716	32.960	3.367	38.042
1990	-39.445	-2.084	37.361	3.279	42.724
1995	-41.968	-1.597	40.371	2.903	44.871
2000	-39.927	-0.971	38.955	2.518	42.445
2005	-39.120	-0.605	38.516	2.247	41.368
2010	-39.638	-0.492	39.147	2.061	41.699
2015	-39.949	-0.480	39.469	1.887	41.836
2020	-39.268	-0.485	38.783	1.709	40.977
2025	-36.917	-0.437	36.479	1.526	38.443
2030	-34.600	-0.369	34.230	1.359	35.959
2035	-32.690	-0.317	32.373	1.224	33.914
2040	-31.066	-0.280	30.786	1.108	32.174
2045	-29.443	-0.236	29.207	1.002	30.445
2050	-27.731	-0.183	27.548	0.902	28.633

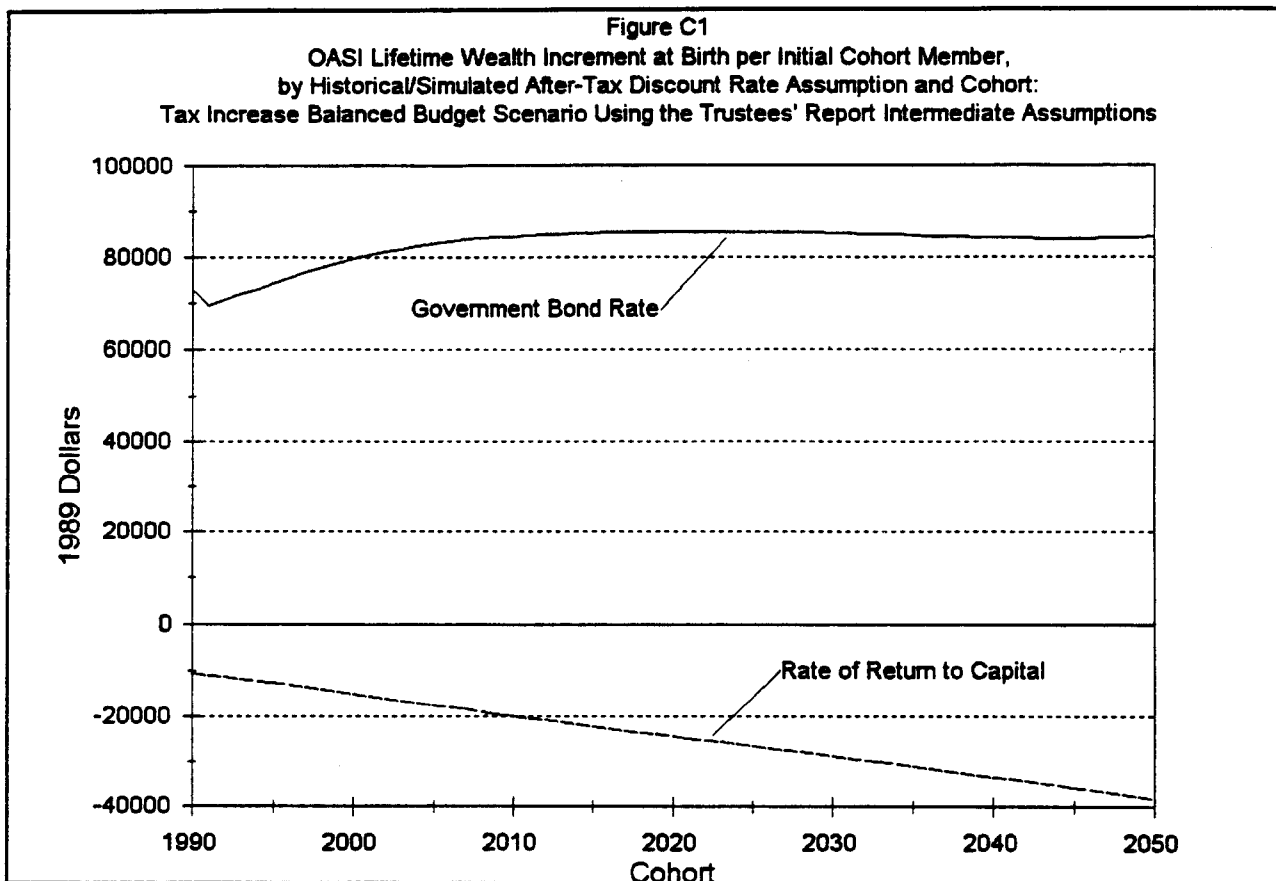
fairness implicit in either the single start-up or shared start-up program, most early cohorts have been treated more generously under the present program at the expense of later cohorts. Under this interpretation, the episodic expansions characteristic of the present program in previous



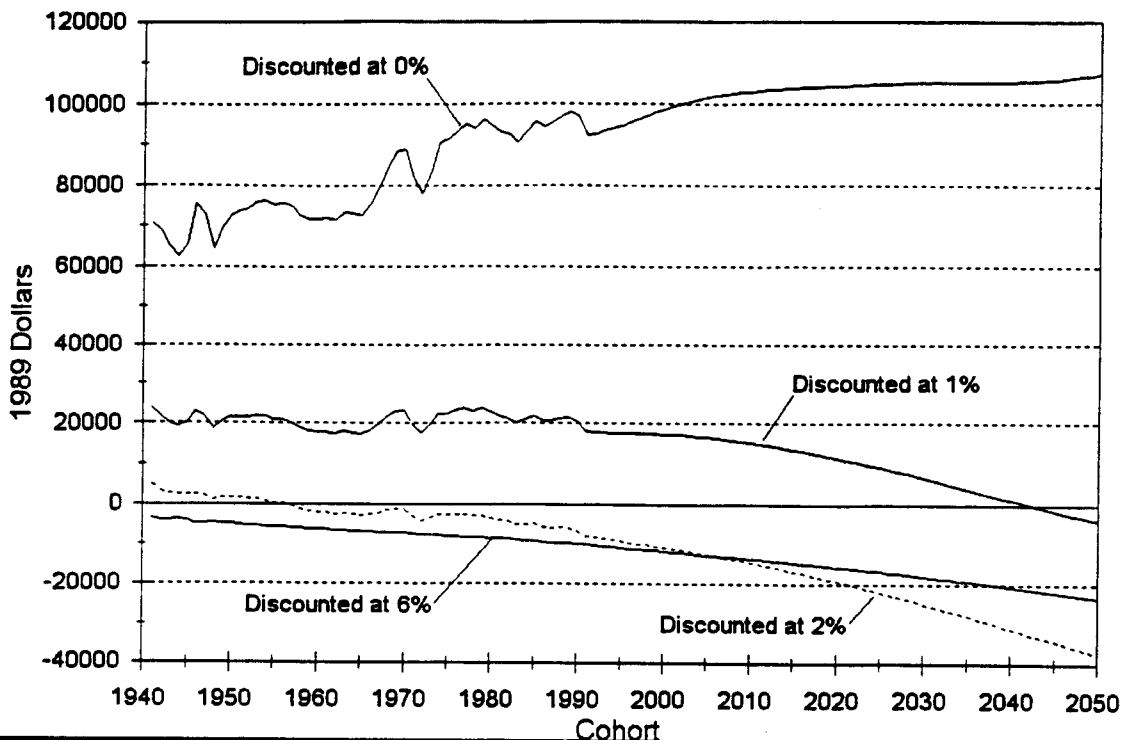
years result in later cohorts experiencing higher tax rates and lower benefit award replacement rates than those afforded to earlier cohorts.

### Appendix C. Per Capita Figures.

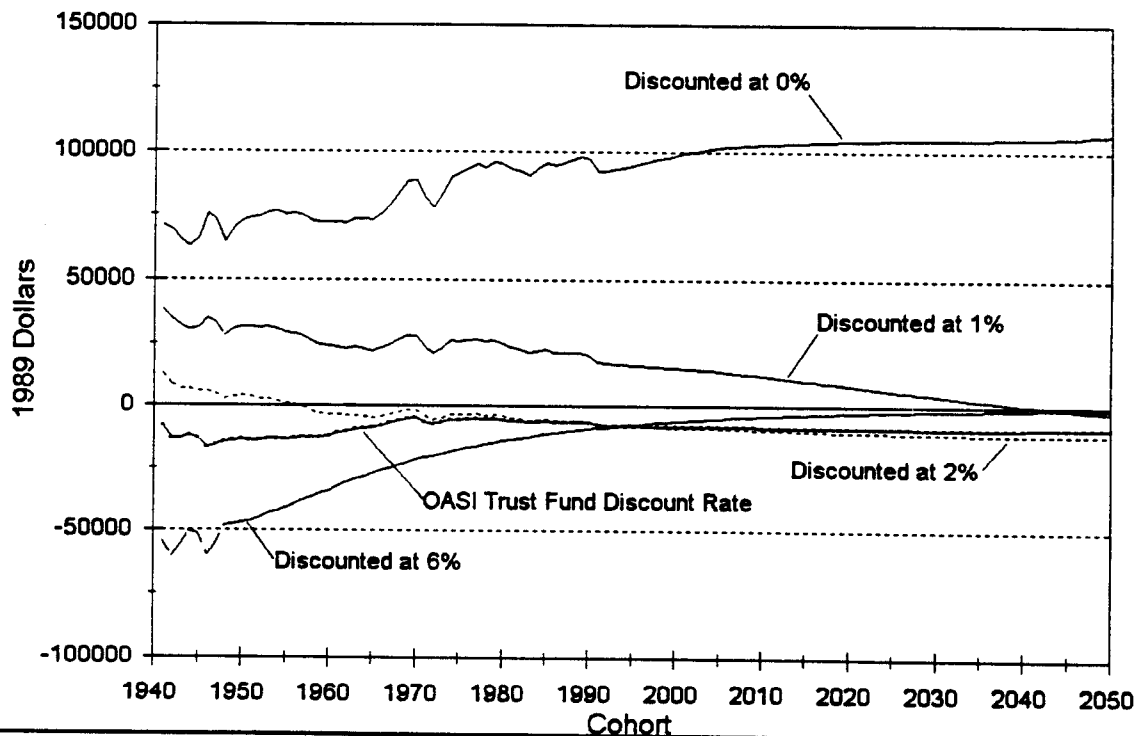
This appendix displays selected "per capita" figures, in which aggregate cohort data presented in the text and in Appendix B are divided by the initial populations of the corresponding cohorts. As noted above, these "per capita" estimates are not equivalent to expected lifetime estimates for individual cohort members, because of the effect of net immigration over the cohort's life cycle, but do give a feel for the level of expected lifetime transfers per cohort member.



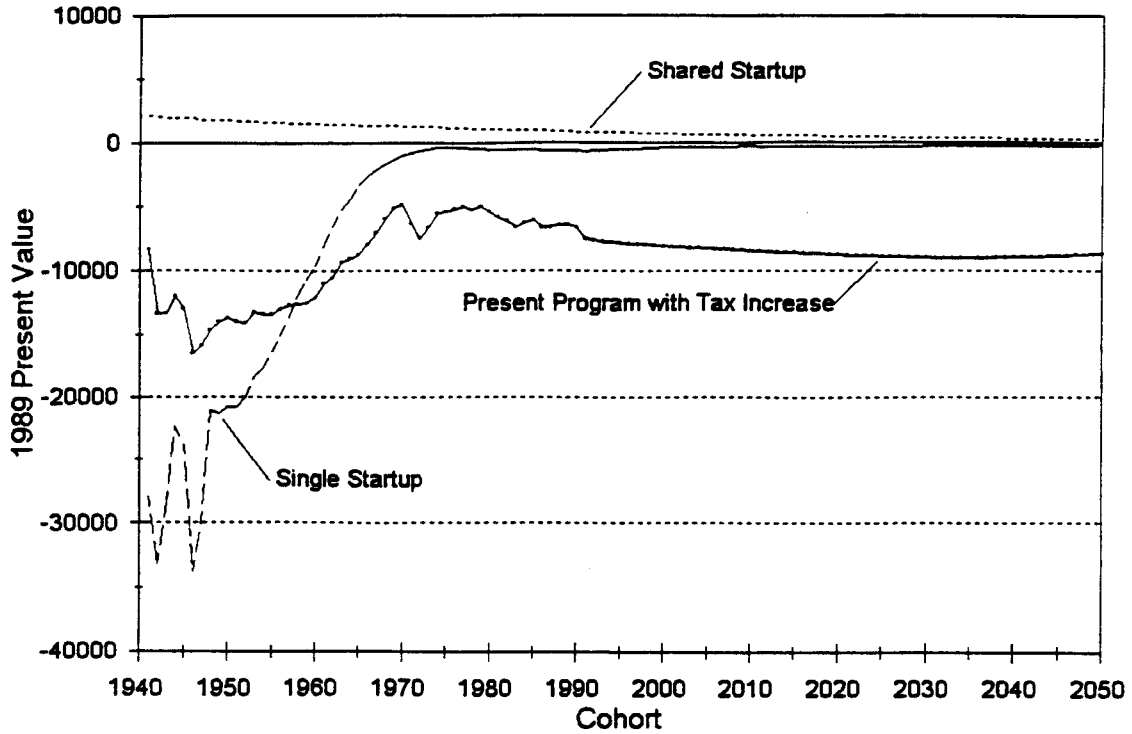
**Figure C2**  
**OASI Lifetime Wealth Increment at Birth per Initial Cohort Member,**  
**by Constant Discount Rate Assumption and Cohort:**  
**Tax Increase Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions**



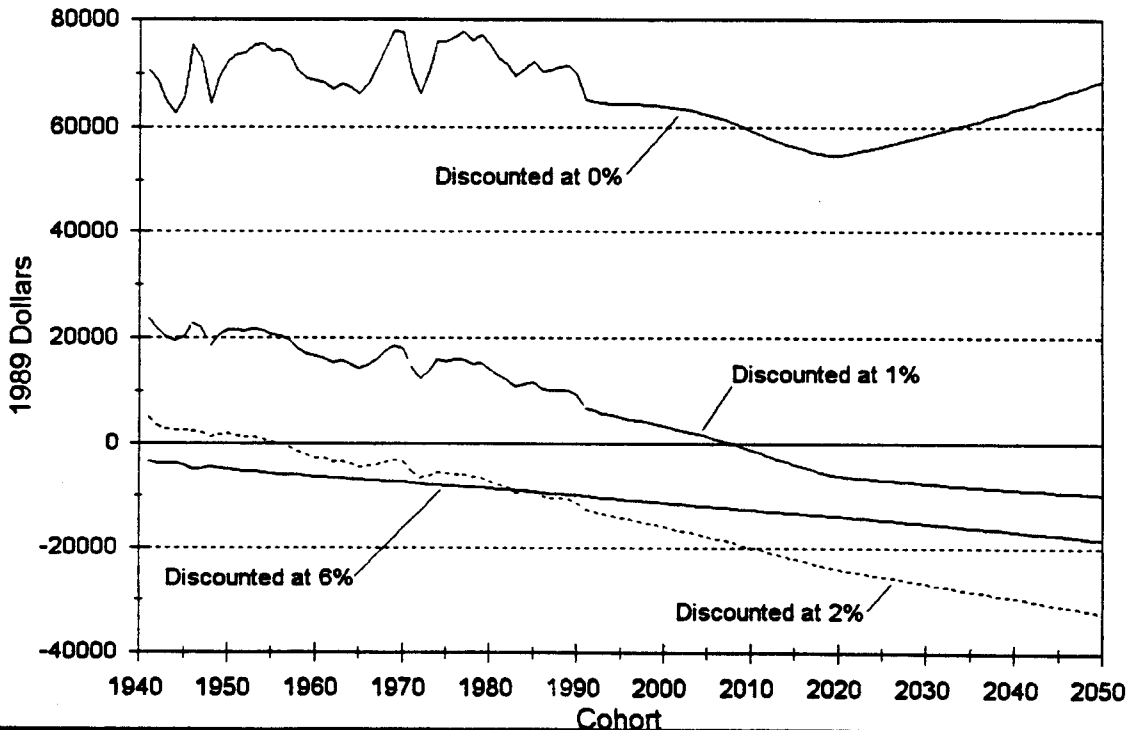
**Figure C3**  
**OASI Lifetime Net Intercohort Transfer per Initial Cohort Member,**  
**Evaluated in 1989, by Discount Rate Assumption and Cohort:**  
**Tax Increase Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions**



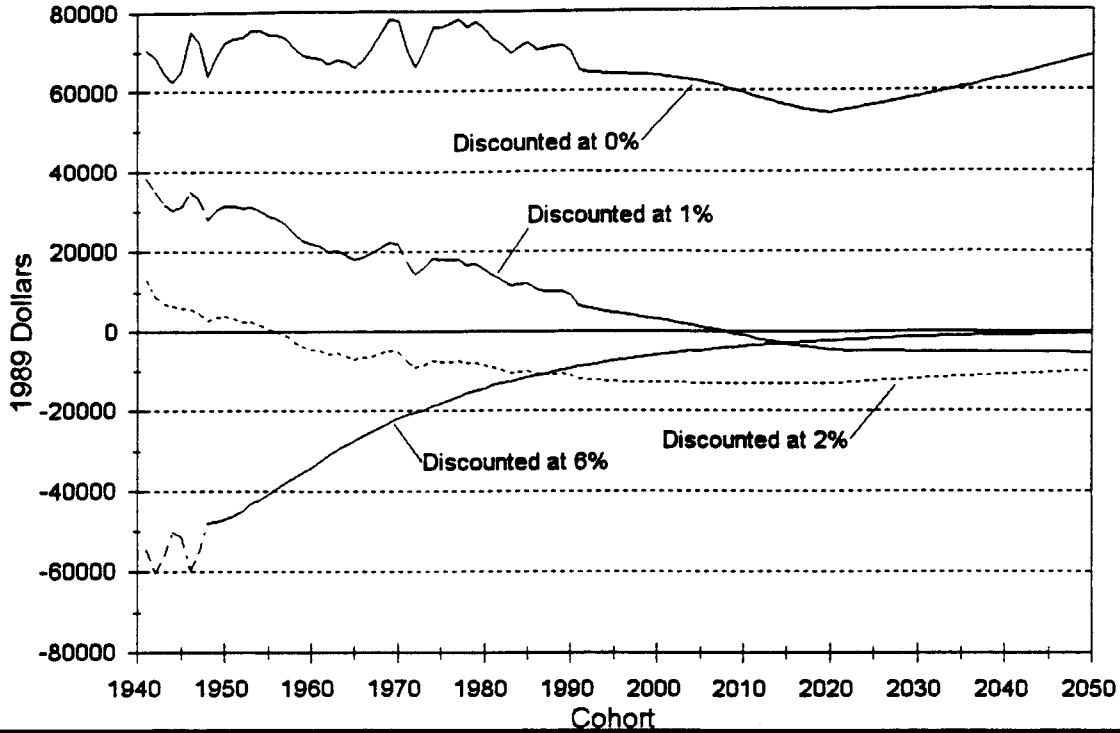
**Figure C4**  
**Present Program, Single Startup, and Shared Startup Lifetime Net Transfer**  
**per Initial Cohort Member, by Cohort: Tax Increase Balanced Budget Scenarios**  
**Using the Trustees' Report Intermediate Assumptions**



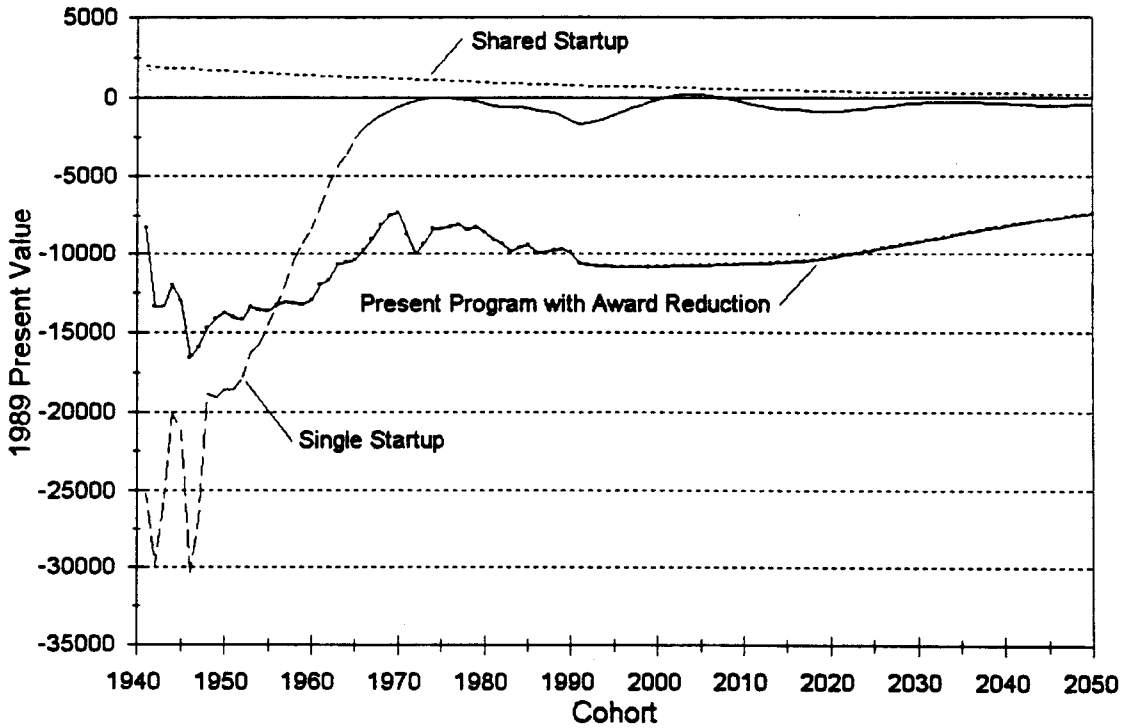
**Figure C5**  
**OASI Lifetime Wealth Increment at Birth per Initial Cohort Member, by Constant**  
**Discount Rate Assumption and Cohort: Award Reduction Balanced Budget**  
**Scenario Using the Trustees' Report Intermediate Assumptions**



**Figure C6**  
**OASI Lifetime Net Intercohort Transfer per Initial Cohort Member,**  
**Evaluated in 1989, by Constant Discount Rate Assumption and Cohort: Award Reduction**  
**Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions**



**Figure C7**  
**Present Program, Single Startup, and Shared Startup Lifetime Net Transfer**  
**per Initial Cohort Member, by Cohort: Award Reduction Balanced Budget Scenarios**  
**Using the Trustees' Report Intermediate Assumptions**



#### **Appendix D. Notch Cohort Estimates.**

Because the "notch" cohorts, born between 1917 and 1921, have been singled out in some policy discussions as having received unfair treatment under the 1977 Social Security Amendments, this appendix presents estimates of the internal rates of return and the ratios of benefit/tax present values for the "notch" and surrounding cohorts under the present law scenario using the Trustees' Report intermediate assumptions. Single year birth cohorts born up to 10 years preceding and 10 years succeeding the notch cohorts are included in these estimates. The youngest of these cohorts was aged 58 in the base year (1989) of the LRM simulations underlying these estimates; as such, these estimates are largely based on historical data. In addition, these cohorts are virtually unaffected by either of the balanced budget policy alternatives considered in this paper, since the tax and benefit award adjustments simulated under these alternatives are not initiated until after the year 2020.

The internal rates of return and ratios of benefit/tax present values are displayed in Table D1 and Figures D1 and D2. The average decline in the various estimates across successive cohorts is larger over the 1917-21 cohort range than over the 1907-16 or 1922-1931 cohort ranges,<sup>60</sup> but the general downward trend in internal rates of return and benefit/tax ratios across the notch and surrounding cohorts does not appear atypical in the context of the general decline observed across all of the early cohorts participating in the OASI program. All of the notch cohorts fare better by these measures than all cohorts born after 1922. The evidence presented in this paper, then, suggests that, on average, the notch cohorts generally have fared quite well

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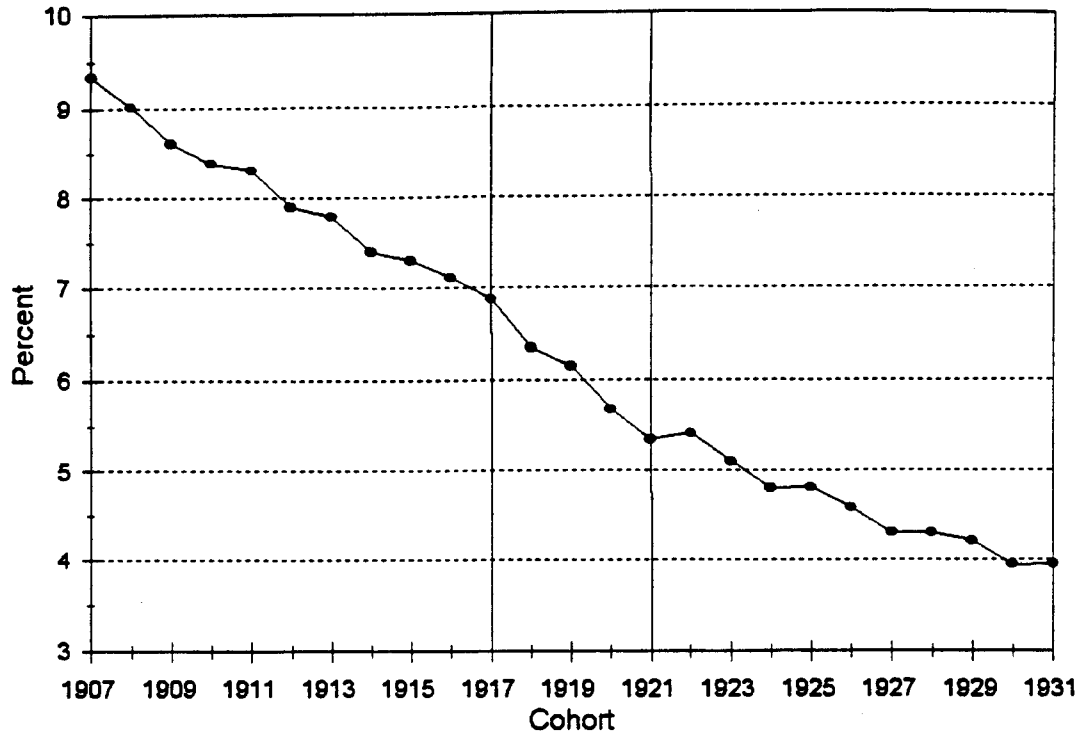
<sup>60</sup> The average percentage point change from the preceding cohort in the real internal rate of return over the 1907-16, 1917-21, and 1922-31 cohort ranges was respectively -0.23, -0.35, and -0.14. The corresponding average changes over these cohort ranges in the benefit/tax ratios were respectively -0.22, -0.32, and -0.07, when evaluated at the 0 percent discount rate; -0.19, -0.26, and -0.06, when evaluated at the 1 percent discount rate; -0.16, -0.21, and -0.05 when evaluated at the 2 percent discount rate; and -0.08, -0.09, and -0.03, when evaluated at the 6 percent discount rate.

Table D1. Real OASI Internal Rate of Return and Ratio of OASI Benefit/Tax Present Values for the Notch and Surrounding Cohorts: Present Law Scenario Using the Trustees' Report Intermediate Assumptions

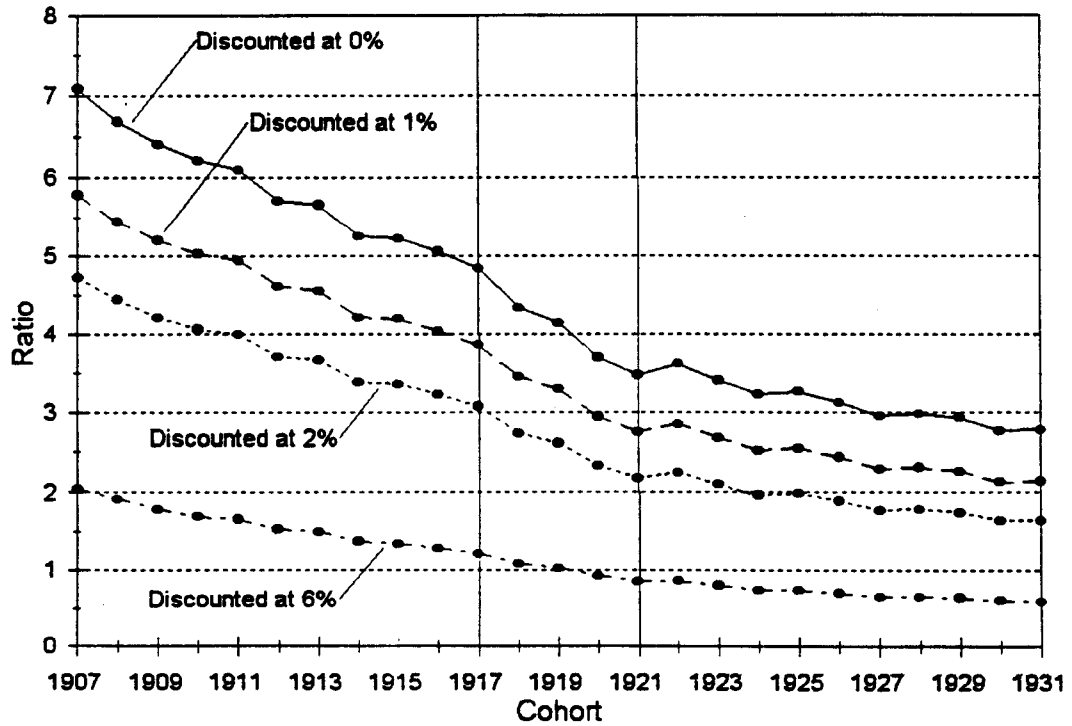
Cohort	Internal Rate of Return (%)	Ratio of Benefit/Tax Present Values			
		Assumed Constant Discount Rate			
		0%	1%	2%	6%
1907	9.35	7.09	5.79	4.72	2.05
1908	9.02	6.69	5.45	4.44	1.92
1909	8.62	6.41	5.20	4.21	1.79
1910	8.38	6.21	5.03	4.06	1.70
1911	8.31	6.10	4.94	3.99	1.67
1912	7.90	5.71	4.61	3.71	1.54
1913	7.80	5.66	4.55	3.66	1.50
1914	7.40	5.25	4.21	3.38	1.38
1915	7.30	5.23	4.19	3.35	1.35
1916	7.11	5.06	4.04	3.22	1.29
1917	6.87	4.84	3.86	3.07	1.22
1918	6.35	4.34	3.45	2.74	1.09
1919	6.15	4.14	3.29	2.61	1.03
1920	5.68	3.70	2.94	2.33	0.93
1921	5.35	3.47	2.75	2.18	0.86
1922	5.42	3.62	2.85	2.25	0.87
1923	5.11	3.40	2.68	2.10	0.81
1924	4.81	3.22	2.52	1.97	0.75
1925	4.82	3.26	2.55	1.99	0.75
1926	4.59	3.12	2.44	1.90	0.71
1927	4.31	2.95	2.29	1.78	0.66
1928	4.31	2.98	2.31	1.79	0.66
1929	4.22	2.93	2.26	1.75	0.65
1930	3.95	2.76	2.13	1.65	0.61
1931	3.96	2.78	2.14	1.65	0.60

under the OASI program whether compared to subsequent cohorts, to the market alternative, or to the standard of fairness implicit in either of the counterfactual pay-as-you-go programs considered in Section IV.

**Figure D1**  
**Real OASI Internal Rate of Return for the Notch and Surrounding Cohorts:**  
**Present Law Scenario Using the Trustees' Report Intermediate Assumptions**



**Figure D2**  
**Ratio of OASI Benefit/Tax Present Values for the Notch and Surrounding Cohorts:**  
**Present Law Scenario Using the Trustees' Report Intermediate Assumptions**





Appendix E. Individual Cohort Estimates Under the OASI Present Law Scenario Using the Trustees' Report Intermediate Assumptions.

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)					
		--- Assumed Constant Discount Rates ---			--- Assumed Constant Discount Rates ---			--- Assumed Constant Discount Rates ---					
		0%	1%	2%	0%	1%	2%	Fund	Rate	0%	1%	2%	
1876	36.54	-----	-----	-----	15.25	13.63	12.20	8.02	10.997	6.415	8.813	12.118	43.422
1877	33.36	-----	-----	-----	17.59	15.72	14.06	9.11	13.019	7.592	10.347	14.113	49.157
1878	29.05	-----	-----	-----	16.34	14.48	12.86	8.12	15.488	9.032	12.194	16.475	54.748
1879	27.22	-----	-----	-----	16.88	14.90	13.17	8.15	18.504	10.814	14.482	19.411	62.587
1880	25.03	-----	-----	-----	15.29	13.50	11.92	7.34	22.167	12.954	17.229	22.926	71.655
1881	24.17	-----	-----	-----	16.37	14.37	12.62	7.60	25.920	15.182	20.063	26.526	81.119
1882	23.26	-----	-----	-----	15.92	13.99	12.29	7.38	31.261	18.327	24.095	31.706	94.894
1883	23.25	-----	-----	-----	17.05	14.93	13.09	7.79	35.804	21.086	27.564	36.061	105.406
1884	21.71	-----	-----	-----	15.36	13.44	11.76	6.94	41.938	24.799	32.172	41.777	118.510
1885	20.55	-----	-----	-----	14.54	12.69	11.07	6.45	46.866	27.834	35.785	46.047	125.938
1886	20.69	-----	-----	-----	15.97	13.88	12.07	6.93	53.495	31.926	40.754	52.079	139.015
1887	19.87	-----	-----	-----	16.19	13.98	12.07	6.77	59.077	35.447	44.820	56.749	145.634
1888	19.01	-----	-----	-----	15.37	13.28	11.46	6.37	69.766	42.028	52.750	66.284	164.724
1889	18.33	-----	-----	-----	15.40	13.22	11.35	6.18	74.555	45.206	56.187	69.918	167.276
1890	17.89	-----	-----	-----	15.24	13.08	11.22	6.07	80.661	49.182	60.574	74.698	172.212
1891	16.67	-----	-----	-----	14.82	12.61	10.73	5.60	87.059	53.381	65.039	79.326	173.939
1892	16.42	-----	-----	-----	14.58	12.38	10.52	5.46	97.545	60.163	72.696	87.929	186.599
1893	15.69	-----	-----	-----	13.88	11.73	9.92	5.06	102.765	63.772	76.237	91.225	184.637
1894	15.34	-----	-----	-----	13.78	11.62	9.80	4.94	108.561	67.947	80.477	95.414	186.103
1895	14.58	-----	-----	-----	12.87	10.81	9.09	4.51	113.022	71.475	83.701	98.097	181.549
1896	13.73	-----	-----	-----	11.74	9.85	8.26	4.05	117.429	74.843	86.707	100.475	176.011
1897	13.47	-----	-----	-----	11.70	9.79	8.19	3.97	118.387	76.111	87.307	100.175	168.390
1898	12.70	-----	-----	-----	10.63	8.87	7.40	3.54	123.868	80.247	91.097	103.375	163.879
1899	12.24	-----	-----	-----	10.02	8.35	6.95	3.30	121.997	79.965	89.762	100.689	151.193
1900	11.90	-----	-----	-----	9.98	8.27	6.84	3.18	136.254	90.882	100.922	111.993	160.151

**Appendix E. Individual Cohort Estimates Under the OASI Present Law Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			Trust						
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%
1901	11.10	-----	-----	-----	9.06	7.49	6.17	2.81	132.875	89.875	98.514	107.798	142.149	
1902	10.71	-----	-----	-----	8.50	7.02	5.78	2.62	143.271	97.729	106.152	115.003	143.170	
1903	10.63	-----	-----	-----	8.32	6.87	5.67	2.58	149.081	102.805	110.753	118.991	142.870	
1904	10.21	-----	-----	-----	7.83	6.45	5.31	2.39	153.098	107.162	114.248	121.379	136.340	
1905	9.80	-----	-----	-----	7.58	6.21	5.08	2.24	161.506	116.017	122.148	128.086	133.565	
1906	9.45	-----	-----	-----	7.23	5.91	4.82	2.10	164.432	120.699	125.659	130.205	126.131	
1907	9.35	-----	-----	-----	7.09	5.79	4.72	2.05	171.426	128.337	132.425	135.966	126.124	
1908	9.02	-----	-----	-----	6.69	5.45	4.44	1.92	174.529	134.132	136.798	138.710	118.536	
1909	8.62	-----	-----	-----	6.41	5.20	4.21	1.79	173.399	137.234	138.223	138.243	106.642	
1910	8.38	-----	-----	-----	6.21	5.03	4.06	1.70	173.683	141.544	141.040	139.438	98.909	
1911	8.31	-----	-----	-----	6.10	4.94	3.99	1.67	173.567	146.260	144.253	141.132	95.005	
1912	7.90	-----	-----	-----	5.71	4.61	3.71	1.54	174.276	152.594	148.489	143.055	83.143	
1913	7.80	-----	-----	-----	5.66	4.55	3.66	1.50	174.203	159.428	153.453	146.173	79.191	
1914	7.40	-----	-----	-----	5.25	4.21	3.38	1.38	169.639	163.683	155.198	145.259	64.115	
1915	7.30	-----	-----	-----	5.23	4.19	3.35	1.35	165.140	168.476	157.963	146.134	59.218	
1916	7.11	-----	-----	-----	5.06	4.04	3.22	1.29	157.196	170.362	157.770	143.960	50.308	
1917	6.87	-----	-----	-----	4.84	3.86	3.07	1.22	146.222	170.648	155.778	139.835	38.964	
1918	6.35	-----	-----	-----	4.34	3.45	2.74	1.09	128.657	164.517	147.263	128.893	15.968	
1919	6.15	-----	-----	-----	4.14	3.29	2.61	1.03	113.283	159.988	140.780	120.779	6.203	
1920	5.68	-----	-----	-----	3.70	2.94	2.33	0.93	96.964	152.838	131.634	109.643	-13.989	
1921	5.35	-----	-----	-----	3.47	2.75	2.18	0.86	86.840	156.133	131.672	106.628	-28.970	
1922	5.42	-----	-----	-----	3.62	2.85	2.25	0.87	86.988	167.104	139.854	112.621	-25.644	
1923	5.11	-----	-----	-----	3.40	2.68	2.10	0.81	74.266	161.638	132.462	103.596	-38.839	
1924	4.81	-----	-----	-----	3.22	2.52	1.97	0.75	64.010	160.759	128.810	97.504	-53.106	
1925	4.82	-----	-----	-----	3.26	2.55	1.99	0.75	62.578	167.063	132.673	99.595	-51.808	

Appendix E. Individual Cohort Estimates Under the OASI Present Law Scenario Using the Trustees' Report Intermediate Assumptions (Continued).

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)									
		--- Assumed Constant Discount Rates ---			--- Assumed Constant Discount Rates ---			--- Assumed Constant Discount Rates ---									
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%
1926	4.59	---	---	---	3.12	2.44	1.90	0.71	53.576	163.862	127.470	92.872	-60.858				
1927	4.31	---	---	---	2.95	2.29	1.78	0.66	43.010	160.107	121.296	84.787	-73.055				
1928	4.31	---	---	---	2.98	2.31	1.79	0.66	41.828	162.370	121.956	84.567	-70.039				
1929	4.22	---	---	---	2.93	2.26	1.75	0.65	36.654	159.376	117.776	79.873	-70.363				
1930	3.95	---	---	---	2.76	2.13	1.65	0.61	27.494	154.665	111.072	71.758	-80.073				
1931	3.96	---	---	---	2.78	2.14	1.65	0.60	26.996	156.384	111.262	71.247	-76.509				
1932	3.74	---	---	---	2.65	2.04	1.57	0.57	19.478	150.778	104.336	63.592	-83.091				
1933	3.63	---	---	---	2.61	2.00	1.54	0.55	16.340	149.738	101.744	60.205	-84.319				
1934	3.51	---	---	---	2.57	1.96	1.49	0.53	12.811	152.361	101.336	57.696	-89.850				
1935	3.33	---	---	---	2.47	1.88	1.43	0.51	7.096	154.557	99.801	53.529	-98.415				
1936	3.24	---	---	---	2.42	1.84	1.40	0.49	4.058	156.109	98.643	50.771	-100.743				
1937	3.20	---	---	---	2.42	1.83	1.39	0.49	3.412	162.390	101.188	50.955	-101.953				
1938	2.96	---	---	---	2.29	1.73	1.30	0.45	-6.200	159.967	95.198	42.625	-113.462				
1939	2.83	---	---	---	2.23	1.68	1.26	0.44	-10.200	159.033	91.828	38.051	-116.139				
1940	2.68	---	---	---	2.15	1.61	1.21	0.41	-17.127	158.001	87.503	31.803	-123.120				
1941	2.62	70,588	23,729	5,055	2.13	1.59	1.19	0.40	-19.661	165.781	89.846	30.716	-127.823				
1942	2.39	68,734	21,832	3,438	2.03	1.51	1.12	0.37	-33.416	172.124	87.271	21.835	-150.344				
1943	2.33	64,905	20,224	2,811	2.00	1.48	1.10	0.36	-37.196	180.787	89.030	19.468	-155.564				
1944	2.33	62,527	19,439	2,685	1.98	1.48	1.10	0.37	-34.626	180.149	87.642	18.862	-144.914				
1945	2.29	65,623	20,192	2,568	1.97	1.46	1.09	0.37	-35.629	180.339	85.973	16.864	-141.087				
1946	2.24	75,386	22,856	2,483	1.99	1.46	1.08	0.35	-44.316	201.697	93.804	15.568	-159.280				
1947	2.21	72,982	21,918	2,170	1.98	1.45	1.07	0.34	-51.052	234.088	106.775	15.989	-177.736				
1948	2.13	64,337	18,687	1,243	1.90	1.41	1.04	0.34	-53.007	232.126	101.386	10.097	-173.268				
1949	2.17	69,518	20,529	1,714	1.94	1.43	1.05	0.35	-48.638	240.158	105.590	13.072	-164.746				
1950	2.18	72,692	21,548	1,878	1.95	1.43	1.06	0.34	-47.074	250.056	109.268	13.982	-161.292				

Appendix E. Individual Cohort Estimates Under the OASI Present Law Scenario Using the Trustees' Report Intermediate Assumptions (Continued).

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)					
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			Trust					
		0%	1%	2%	0%	1%	2%	Fund	Rate	0%	1%	2%	
1951	2.16	73,877	21,676	1,636	1.94	1.43	1.05	0.34	-49,348	260,739	111,658	12,254	-163,284
1952	2.12	74,312	21,527	1,325	1.93	1.41	1.04	0.34	-51,263	270,521	113,245	10,035	-164,224
1953	2.12	75,892	22,029	1,409	1.93	1.42	1.04	0.34	-49,324	283,120	117,583	10,720	-161,250
1954	2.09	76,207	21,780	1,019	1.92	1.40	1.03	0.33	-51,191	291,922	118,189	7,806	-161,938
1955	2.04	75,178	21,017	477	1.89	1.38	1.01	0.33	-52,503	294,803	115,598	3,666	-160,074
1956	2.02	75,670	20,931	227	1.88	1.37	1.01	0.33	-51,784	301,862	115,954	1,742	-157,327
1957	1.98	74,948	20,326	-228	1.86	1.36	0.99	0.32	-51,536	305,465	113,906	-1,749	-154,488
1958	1.92	72,721	19,042	-985	1.82	1.33	0.97	0.32	-52,184	301,185	107,362	-7,534	-150,930
1959	1.87	71,852	18,290	-1,572	1.79	1.31	0.96	0.31	-51,790	297,283	101,997	-11,779	-146,419
1960	1.84	71,995	18,052	-1,893	1.78	1.30	0.95	0.31	-49,895	297,769	99,635	-13,907	-141,610
1961	1.84	72,252	18,080	-1,928	1.78	1.30	0.95	0.31	-45,605	301,490	99,681	-14,007	-134,974
1962	1.81	71,629	17,580	-2,298	1.77	1.29	0.94	0.30	-43,559	298,389	95,807	-16,342	-129,051
1963	1.83	73,595	18,282	-2,103	1.78	1.30	0.95	0.30	-37,988	300,741	96,765	-14,378	-120,522
1964	1.80	73,540	17,961	-2,448	1.77	1.29	0.94	0.30	-36,035	295,561	92,574	-16,144	-114,151
1965	1.78	73,123	17,523	-2,802	1.75	1.28	0.93	0.29	-33,681	284,998	86,719	-17,564	-105,730
1966	1.81	76,028	18,558	-2,516	1.77	1.29	0.94	0.30	-28,918	281,546	86,399	-14,690	-96,051
1967	1.85	80,114	20,129	-1,990	1.79	1.31	0.95	0.30	-24,239	283,969	88,807	-10,905	-87,883
1968	1.90	84,777	21,958	-1,350	1.82	1.33	0.97	0.30	-19,795	292,477	93,360	-7,060	-81,766
1969	1.94	88,933	23,569	-803	1.85	1.35	0.98	0.30	-16,501	305,527	98,799	-4,097	-77,799
1970	1.94	89,746	23,797	-778	1.85	1.35	0.98	0.30	-15,560	315,031	100,918	-3,980	-75,171
1971	1.83	82,919	20,478	-2,425	1.78	1.30	0.95	0.29	-21,280	299,169	88,376	-12,499	-74,144
1972	1.73	79,247	18,382	-3,666	1.73	1.26	0.92	0.28	-24,367	277,306	76,179	-17,965	-69,842
1973	1.80	85,190	20,641	-2,940	1.77	1.29	0.94	0.29	-19,693	277,622	78,876	-13,153	-62,734
1974	1.87	92,004	23,425	-1,882	1.81	1.32	0.96	0.29	-15,045	288,316	85,224	-7,939	-57,563
1975	1.87	93,128	23,680	-1,938	1.81	1.32	0.96	0.29	-14,677	292,534	85,500	-8,034	-55,166

Appendix E. Individual Cohort Estimates Under the OASI Present Law Scenario Using the Trustees' Report Intermediate Assumptions (Continued).

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			Trust						
		0%	1%	2%	0%	1%	2%	Fund	Rate	0%	1%	2%		
1976	1.89	95,272	24,430	-1,747	-7,851	1.82	1.32	0.96	0.29	-13,643	301,120	87,878	-7,145	-52,926
1977	1.90	97,323	25,175	-1,536	-7,920	1.83	1.33	0.97	0.29	-12,715	312,993	91,230	-6,264	-51,255
1978	1.88	96,535	24,616	-1,925	-8,016	1.82	1.32	0.96	0.29	-13,732	319,561	90,914	-7,924	-50,373
1979	1.90	98,997	25,521	-1,660	-8,098	1.83	1.33	0.97	0.29	-12,688	334,345	95,210	-6,834	-48,976
1980	1.87	98,037	24,861	-2,113	-8,208	1.82	1.32	0.96	0.29	-13,966	342,263	94,926	-8,815	-48,414
1981	1.83	96,529	23,981	-2,649	-8,312	1.80	1.31	0.95	0.28	-15,417	346,321	93,166	-11,134	-47,530
1982	1.82	96,228	23,603	-2,986	-8,427	1.79	1.30	0.94	0.28	-16,068	350,212	92,099	-12,482	-46,116
1983	1.78	94,831	22,674	-3,611	-8,575	1.77	1.28	0.93	0.28	-17,463	347,804	88,277	-14,914	-44,614
1984	1.80	97,708	23,758	-3,272	-8,662	1.79	1.29	0.94	0.28	-15,731	356,766	91,175	-13,192	-42,325
1985	1.82	100,551	24,817	-2,954	-8,757	1.80	1.30	0.95	0.28	-14,268	369,623	94,930	-11,752	-40,640
1986	1.79	99,803	24,067	-3,578	-8,957	1.78	1.29	0.93	0.28	-15,639	371,487	92,298	-14,132	-39,706
1987	1.79	101,344	24,484	-3,585	-9,084	1.79	1.29	0.94	0.28	-15,049	379,024	93,412	-13,948	-38,171
1988	1.81	103,199	25,204	-3,345	-9,137	1.80	1.30	0.94	0.28	-13,851	391,479	96,565	-12,945	-36,742
1989	1.82	104,860	25,767	-3,224	-9,224	1.80	1.30	0.94	0.28	-13,045	405,623	99,673	-12,471	-35,679
1990	1.80	104,403	25,363	-3,546	-9,327	1.79	1.30	0.94	0.27	-13,590	415,671	99,981	-13,840	-35,032
1991	1.73	99,994	23,079	-4,781	-9,494	1.75	1.27	0.92	0.27	-16,622	406,254	91,916	-18,670	-34,331
1992	1.73	101,011	23,248	-4,907	-9,629	1.75	1.27	0.92	0.27	-15,939	405,930	90,676	-18,582	-32,489
1993	1.73	102,172	23,490	-4,993	-9,759	1.75	1.27	0.91	0.27	-15,130	405,852	89,669	-18,324	-30,705
1994	1.73	103,421	23,774	-5,062	-9,887	1.75	1.27	0.91	0.27	-14,259	405,627	88,718	-17,981	-28,978
1995	1.73	104,795	24,115	-5,102	-10,014	1.76	1.27	0.91	0.26	-13,323	405,769	87,963	-17,542	-27,334
1996	1.73	106,315	24,528	-5,107	-10,137	1.76	1.27	0.92	0.26	-12,322	406,571	87,489	-17,001	-25,782
1997	1.73	107,793	24,923	-5,118	-10,259	1.76	1.27	0.92	0.26	-11,373	407,559	87,023	-16,515	-24,337
1998	1.73	109,315	25,347	-5,111	-10,378	1.76	1.27	0.92	0.26	-10,422	409,183	86,749	-16,007	-22,992
1999	1.74	110,764	25,738	-5,117	-10,495	1.76	1.27	0.92	0.26	-9,551	411,087	86,477	-15,578	-21,750
2000	1.74	112,195	26,128	-5,120	-10,609	1.77	1.27	0.92	0.26	-8,715	413,448	86,300	-15,173	-20,595

**Appendix E. Individual Cohort Estimates Under the OASI Present Law Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			Trust Fund						
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%
2001	1.74	113,572	26,496	-5,128	-10,722	1.77	1.27	0.92	0.26	-7,938	416,171	86,165	-14,817	-19,525
2002	1.74	114,940	26,868	-5,132	-10,831	1.77	1.28	0.92	0.26	-7,189	419,375	86,135	-14,474	-18,529
2003	1.75	116,281	27,231	-5,135	-10,938	1.77	1.28	0.92	0.26	-6,479	423,074	86,192	-14,160	-17,603
2004	1.75	117,561	27,572	-5,146	-11,043	1.77	1.28	0.92	0.26	-5,817	427,164	86,293	-13,893	-16,744
2005	1.75	118,814	27,906	-5,155	-11,146	1.77	1.28	0.92	0.26	-5,185	431,816	86,496	-13,648	-15,946
2006	1.75	119,975	28,205	-5,177	-11,246	1.78	1.28	0.92	0.26	-4,610	436,866	86,721	-13,463	-15,207
2007	1.75	121,060	28,473	-5,211	-11,345	1.78	1.28	0.92	0.26	-4,085	442,287	86,966	-13,329	-14,521
2008	1.75	122,070	28,709	-5,257	-11,442	1.78	1.28	0.92	0.26	-3,607	447,985	87,209	-13,243	-13,879
2009	1.75	123,017	28,919	-5,314	-11,539	1.78	1.28	0.92	0.26	-3,169	453,860	87,442	-13,194	-13,274
2010	1.75	123,969	29,131	-5,369	-11,636	1.78	1.28	0.92	0.26	-2,745	459,964	87,703	-13,143	-12,700
2011	1.75	124,926	29,344	-5,425	-11,733	1.77	1.28	0.92	0.26	-2,337	466,070	87,953	-13,091	-12,147
2012	1.75	125,897	29,560	-5,482	-11,831	1.77	1.28	0.92	0.26	-1,943	471,990	88,152	-13,033	-11,612
2013	1.75	126,878	29,775	-5,542	-11,931	1.77	1.28	0.92	0.26	-1,568	477,590	88,269	-12,970	-11,092
2014	1.75	127,876	29,994	-5,604	-12,034	1.77	1.28	0.92	0.26	-1,210	482,835	88,309	-12,897	-10,587
2015	1.75	128,892	30,214	-5,669	-12,138	1.77	1.28	0.92	0.26	-0,871	487,669	88,257	-12,818	-10,095
2016	1.75	129,926	30,436	-5,738	-12,245	1.77	1.28	0.92	0.26	-0,554	492,039	88,109	-12,730	-9,616
2017	1.75	130,888	30,634	-5,813	-12,350	1.77	1.28	0.92	0.26	-0,268	497,357	88,099	-12,688	-9,181
2018	1.75	131,872	30,834	-5,892	-12,458	1.77	1.28	0.92	0.26	-0,002	502,228	87,995	-12,635	-8,756
2019	1.75	132,875	31,037	-5,973	-12,568	1.77	1.28	0.92	0.26	0,246	506,658	87,802	-12,573	-8,344
2020	1.74	133,899	31,243	-6,057	-12,680	1.77	1.28	0.92	0.26	0,474	510,672	87,531	-12,502	-7,944
2021	1.74	134,940	31,452	-6,143	-12,795	1.77	1.28	0.92	0.26	0,683	514,287	87,182	-12,424	-7,557
2022	1.74	136,001	31,664	-6,232	-12,913	1.77	1.27	0.92	0.26	0,873	517,568	86,772	-12,337	-7,184
2023	1.74	137,076	31,879	-6,323	-13,032	1.77	1.27	0.92	0.26	1,046	520,574	86,316	-12,246	-6,826
2024	1.74	138,165	32,095	-6,415	-13,154	1.77	1.27	0.92	0.26	1,200	523,392	85,826	-12,151	-6,483
2025	1.74	139,264	32,313	-6,509	-13,276	1.77	1.27	0.92	0.26	1,338	526,115	85,318	-12,055	-6,156

**Appendix E. Individual Cohort Estimates Under the OASI Present Law Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		--- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			Trust						
		0%	1%	2%	0%	1%	2%	Fund	0%	1%	2%			
2026	1.74	140,372	32,531	-6,604	-13,400	1.77	1.27	0.92	0.26	1.460	528.826	84.808	-11.957	-5.845
2027	1.74	141,482	32,750	-6,700	-13,524	1.76	1.27	0.92	0.26	1.568	531.597	84.309	-11.862	-5.551
2028	1.73	142,597	32,970	-6,797	-13,650	1.76	1.27	0.92	0.26	1.663	534.511	83.836	-11.769	-5.273
2029	1.73	143,712	33,190	-6,894	-13,775	1.76	1.27	0.92	0.26	1.746	537.606	83.392	-11.679	-5.010
2030	1.73	144,828	33,411	-6,989	-13,900	1.76	1.27	0.91	0.26	1.818	540.935	82.986	-11.591	-4.762
2031	1.73	145,938	33,629	-7,087	-14,025	1.76	1.27	0.91	0.26	1.879	544.500	82.612	-11.510	-4.528
2032	1.73	147,054	33,851	-7,182	-14,150	1.76	1.27	0.91	0.26	1.934	548.364	82.289	-11.430	-4.307
2033	1.73	148,167	34,071	-7,278	-14,275	1.76	1.27	0.91	0.26	1.980	552.490	82.001	-11.354	-4.099
2034	1.73	149,285	34,295	-7,371	-14,399	1.76	1.27	0.91	0.26	2.020	556.902	81.757	-11.279	-3.902
2035	1.73	150,403	34,518	-7,464	-14,524	1.76	1.27	0.91	0.26	2.055	561.568	81.548	-11.208	-3.717
2036	1.73	151,532	34,748	-7,555	-14,648	1.76	1.27	0.91	0.26	2.087	566.493	81.380	-11.136	-3.541
2037	1.72	152,667	34,980	-7,645	-14,772	1.76	1.27	0.91	0.26	2.116	571.626	81.238	-11.065	-3.374
2038	1.72	153,815	35,217	-7,733	-14,897	1.76	1.27	0.91	0.26	2.143	576.941	81.122	-10.991	-3.215
2039	1.72	154,974	35,458	-7,819	-15,022	1.76	1.27	0.91	0.26	2.169	582.377	81.021	-10.917	-3.065
2040	1.72	156,148	35,705	-7,904	-15,147	1.76	1.27	0.91	0.26	2.195	587.893	80.929	-10.839	-2.921
2041	1.72	157,342	35,960	-7,986	-15,273	1.76	1.27	0.91	0.26	2.222	593.450	80.843	-10.757	-2.783
2042	1.72	158,555	36,219	-8,069	-15,401	1.76	1.26	0.91	0.26	2.249	598.997	80.751	-10.672	-2.652
2043	1.72	159,791	36,487	-8,149	-15,528	1.76	1.26	0.91	0.26	2.279	604.516	80.656	-10.582	-2.526
2044	1.72	161,043	36,759	-8,229	-15,658	1.76	1.26	0.91	0.26	2.309	609.953	80.546	-10.487	-2.406
2045	1.72	162,317	37,038	-8,308	-15,788	1.76	1.26	0.91	0.26	2.340	615.310	80.422	-10.390	-2.291
2046	1.71	163,610	37,322	-8,388	-15,921	1.76	1.26	0.91	0.26	2.371	620.571	80.283	-10.290	-2.180
2047	1.71	164,922	37,611	-8,467	-16,054	1.76	1.26	0.91	0.26	2.403	625.729	80.127	-10.186	-2.075
2048	1.71	166,254	37,905	-8,546	-16,189	1.76	1.26	0.91	0.26	2.434	630.798	79.957	-10.080	-1.974
2049	1.71	167,601	38,203	-8,626	-16,325	1.75	1.26	0.91	0.26	2.465	635.775	79.771	-9.973	-1.877
2050	1.71	168,967	38,507	-8,705	-16,462	1.75	1.26	0.91	0.26	2.496	640.694	79.578	-9.863	-1.785

**Appendix F. Individual Cohort Estimates Under the OASI Tax Increase Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions.**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)					
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			Trust					
		0%	1%	2%	0%	1%	2%	Fund	Rate	0%	1%	2%	6%
1876	36.54	-----	-----	-----	15.25	13.63	12.20	8.02	10.997	6.415	8.813	12.118	43.422
1877	33.36	-----	-----	-----	17.59	15.72	14.06	9.11	13.019	7.592	10.347	14.113	49.157
1878	29.05	-----	-----	-----	16.34	14.48	12.86	8.12	15.488	9.032	12.194	16.475	54.748
1879	27.22	-----	-----	-----	16.88	14.90	13.17	8.15	18.504	10.814	14.482	19.411	62.587
1880	25.03	-----	-----	-----	15.29	13.50	11.92	7.34	22.167	12.954	17.229	22.926	71.655
1881	24.17	-----	-----	-----	16.37	14.37	12.62	7.60	25.920	15.182	20.063	26.526	81.119
1882	23.26	-----	-----	-----	15.92	13.99	12.29	7.38	31.261	18.327	24.095	31.706	94.894
1883	23.25	-----	-----	-----	17.05	14.93	13.09	7.79	35.804	21.086	27.564	36.061	105.406
1884	21.71	-----	-----	-----	15.36	13.44	11.76	6.94	41.938	24.799	32.172	41.777	118.510
1885	20.55	-----	-----	-----	14.54	12.69	11.07	6.45	46.866	27.834	35.785	46.047	125.938
1886	20.69	-----	-----	-----	15.97	13.88	12.07	6.93	53.495	31.926	40.754	52.079	139.015
1887	19.87	-----	-----	-----	16.19	13.98	12.07	6.77	59.077	35.447	44.820	56.749	145.634
1888	19.01	-----	-----	-----	15.37	13.28	11.46	6.37	69.766	42.028	52.750	66.284	164.724
1889	18.33	-----	-----	-----	15.40	13.22	11.35	6.18	74.555	45.206	56.187	69.918	167.276
1890	17.89	-----	-----	-----	15.24	13.08	11.22	6.07	80.661	49.182	60.574	74.698	172.212
1891	16.67	-----	-----	-----	14.82	12.61	10.73	5.60	87.059	53.381	65.039	79.326	173.939
1892	16.42	-----	-----	-----	14.58	12.38	10.52	5.46	97.545	60.163	72.696	87.929	186.599
1893	15.69	-----	-----	-----	13.88	11.73	9.92	5.06	102.765	63.772	76.237	91.225	184.637
1894	15.34	-----	-----	-----	13.78	11.62	9.80	4.94	108.561	67.947	80.477	95.414	186.103
1895	14.58	-----	-----	-----	12.87	10.81	9.09	4.51	113.022	71.475	83.701	98.097	181.549
1896	13.73	-----	-----	-----	11.74	9.85	8.26	4.05	117.429	74.843	86.707	100.475	176.011
1897	13.47	-----	-----	-----	11.70	9.79	8.19	3.97	118.387	76.111	87.307	100.175	168.390
1898	12.70	-----	-----	-----	10.63	8.87	7.40	3.54	123.868	80.247	91.097	103.375	163.879
1899	12.24	-----	-----	-----	10.02	8.35	6.95	3.30	121.997	79.965	89.762	100.689	151.193
1900	11.90	-----	-----	-----	9.98	8.27	6.84	3.18	136.254	90.882	100.922	111.993	160.151



**Appendix F. Individual Cohort Estimates Under the OASI Tax Increase Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)					
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --					
		0%	1%	2%	0%	1%	2%	Fund	Rate	0%	1%	2%	6%
1901	11.10	-----	-----	-----	9.06	7.49	6.17	2.81	132.875	89.875	98.514	107.798	142.149
1902	10.71	-----	-----	-----	8.50	7.02	5.78	2.62	143.271	97.729	106.152	115.003	143.170
1903	10.63	-----	-----	-----	8.32	6.87	5.67	2.58	149.081	102.805	110.753	118.991	142.870
1904	10.21	-----	-----	-----	7.83	6.45	5.31	2.39	153.098	107.162	114.248	121.379	136.340
1905	9.80	-----	-----	-----	7.58	6.21	5.08	2.24	161.506	116.017	122.148	128.086	133.565
1906	9.45	-----	-----	-----	7.23	5.91	4.82	2.10	164.432	120.699	125.659	130.205	126.131
1907	9.35	-----	-----	-----	7.09	5.79	4.72	2.05	171.426	128.337	132.425	135.966	126.124
1908	9.02	-----	-----	-----	6.69	5.45	4.44	1.92	174.529	134.132	136.798	138.710	118.536
1909	8.62	-----	-----	-----	6.41	5.20	4.21	1.79	173.399	137.234	138.223	138.243	106.642
1910	8.38	-----	-----	-----	6.21	5.03	4.06	1.70	173.683	141.544	141.040	139.438	98.909
1911	8.31	-----	-----	-----	6.10	4.94	3.99	1.67	173.567	146.260	144.253	141.132	95.005
1912	7.90	-----	-----	-----	5.71	4.61	3.71	1.54	174.276	152.594	148.489	143.055	83.143
1913	7.80	-----	-----	-----	5.66	4.55	3.66	1.50	174.204	159.428	153.453	146.173	79.191
1914	7.40	-----	-----	-----	5.25	4.21	3.38	1.38	169.639	163.683	155.198	145.259	64.115
1915	7.30	-----	-----	-----	5.23	4.19	3.35	1.35	165.140	168.476	157.963	146.134	59.218
1916	7.11	-----	-----	-----	5.06	4.04	3.22	1.29	157.196	170.363	157.770	143.960	50.308
1917	6.87	-----	-----	-----	4.84	3.86	3.07	1.22	146.223	170.648	155.780	139.835	38.964
1918	6.35	-----	-----	-----	4.34	3.45	2.74	1.09	128.658	164.518	147.263	128.893	15.968
1919	6.15	-----	-----	-----	4.14	3.29	2.61	1.03	113.283	159.988	140.780	120.779	6.203
1920	5.68	-----	-----	-----	3.70	2.94	2.33	0.93	96.964	152.839	131.634	109.643	-13.989
1921	5.35	-----	-----	-----	3.47	2.75	2.18	0.86	86.841	156.134	131.674	106.628	-28.970
1922	5.42	-----	-----	-----	3.62	2.85	2.25	0.87	86.989	167.105	139.854	112.621	-25.644
1923	5.11	-----	-----	-----	3.40	2.68	2.10	0.81	74.267	161.639	132.462	103.596	-38.839
1924	4.81	-----	-----	-----	3.22	2.52	1.97	0.75	64.011	160.760	128.812	97.504	-53.106
1925	4.81	-----	-----	-----	3.26	2.55	1.99	0.75	62.579	167.065	132.675	99.598	-51.808

**Appendix F. Individual Cohort Estimates Under the OASI Tax Increase Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)					
		Assumed Constant Discount Rates --			Assumed Constant Discount Rates --			Assumed Constant Discount Rates --					
		0%	1%	2%	0%	1%	2%	0%	1%	2%			
1926	4.59	---	---	---	3.12	2.44	1.90	0.71	53.577	163.864	127.471	92.875	-60.858
1927	4.31	---	---	---	2.95	2.29	1.78	0.66	43.011	160.109	121.298	84.787	-73.055
1928	4.31	---	---	---	2.98	2.31	1.79	0.66	41.830	162.372	121.958	84.567	-70.039
1929	4.22	---	---	---	2.93	2.26	1.75	0.65	36.656	159.379	117.778	79.873	-70.363
1930	3.95	---	---	---	2.76	2.13	1.65	0.61	27.496	154.669	111.074	71.761	-80.073
1931	3.96	---	---	---	2.78	2.14	1.65	0.60	26.999	156.388	111.265	71.247	-76.509
1932	3.74	---	---	---	2.65	2.04	1.57	0.57	19.481	150.782	104.338	63.592	-83.091
1933	3.63	---	---	---	2.61	2.00	1.54	0.55	16.343	149.743	101.748	60.208	-84.319
1934	3.51	---	---	---	2.57	1.96	1.49	0.53	12.815	152.365	101.340	57.699	-89.850
1935	3.33	---	---	---	2.47	1.88	1.43	0.51	7.100	154.562	99.806	53.532	-98.415
1936	3.24	---	---	---	2.42	1.84	1.40	0.49	4.063	156.117	98.648	50.774	-100.743
1937	3.20	---	---	---	2.42	1.83	1.39	0.49	3.419	162.401	101.195	50.960	-101.953
1938	2.96	---	---	---	2.29	1.73	1.30	0.45	-6.192	159.979	95.208	42.634	-113.462
1939	2.83	---	---	---	2.23	1.68	1.26	0.44	-10.190	159.050	91.841	38.059	-116.139
1940	2.68	---	---	---	2.15	1.61	1.21	0.41	-17.115	158.020	87.517	31.814	-123.102
1941	2.62	70,598	23,733	5,058	2.13	1.59	1.19	0.40	-19.647	165.804	89.864	30.729	-127.823
1942	2.39	68,745	21,837	3,440	2.03	1.51	1.12	0.37	-33.401	172.151	87.290	21.851	-150.344
1943	2.33	64,916	20,229	2,813	2.00	1.48	1.10	0.36	-37.178	180.819	89.054	19.483	-155.564
1944	2.33	62,539	19,445	2,688	1.98	1.48	1.10	0.37	-34.607	180.183	87.667	18.879	-144.900
1945	2.29	65,636	20,199	2,570	1.97	1.47	1.09	0.37	-35.609	180.375	86.000	16.883	-141.087
1946	2.24	75,402	22,863	2,486	1.99	1.46	1.08	0.35	-44.292	201.740	93.833	15.587	-159.268
1947	2.21	72,998	21,926	2,173	1.98	1.45	1.07	0.34	-51.024	234.140	106.810	16.012	-177.736
1948	2.14	64,352	18,694	1,245	1.90	1.41	1.04	0.34	-52.978	232.181	101.422	10.119	-173.268
1949	2.17	69,534	20,536	1,717	1.94	1.43	1.05	0.35	-48.609	240.213	105.626	13.096	-164.746
1950	2.18	72,709	21,556	1,881	1.95	1.43	1.06	0.34	-47.044	250.115	109.306	14.006	-161.292

**Appendix F. Individual Cohort Estimates Under the OASI Tax Increase Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)					
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			Trust					
		0%	1%	2%	0%	1%	2%	Fund	Rate	0%	1%	2%	6%
1951	2.16	73,895	21,684	1,639	1.94	1.43	1.05	0.34	-49,316	260,801	111,696	12.277	-163.284
1952	2.12	74,329	21,534	1,328	1.93	1.41	1.04	0.34	-51,232	270,583	113,282	10.056	-164.224
1953	2.12	75,908	22,036	1,411	1.93	1.42	1.04	0.34	-49,294	283,180	117,616	10.740	-161.250
1954	2.09	76,221	21,785	1,020	1.92	1.40	1.03	0.33	-51,164	291,977	118,215	7.818	-161.938
1955	2.04	75,188	21,021	477	1.89	1.38	1.01	0.33	-52,482	294,844	115,616	3.670	-160.081
1956	2.02	75,675	20,931	226	1.88	1.37	1.01	0.33	-51,772	301,884	115,954	1.734	-157.340
1957	1.98	74,945	20,322	-231	1.86	1.36	0.99	0.32	-51,538	305,455	113,881	-1.775	-154.507
1958	1.91	72,705	19,030	-992	1.82	1.33	0.97	0.32	-52,212	301,118	107,296	-7.594	-150.954
1959	1.86	71,817	18,268	-1,585	1.79	1.31	0.96	0.31	-51,850	297,139	101,873	-11.881	-146.459
1960	1.84	71,937	18,016	-1,914	1.78	1.30	0.95	0.31	-49,995	297,529	99,441	-14.058	-141.658
1961	1.84	72,166	18,029	-1,957	1.78	1.30	0.95	0.31	-45,757	301,130	99,401	-14.219	-135.041
1962	1.81	71,505	17,508	-2,339	1.76	1.29	0.94	0.30	-43,778	297,873	95,414	-16.634	-129.133
1963	1.83	73,426	18,184	-2,158	1.78	1.30	0.95	0.30	-38,284	300,047	96,247	-14.758	-120.627
1964	1.80	73,312	17,830	-2,522	1.76	1.29	0.94	0.30	-36,428	294,644	91,900	-16.632	-114.284
1965	1.77	72,823	17,352	-2,899	1.74	1.27	0.93	0.29	-34,179	283,831	85,873	-18.172	-105.888
1966	1.80	75,647	18,341	-2,639	1.76	1.28	0.94	0.29	-29,522	280,135	85,385	-15.413	-96.239
1967	1.84	79,637	19,856	-2,145	1.78	1.30	0.95	0.30	-24,965	282,281	87,606	-11.756	-88.096
1968	1.89	84,192	21,623	-1,542	1.81	1.32	0.97	0.30	-20,669	290,458	91,933	-8.063	-82.011
1969	1.93	88,224	23,161	-1,037	1.83	1.34	0.98	0.30	-17,561	303,091	97,088	-5.293	-78.087
1970	1.92	88,899	23,308	-1,060	1.83	1.34	0.98	0.30	-16,857	312,056	98,845	-5.421	-75.507
1971	1.79	81,915	19,898	-2,761	1.76	1.29	0.94	0.29	-22,847	295,545	85,874	-14.225	-74.541
1972	1.71	78,058	17,694	-4,065	1.71	1.25	0.91	0.28	-26,156	273,146	73,327	-19.916	-70.279
1973	1.76	83,800	19,833	-3,409	1.74	1.27	0.93	0.29	-21,656	273,092	75,788	-15.253	-63.194
1974	1.84	90,405	22,491	-2,428	1.78	1.30	0.95	0.29	-17,239	283,305	81,826	-10.241	-58.057
1975	1.83	91,304	22,611	-2,566	1.78	1.30	0.95	0.29	-17,191	286,805	81,640	-10.634	-55.711

**Appendix F. Individual Cohort Estimates Under the OASI Tax Increase Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions**  
(Continued).

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --						
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%
1976	1.84	93,211	23,218	-2,461	-7,940	1.79	1.30	0.95	0.29	-16,515	294,609	83,517	-10,063	-53,526
1977	1.85	95,013	23,810	-2,342	-8,023	1.79	1.31	0.95	0.29	-16,005	305,563	86,283	-9,554	-51,919
1978	1.82	93,957	23,088	-2,832	-8,133	1.78	1.29	0.95	0.29	-17,511	311,029	85,269	-11,655	-51,108
1979	1.83	96,135	23,817	-2,675	-8,231	1.79	1.30	0.95	0.29	-16,992	324,678	88,852	-11,011	-49,784
1980	1.80	94,872	22,971	-3,243	-8,359	1.77	1.29	0.94	0.28	-18,885	331,213	87,707	-13,532	-49,306
1981	1.76	93,046	21,895	-3,901	-8,482	1.75	1.27	0.93	0.28	-20,968	333,827	85,061	-16,399	-48,504
1982	1.73	92,401	21,304	-4,372	-8,619	1.73	1.26	0.92	0.28	-22,252	336,284	83,125	-18,278	-47,166
1983	1.69	90,630	20,141	-5,143	-8,791	1.71	1.24	0.91	0.27	-24,283	332,394	78,413	-21,244	-45,736
1984	1.70	93,128	20,985	-4,957	-8,904	1.72	1.25	0.91	0.27	-23,165	340,042	80,532	-19,982	-43,506
1985	1.72	95,571	21,789	-4,800	-9,026	1.73	1.26	0.91	0.27	-22,438	351,316	83,346	-19,098	-41,890
1986	1.67	94,361	20,746	-5,609	-9,258	1.70	1.24	0.90	0.27	-24,645	351,229	79,561	-22,157	-41,042
1987	1.67	95,447	20,872	-5,803	-9,419	1.70	1.24	0.90	0.27	-24,863	356,967	79,630	-22,579	-39,580
1988	1.67	96,870	21,313	-5,745	-9,506	1.71	1.24	0.90	0.27	-24,559	367,470	81,656	-22,228	-38,226
1989	1.67	98,064	21,573	-5,819	-9,630	1.71	1.24	0.90	0.27	-24,785	379,334	83,451	-22,510	-37,250
1990	1.65	97,122	20,855	-6,345	-9,772	1.69	1.23	0.89	0.27	-26,497	386,684	82,212	-24,769	-36,706
1991	1.56	92,177	18,227	-7,804	-9,983	1.65	1.20	0.87	0.26	-30,597	374,497	72,592	-30,473	-36,097
1992	1.55	92,631	18,028	-8,170	-10,165	1.64	1.19	0.87	0.26	-30,724	372,251	70,318	-30,938	-34,298
1993	1.54	93,208	17,890	-8,507	-10,345	1.64	1.19	0.86	0.26	-30,718	370,247	68,291	-31,218	-32,550
1994	1.53	93,852	17,776	-8,837	-10,528	1.63	1.18	0.86	0.25	-30,635	368,099	66,336	-31,392	-30,856
1995	1.53	94,605	17,707	-9,149	-10,711	1.63	1.18	0.86	0.25	-30,479	366,311	64,590	-31,457	-29,238
1996	1.51	95,481	17,695	-9,437	-10,895	1.62	1.18	0.86	0.25	-30,257	365,140	63,115	-31,417	-27,709
1997	1.51	96,300	17,652	-9,739	-11,080	1.62	1.18	0.85	0.25	-30,085	364,105	61,634	-31,429	-26,284
1998	1.50	97,149	17,626	-10,033	-11,264	1.62	1.17	0.85	0.25	-29,912	363,644	60,326	-31,424	-24,957
1999	1.50	97,907	17,557	-10,348	-11,450	1.61	1.17	0.85	0.25	-29,815	363,372	58,989	-31,506	-23,730
2000	1.48	98,636	17,477	-10,667	-11,636	1.61	1.17	0.85	0.25	-29,749	363,482	57,725	-31,615	-22,588

**Appendix F. Individual Cohort Estimates Under the OASI Tax Increase Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		--- Assumed Constant Discount Rates ---			--- Assumed Constant Discount Rates ---			--- Assumed Constant Discount Rates ---						
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%
2001	1.47	99,300	17,367	-10,998	1.60	1.16	0.84	0.25	-29,732	363,873	56,475	-31,779	-21,527	
2002	1.47	99,943	17,251	-11,331	1.60	1.16	0.84	0.24	-29,738	364,655	55,306	-31,959	-20,537	
2003	1.45	100,550	17,121	-11,668	1.60	1.16	0.84	0.24	-29,777	365,838	54,193	-32,175	-19,616	
2004	1.45	101,086	16,961	-12,018	1.59	1.15	0.84	0.24	-29,866	367,301	53,083	-32,447	-18,758	
2005	1.43	101,588	16,789	-12,371	1.59	1.15	0.83	0.24	-29,988	369,211	52,036	-32,752	-17,961	
2006	1.42	101,990	16,574	-12,741	1.58	1.15	0.83	0.24	-30,172	371,377	50,959	-33,132	-17,220	
2007	1.41	102,310	16,324	-13,126	1.58	1.14	0.83	0.24	-30,408	373,784	49,859	-33,575	-16,530	
2008	1.40	102,545	16,035	-13,528	1.57	1.14	0.82	0.24	-30,692	376,328	48,711	-34,078	-15,883	
2009	1.39	102,710	15,715	-13,945	1.56	1.13	0.82	0.24	-31,008	378,941	47,516	-34,623	-15,272	
2010	1.38	102,869	15,390	-14,365	1.56	1.13	0.82	0.24	-31,326	381,678	46,333	-35,165	-14,687	
2011	1.36	103,023	15,057	-14,792	1.55	1.12	0.81	0.24	-31,632	384,358	45,130	-35,696	-14,123	
2012	1.35	103,179	14,718	-15,226	1.55	1.12	0.81	0.23	-31,915	386,821	43,890	-36,200	-13,571	
2013	1.34	103,330	14,369	-15,670	1.54	1.12	0.81	0.23	-32,172	388,952	42,598	-36,673	-13,031	
2014	1.33	103,486	14,014	-16,124	1.53	1.11	0.81	0.23	-32,395	390,740	41,261	-37,108	-12,502	
2015	1.32	103,642	13,649	-16,588	1.53	1.11	0.80	0.23	-32,586	392,134	39,870	-37,504	-11,983	
2016	1.30	103,800	13,275	-17,063	1.52	1.10	0.80	0.23	-32,741	393,099	38,429	-37,858	-11,474	
2017	1.29	103,887	12,874	-17,547	1.52	1.10	0.80	0.23	-32,968	394,756	37,023	-38,298	-11,010	
2018	1.28	103,976	12,463	-18,043	1.51	1.09	0.79	0.23	-33,160	395,988	35,566	-38,695	-10,555	
2019	1.27	104,070	12,043	-18,550	1.50	1.09	0.79	0.23	-33,314	396,821	34,069	-39,049	-10,109	
2020	1.26	104,166	11,616	-19,067	1.50	1.09	0.79	0.23	-33,434	397,276	32,543	-39,359	-9,673	
2021	1.24	104,264	11,178	-19,596	1.49	1.08	0.78	0.23	-33,521	397,376	30,986	-39,630	-9,249	
2022	1.23	104,365	10,733	-20,135	1.49	1.08	0.78	0.22	-33,579	397,173	29,412	-39,863	-8,837	
2023	1.22	104,467	10,278	-20,684	1.48	1.07	0.78	0.22	-33,610	396,734	27,830	-40,064	-8,439	
2024	1.21	104,564	9,814	-21,244	1.48	1.07	0.77	0.22	-33,622	396,106	26,243	-40,239	-8,055	
2025	1.19	104,657	9,339	-21,813	1.47	1.06	0.77	0.22	-33,622	395,374	24,659	-40,396	-7,687	

**Appendix F. Individual Cohort Estimates Under the OASI Tax Increase Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions**  
(Continued).

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --						
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%
2026	1.18	104,746	8,857	-22,390	-16,817	1.46	1.06	0.77	0.22	-33,611	394,611	23,089	-40,539	-7,336
2027	1.17	104,822	8,363	-22,976	-17,057	1.46	1.06	0.77	0.22	-33,597	393,850	21,530	-40,676	-7,001
2028	1.16	104,891	7,862	-23,568	-17,300	1.45	1.05	0.76	0.22	-33,582	393,172	19,992	-40,810	-6,683
2029	1.15	104,946	7,351	-24,168	-17,545	1.45	1.05	0.76	0.22	-33,572	392,590	18,469	-40,945	-6,381
2030	1.13	104,993	6,832	-24,774	-17,792	1.44	1.04	0.76	0.22	-33,566	392,151	16,969	-41,085	-6,095
2031	1.12	105,024	6,302	-25,387	-18,040	1.44	1.04	0.75	0.22	-33,567	391,848	15,482	-41,231	-5,824
2032	1.11	105,048	5,767	-26,004	-18,290	1.43	1.04	0.75	0.21	-33,574	391,725	14,020	-41,383	-5,568
2033	1.10	105,061	5,223	-26,627	-18,542	1.43	1.03	0.75	0.21	-33,588	391,753	12,571	-41,542	-5,324
2034	1.09	105,068	4,675	-27,255	-18,795	1.42	1.03	0.75	0.21	-33,608	391,953	11,146	-41,706	-5,094
2035	1.08	105,066	4,119	-27,888	-19,049	1.42	1.03	0.74	0.21	-33,633	392,288	9,731	-41,875	-4,875
2036	1.07	105,070	3,564	-28,523	-19,305	1.41	1.02	0.74	0.21	-33,658	392,798	8,346	-42,041	-4,666
2037	1.05	105,077	3,006	-29,161	-19,563	1.41	1.02	0.74	0.21	-33,682	393,436	6,982	-42,205	-4,468
2038	1.04	105,094	2,450	-29,801	-19,822	1.40	1.01	0.73	0.21	-33,702	394,194	5,643	-42,360	-4,279
2039	1.03	105,117	1,891	-30,445	-20,084	1.40	1.01	0.73	0.21	-33,715	395,019	4,321	-42,507	-4,097
2040	1.02	105,154	1,336	-31,091	-20,347	1.39	1.01	0.73	0.21	-33,718	395,903	3,028	-42,637	-3,923
2041	1.02	105,214	786	-31,738	-20,613	1.39	1.00	0.73	0.21	-33,706	396,837	1,766	-42,747	-3,756
2042	1.00	105,294	240	-32,386	-20,882	1.38	1.00	0.72	0.21	-33,678	397,787	0,535	-42,834	-3,596
2043	1.00	105,402	-299	-33,034	-21,153	1.38	1.00	0.72	0.21	-33,632	398,753	-0,661	-42,896	-3,441
2044	0.99	105,531	-832	-33,685	-21,426	1.38	1.00	0.72	0.21	-33,568	399,703	-1,823	-42,932	-3,292
2045	0.99	105,686	-1,361	-34,337	-21,703	1.37	0.99	0.72	0.20	-33,485	400,634	-2,955	-42,943	-3,149
2046	0.97	105,870	-1,881	-34,989	-21,983	1.37	0.99	0.72	0.20	-33,382	401,561	-4,046	-42,924	-3,010
2047	0.97	106,082	-2,394	-35,642	-22,265	1.37	0.99	0.71	0.20	-33,261	402,484	-5,100	-42,880	-2,877
2048	0.95	106,323	-2,897	-36,293	-22,549	1.36	0.98	0.71	0.20	-33,121	403,408	-6,112	-42,809	-2,749
2049	0.95	106,591	-3,393	-36,945	-22,836	1.36	0.98	0.71	0.20	-32,964	404,341	-7,084	-42,714	-2,626
2050	0.94	106,887	-3,879	-37,594	-23,125	1.36	0.98	0.71	0.20	-32,792	405,300	-8,016	-42,595	-2,508

**Appendix G. Individual Cohort Estimates Under the OASI Award Reduction Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions.**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)					
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --					
		0%	1%	2%	0%	1%	2%	Fund	Rate	Trust			
1876	36.54	-----	-----	-----	15.25	13.63	12.20	8.02	10.997	6.415	8.813	12.118	43.422
1877	33.36	-----	-----	-----	17.59	15.72	14.06	9.11	13.019	7.592	10.347	14.113	49.157
1878	29.05	-----	-----	-----	16.34	14.48	12.86	8.12	15.488	9.032	12.194	16.475	54.748
1879	27.22	-----	-----	-----	16.88	14.90	13.17	8.15	18.504	10.814	14.482	19.411	62.587
1880	25.03	-----	-----	-----	15.29	13.50	11.92	7.34	22.167	12.954	17.229	22.926	71.655
1881	24.17	-----	-----	-----	16.37	14.37	12.62	7.60	25.920	15.182	20.063	26.526	81.119
1882	23.26	-----	-----	-----	15.92	13.99	12.29	7.38	31.261	18.327	24.095	31.706	94.894
1883	23.25	-----	-----	-----	17.05	14.93	13.09	7.79	35.804	21.086	27.564	36.061	105.406
1884	21.71	-----	-----	-----	15.36	13.44	11.76	6.94	41.938	24.799	32.172	41.777	118.510
1885	20.55	-----	-----	-----	14.54	12.69	11.07	6.45	46.866	27.834	35.785	46.047	125.938
1886	20.69	-----	-----	-----	15.97	13.88	12.07	6.93	53.495	31.926	40.754	52.079	139.015
1887	19.87	-----	-----	-----	16.19	13.98	12.07	6.77	59.077	35.447	44.820	56.749	145.634
1888	19.01	-----	-----	-----	15.37	13.28	11.46	6.37	69.766	42.028	52.750	66.284	164.724
1889	18.33	-----	-----	-----	15.40	13.22	11.35	6.18	74.555	45.206	56.187	69.918	167.276
1890	17.89	-----	-----	-----	15.24	13.08	11.22	6.07	80.661	49.182	60.574	74.698	172.212
1891	16.67	-----	-----	-----	14.82	12.61	10.73	5.60	87.059	53.381	65.039	79.326	173.939
1892	16.42	-----	-----	-----	14.58	12.38	10.52	5.46	97.545	60.163	72.696	87.929	186.599
1893	15.69	-----	-----	-----	13.88	11.73	9.92	5.06	102.765	63.772	76.237	91.225	184.637
1894	15.34	-----	-----	-----	13.78	11.62	9.80	4.94	108.561	67.947	80.477	95.414	186.103
1895	14.58	-----	-----	-----	12.87	10.81	9.09	4.51	113.022	71.475	83.701	98.097	181.549
1896	13.73	-----	-----	-----	11.74	9.85	8.26	4.05	117.429	74.843	86.707	100.475	176.011
1897	13.47	-----	-----	-----	11.70	9.79	8.19	3.97	118.387	76.111	87.307	100.175	168.390
1898	12.70	-----	-----	-----	10.63	8.87	7.40	3.54	123.868	80.247	91.097	103.375	163.879
1899	12.24	-----	-----	-----	10.02	8.35	6.95	3.30	121.997	79.965	89.762	100.689	151.193
1900	11.90	-----	-----	-----	9.98	8.27	6.84	3.18	136.254	90.882	100.922	111.993	160.151

**Appendix G. Individual Cohort Estimates Under the OASI Award Reduction Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --						
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%
1901	11.10	-----	-----	-----	9.06	7.49	6.17	2.81	132.875	89.875	98.514	107.798	142.149	
1902	10.71	-----	-----	-----	8.50	7.02	5.78	2.62	143.271	97.729	106.152	115.003	143.170	
1903	10.63	-----	-----	-----	8.32	6.87	5.67	2.58	149.081	102.805	110.753	118.991	142.870	
1904	10.21	-----	-----	-----	7.83	6.45	5.31	2.39	153.098	107.162	114.248	121.379	136.340	
1905	9.80	-----	-----	-----	7.58	6.21	5.08	2.24	161.506	116.017	122.148	128.086	133.565	
1906	9.45	-----	-----	-----	7.23	5.91	4.82	2.10	164.432	120.699	125.659	130.205	126.131	
1907	9.35	-----	-----	-----	7.09	5.79	4.72	2.05	171.426	128.337	132.425	135.966	126.124	
1908	9.02	-----	-----	-----	6.69	5.45	4.44	1.92	174.529	134.133	136.798	138.710	118.536	
1909	8.62	-----	-----	-----	6.41	5.20	4.21	1.79	173.400	137.235	138.223	138.243	106.642	
1910	8.38	-----	-----	-----	6.21	5.03	4.06	1.70	173.684	141.545	141.040	139.438	98.909	
1911	8.31	-----	-----	-----	6.10	4.94	3.99	1.67	173.568	146.261	144.253	141.132	95.005	
1912	7.90	-----	-----	-----	5.71	4.61	3.71	1.54	174.277	152.595	148.492	143.055	83.143	
1913	7.80	-----	-----	-----	5.66	4.55	3.66	1.50	174.204	159.429	153.455	146.173	79.191	
1914	7.40	-----	-----	-----	5.25	4.21	3.38	1.38	169.640	163.684	155.198	145.259	64.115	
1915	7.30	-----	-----	-----	5.23	4.19	3.35	1.35	165.141	168.478	157.965	146.134	59.218	
1916	7.11	-----	-----	-----	5.06	4.04	3.22	1.29	157.198	170.364	157.772	143.960	50.308	
1917	6.87	-----	-----	-----	4.84	3.86	3.07	1.22	146.224	170.651	155.782	139.839	38.964	
1918	6.35	-----	-----	-----	4.34	3.45	2.74	1.09	128.660	164.521	147.268	128.897	15.968	
1919	6.15	-----	-----	-----	4.14	3.29	2.61	1.03	113.285	159.992	140.784	120.779	6.203	
1920	5.68	-----	-----	-----	3.70	2.94	2.33	0.93	96.967	152.843	131.638	109.647	-13.989	
1921	5.35	-----	-----	-----	3.47	2.75	2.18	0.86	86.844	156.140	131.678	106.632	-28.970	
1922	5.42	-----	-----	-----	3.62	2.85	2.25	0.87	86.993	167.111	139.860	112.625	-25.644	
1923	5.11	-----	-----	-----	3.40	2.68	2.10	0.81	74.272	161.646	132.468	103.600	-38.839	
1924	4.81	-----	-----	-----	3.22	2.52	1.97	0.75	64.016	160.767	128.817	97.507	-53.106	
1925	4.82	-----	-----	-----	3.26	2.55	1.99	0.75	62.585	167.073	132.680	99.602	-51.766	



**Appendix G. Individual Cohort Estimates Under the OASI Award Reduction Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)					
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			Trust					
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%
1926	4.59	---	---	---	3.12	2.44	1.90	0.71	53.583	163.871	127.477	92.879	-60.858
1927	4.31	---	---	---	2.95	2.29	1.78	0.66	43.017	160.116	121.304	84.793	-73.055
1928	4.31	---	---	---	2.98	2.31	1.79	0.66	41.835	162.378	121.962	84.573	-70.039
1929	4.21	---	---	---	2.93	2.26	1.75	0.65	36.661	159.382	117.782	79.877	-70.363
1930	3.95	---	---	---	2.76	2.13	1.65	0.61	27.500	154.669	111.076	71.765	-80.073
1931	3.95	---	---	---	2.78	2.14	1.65	0.60	27.002	156.383	111.264	71.247	-76.509
1932	3.74	---	---	---	2.65	2.04	1.57	0.57	19.482	150.771	104.333	63.592	-83.091
1933	3.64	---	---	---	2.61	2.00	1.54	0.55	16.343	149.725	101.737	60.202	-84.319
1934	3.51	---	---	---	2.56	1.96	1.49	0.53	12.812	152.338	101.323	57.687	-89.850
1935	3.33	---	---	---	2.47	1.88	1.43	0.51	7.093	154.522	99.780	53.517	-98.415
1936	3.24	---	---	---	2.42	1.84	1.40	0.49	4.065	156.086	98.633	50.768	-100.743
1937	3.20	---	---	---	2.42	1.83	1.39	0.49	3.426	162.373	101.185	50.960	-101.932
1938	2.96	---	---	---	2.29	1.73	1.30	0.45	-6.181	159.949	95.198	42.634	-113.442
1939	2.83	---	---	---	2.23	1.68	1.26	0.44	-10.182	159.005	91.823	38.059	-116.121
1940	2.68	---	---	---	2.15	1.61	1.21	0.41	-17.109	157.959	87.491	31.806	-123.102
1941	2.62	70,562	23,723	5,055	2.13	1.59	1.19	0.40	-19.645	165.719	89.824	30.716	-127.807
1942	2.39	68,697	21,822	3,436	2.03	1.51	1.12	0.37	-33.406	172.032	87.231	21.823	-150.344
1943	2.33	64,851	20,207	2,806	2.00	1.48	1.10	0.36	-37.199	180.637	88.955	19.433	-155.549
1944	2.33	62,450	19,413	2,676	1.98	1.47	1.10	0.37	-34.649	179.928	87.521	18.798	-144.914
1945	2.29	65,524	20,157	2,555	1.97	1.46	1.09	0.37	-35.665	180.068	85.823	16.783	-141.087
1946	2.24	75,272	22,814	2,469	1.99	1.46	1.08	0.35	-44.354	201.394	93.636	15.477	-159.280
1947	2.21	72,843	21,866	2,151	1.97	1.45	1.07	0.34	-51.123	233.641	106.522	15.846	-177.747
1948	2.13	64,154	18,616	1,215	1.90	1.40	1.04	0.34	-53.137	231.468	101.001	9.869	-173.301
1949	2.17	69,301	20,443	1,680	1.93	1.43	1.05	0.35	-48.790	239.408	105.150	12.813	-164.787
1950	2.18	72,434	21,445	1,836	1.95	1.43	1.06	0.34	-47.261	249.168	108.746	13.670	-161.340

**Appendix G. Individual Cohort Estimates Under the OASI Award Reduction Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --						
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%
1951	2.15	73,550	21,542	1,581	-5,056	1.94	1.42	1.05	0.34	49,609	259,585	110,969	11,840	-163,358
1952	2.12	73,888	21,350	1,250	-5,227	1.92	1.41	1.04	0.34	-51,634	268,977	112,314	9,467	-164,327
1953	2.12	75,338	21,794	1,307	-5,310	1.93	1.41	1.04	0.34	-49,844	281,054	116,329	9,949	-161,381
1954	2.08	75,479	21,466	881	-5,507	1.91	1.40	1.02	0.33	-51,919	289,133	116,484	6,748	-162,130
1955	2.03	74,228	20,603	292	-5,639	1.88	1.37	1.01	0.33	-53,499	291,079	113,317	2,245	-160,327
1956	2.00	74,431	20,384	-19	-5,778	1.86	1.36	1.00	0.33	-53,125	296,923	112,923	-0,146	-157,669
1957	1.95	73,384	19,630	-544	-5,890	1.84	1.34	0.99	0.32	-53,275	299,092	110,001	-4,176	-154,914
1958	1.88	70,763	18,163	-1,386	-6,007	1.80	1.31	0.96	0.32	-54,402	293,076	102,407	-10,607	-151,460
1959	1.82	69,225	17,098	-2,122	-6,192	1.76	1.29	0.95	0.31	-54,788	286,413	95,350	-15,904	-147,131
1960	1.78	68,682	16,539	-2,596	-6,358	1.75	1.28	0.93	0.30	-53,662	284,067	91,288	-19,065	-142,477
1961	1.77	68,268	16,254	-2,780	-6,376	1.74	1.27	0.93	0.30	-50,135	284,866	89,613	-20,194	-135,991
1962	1.72	66,968	15,437	-3,300	-6,480	1.72	1.25	0.92	0.30	-48,785	278,974	84,128	-23,466	-130,184
1963	1.72	68,168	15,781	-3,275	-6,550	1.72	1.26	0.92	0.29	-43,877	278,562	83,526	-22,394	-121,760
1964	1.69	67,371	15,113	-3,785	-6,694	1.70	1.24	0.91	0.29	-42,522	270,768	77,896	-24,959	-115,473
1965	1.65	66,211	14,328	-4,304	-6,786	1.68	1.23	0.90	0.28	-40,618	258,058	70,907	-26,980	-107,090
1966	1.67	68,202	14,936	-4,220	-6,889	1.69	1.23	0.90	0.29	-36,264	252,564	69,536	-24,644	-97,446
1967	1.70	71,271	16,032	-3,920	-6,992	1.70	1.24	0.91	0.29	-32,058	252,627	70,731	-21,483	-89,310
1968	1.73	74,832	17,346	-3,525	-7,098	1.72	1.26	0.92	0.29	-28,220	258,166	73,749	-18,434	-83,249
1969	1.76	77,864	18,430	-3,228	-7,203	1.74	1.27	0.93	0.29	-25,692	267,498	77,259	-16,478	-79,357
1970	1.75	77,756	18,228	-3,409	-7,232	1.73	1.26	0.93	0.29	-25,573	272,943	77,300	-17,431	-76,805
1971	1.62	70,505	14,710	-5,150	-7,360	1.66	1.21	0.89	0.28	-31,767	254,379	63,484	-26,540	-75,791
1972	1.51	66,146	12,293	-6,544	-7,581	1.61	1.17	0.86	0.27	-34,936	231,463	50,946	-32,063	-71,437
1973	1.56	70,655	13,883	-6,136	-7,766	1.63	1.19	0.87	0.27	-30,455	230,253	53,049	-27,449	-64,294
1974	1.62	75,940	15,951	-5,418	-7,873	1.67	1.22	0.89	0.27	-26,320	237,974	58,032	-22,851	-59,128
1975	1.61	75,993	15,705	-5,713	-7,991	1.66	1.21	0.88	0.27	-26,564	238,710	56,705	-23,678	-56,749

**Appendix G. Individual Cohort Estimates Under the OASI Award Reduction Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --						
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%
1976	1.61	76,965	15,907	-5,782	1.66	1.21	0.88	0.27	-26.250	243.261	57.219	-23.642	-54.535	
1977	1.61	77,847	16,103	-5,831	1.66	1.21	0.88	0.27	-26.185	250.358	58.357	-23.783	-52.903	
1978	1.57	76,149	15,119	-6,424	1.65	1.20	0.87	0.27	-28.062	252.077	55.838	-26.440	-52.049	
1979	1.57	77,346	15,431	-6,440	1.65	1.20	0.87	0.27	-28.028	261.221	57.568	-26.514	-50.694	
1980	1.53	75,466	14,341	-7,099	1.63	1.18	0.86	0.26	-30.305	263.463	54.756	-29.618	-50.164	
1981	1.48	73,121	13,068	-7,822	1.60	1.17	0.85	0.26	-32.636	262.341	50.769	-32.880	-49.293	
1982	1.45	71,811	12,218	-8,384	1.59	1.15	0.84	0.26	-34.092	261.348	47.672	-35.050	-47.879	
1983	1.40	69,504	10,863	-9,213	1.56	1.14	0.83	0.25	-36.113	254.915	42.292	-38.053	-46.356	
1984	1.41	70,965	11,282	-9,190	1.57	1.14	0.83	0.25	-35.142	259.119	43.297	-37.050	-44.056	
1985	1.42	72,359	11,662	-9,195	1.57	1.14	0.83	0.25	-34.676	265.989	44.610	-36.588	-42.376	
1986	1.37	70,494	10,389	-10,069	1.55	1.12	0.82	0.25	-36.929	262.393	39.841	-39.774	-41.433	
1987	1.36	70,679	10,170	-10,380	1.55	1.12	0.81	0.25	-37.239	264.337	38.798	-40.388	-39.888	
1988	1.36	71,231	10,277	-10,433	1.55	1.12	0.81	0.24	-37.123	270.211	39.375	-40.370	-38.457	
1989	1.36	71,543	10,207	-10,614	1.55	1.12	0.81	0.24	-37.585	276.745	39.483	-41.057	-37.401	
1990	1.32	70,043	9,312	-11,171	1.53	1.11	0.80	0.24	-39.445	278.869	36.710	-43.604	-36.761	
1991	1.23	65,147	6,797	-12,518	1.49	1.08	0.78	0.23	-43.190	264.676	27.070	-48.882	-36.023	
1992	1.22	64,797	6,324	-12,951	1.48	1.07	0.78	0.23	-43.058	260.396	24.666	-49.044	-34.134	
1993	1.20	64,554	5,906	-13,354	1.47	1.07	0.77	0.23	-42.781	256.423	22.547	-49.004	-32.301	
1994	1.18	64,361	5,512	-13,747	1.47	1.06	0.77	0.23	-42.410	252.433	20.568	-48.833	-30.526	
1995	1.17	64,251	5,154	-14,122	1.46	1.06	0.77	0.23	-41.968	248.782	18.801	-48.554	-28.834	
1996	1.16	64,241	4,847	-14,472	1.46	1.05	0.76	0.23	-41.468	245.670	17.287	-48.180	-27.235	
1997	1.15	64,174	4,514	-14,832	1.45	1.05	0.76	0.22	-41.021	242.637	15.761	-47.863	-25.745	
1998	1.13	64,127	4,197	-15,181	1.44	1.04	0.76	0.22	-40.588	240.039	14.365	-47.547	-24.358	
1999	1.12	63,999	3,844	-15,544	1.44	1.04	0.75	0.22	-40.236	237.524	12.917	-47.325	-23.076	
2000	1.11	63,840	3,483	-15,908	1.43	1.04	0.75	0.22	-39.927	235.256	11.504	-47.147	-21.883	

**Appendix G. Individual Cohort Estimates Under the OASI Award Reduction Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --			-- Assumed Constant Discount Rates --						
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%
2001	1.10	63,623	3,099	-16,279	-11,408	1.43	1.03	0.75	0.22	-39,676	233,138	10,079	-47,035	-20,776
2002	1.08	63,383	2,710	-16,649	-11,542	1.42	1.03	0.74	0.22	-39,460	231,262	8,688	-46,959	-19,744
2003	1.07	63,107	2,309	-17,021	-11,674	1.42	1.02	0.74	0.22	-39,291	229,608	7,308	-46,935	-18,786
2004	1.06	62,769	1,883	-17,402	-11,803	1.41	1.02	0.74	0.22	-39,182	228,074	5,892	-46,982	-17,896
2005	1.04	62,396	1,446	-17,784	-11,930	1.40	1.01	0.73	0.21	-39,120	226,773	4,483	-47,083	-17,069
2006	1.03	61,943	978	-18,178	-12,056	1.40	1.01	0.73	0.21	-39,129	225,554	3,009	-47,270	-16,303
2007	1.01	61,417	480	-18,582	-12,180	1.39	1.00	0.73	0.21	-39,198	224,385	1,467	-47,533	-15,590
2008	1.00	60,820	-49	-18,999	-12,303	1.38	1.00	0.72	0.21	-39,319	223,203	-0.147	-47,861	-14,923
2009	0.98	60,162	-604	-19,428	-12,426	1.38	0.99	0.72	0.21	-39,478	221,962	-1,825	-48,237	-14,295
2010	0.97	59,495	-1,163	-19,858	-12,549	1.37	0.99	0.72	0.21	-39,638	220,745	-3,502	-48,612	-13,696
2011	0.95	58,814	-1,732	-20,294	-12,673	1.36	0.98	0.71	0.21	-39,789	219,423	-5,192	-48,975	-13,120
2012	0.93	58,128	-2,307	-20,737	-12,799	1.35	0.98	0.71	0.21	-39,912	217,925	-6,881	-49,301	-12,562
2013	0.92	57,497	-2,864	-21,174	-12,926	1.35	0.97	0.70	0.20	-39,980	216,428	-8,490	-49,554	-12,017
2014	0.90	56,909	-3,407	-21,609	-13,056	1.34	0.97	0.70	0.20	-39,994	214,875	-10,030	-49,733	-11,486
2015	0.89	56,376	-3,931	-22,040	-13,188	1.33	0.96	0.70	0.20	-39,949	213,301	-11,483	-49,833	-10,968
2016	0.87	55,911	-4,431	-22,465	-13,322	1.33	0.96	0.69	0.20	-39,839	211,739	-12,828	-49,844	-10,462
2017	0.86	55,469	-4,914	-22,877	-13,453	1.32	0.96	0.69	0.20	-39,793	210,774	-14,132	-49,931	-10,001
2018	0.85	55,096	-5,372	-23,282	-13,587	1.32	0.95	0.69	0.20	-39,684	209,830	-15,332	-49,931	-9,550
2019	0.84	54,777	-5,811	-23,683	-13,723	1.31	0.95	0.69	0.20	-39,518	208,867	-16,440	-49,854	-9,110
2020	0.84	54,615	-6,184	-24,057	-13,860	1.31	0.95	0.68	0.20	-39,268	208,293	-17,324	-49,659	-8,682
2021	0.83	54,953	-6,325	-24,323	-13,993	1.31	0.95	0.68	0.20	-38,829	209,440	-17,533	-49,191	-8,264
2022	0.83	55,304	-6,468	-24,594	-14,129	1.31	0.94	0.68	0.20	-38,369	210,466	-17,724	-48,692	-7,860
2023	0.83	55,665	-6,611	-24,869	-14,267	1.31	0.94	0.68	0.20	-37,892	211,400	-17,899	-48,170	-7,472
2024	0.83	56,038	-6,752	-25,147	-14,407	1.31	0.94	0.68	0.20	-37,406	212,283	-18,057	-47,633	-7,101
2025	0.83	56,423	-6,893	-25,427	-14,550	1.31	0.94	0.68	0.20	-36,917	213,157	-18,200	-47,090	-6,747

**Appendix G. Individual Cohort Estimates Under the OASI Award Reduction Balanced Budget Scenario Using the Trustees' Report Intermediate Assumptions (Continued).**

Cohort	Real Internal Rate of Return (%)	Lifetime Wealth Increment at Birth Per Initial Cohort Member (1989 Dollars)			Ratio of Benefit/Tax Present Values			Aggregate Lifetime Net Intercohort Transfer Evaluated in 1989 (Billions of 1989 Dollars)						
		--- Assumed Constant Discount Rates ---			--- Assumed Constant Discount Rates ---			--- Assumed Constant Discount Rates ---						
		0%	1%	2%	0%	1%	2%	0%	1%	2%	0%	1%	2%	0%
2026	0.83	56,822	-7,030	-25,707	-14,693	1.31	0.94	0.68	0.20	-36,429	214,068	-18,326	-46,546	-6,409
2027	0.82	57,225	-7,167	-25,989	-14,838	1.30	0.94	0.68	0.20	-35,951	215,015	-18,450	-46,011	-6,090
2028	0.81	57,639	-7,301	-26,270	-14,983	1.30	0.94	0.68	0.20	-35,485	216,055	-18,565	-45,489	-5,788
2029	0.81	58,059	-7,433	-26,551	-15,129	1.30	0.94	0.68	0.20	-35,034	217,191	-18,676	-44,983	-5,502
2030	0.81	58,485	-7,562	-26,832	-15,275	1.30	0.94	0.68	0.19	-34,600	218,444	-18,783	-44,497	-5,233
2031	0.81	58,914	-7,691	-27,112	-15,421	1.30	0.94	0.68	0.19	-34,184	219,810	-18,894	-44,034	-4,979
2032	0.81	59,351	-7,817	-27,390	-15,568	1.30	0.94	0.68	0.19	-33,786	221,320	-19,002	-43,589	-4,739
2033	0.81	59,792	-7,939	-27,668	-15,714	1.30	0.94	0.68	0.19	-33,406	222,954	-19,108	-43,166	-4,512
2034	0.81	60,240	-8,059	-27,944	-15,860	1.30	0.94	0.68	0.19	-33,041	224,723	-19,213	-42,761	-4,298
2035	0.81	60,693	-8,177	-28,220	-16,007	1.30	0.94	0.68	0.19	-32,690	226,611	-19,317	-42,373	-4,096
2036	0.81	61,156	-8,290	-28,493	-16,154	1.30	0.94	0.68	0.19	-32,351	228,627	-19,415	-41,998	-3,905
2037	0.81	61,625	-8,401	-28,767	-16,301	1.30	0.94	0.68	0.19	-32,022	230,742	-19,512	-41,634	-3,723
2038	0.81	62,105	-8,509	-29,040	-16,449	1.30	0.94	0.68	0.19	-31,700	232,949	-19,601	-41,278	-3,550
2039	0.81	62,591	-8,616	-29,313	-16,598	1.30	0.94	0.68	0.19	-31,383	235,213	-19,686	-40,926	-3,386
2040	0.81	63,091	-8,717	-29,586	-16,747	1.30	0.94	0.68	0.19	-31,066	237,535	-19,759	-40,573	-3,229
2041	0.81	63,600	-8,818	-29,860	-16,898	1.30	0.94	0.68	0.19	-30,748	239,881	-19,825	-40,218	-3,079
2042	0.80	64,120	-8,918	-30,136	-17,050	1.30	0.94	0.68	0.19	-30,428	242,235	-19,882	-39,859	-2,936
2043	0.80	64,654	-9,014	-30,413	-17,203	1.30	0.94	0.68	0.19	-30,104	244,596	-19,927	-39,492	-2,799
2044	0.80	65,195	-9,112	-30,693	-17,358	1.30	0.94	0.68	0.19	-29,775	246,926	-19,966	-39,119	-2,667
2045	0.80	65,745	-9,209	-30,976	-17,516	1.30	0.94	0.68	0.19	-29,443	249,227	-19,997	-38,739	-2,541
2046	0.80	66,307	-9,306	-31,262	-17,675	1.30	0.94	0.68	0.19	-29,106	251,501	-20,019	-38,352	-2,420
2047	0.80	66,874	-9,406	-31,551	-17,836	1.30	0.94	0.67	0.19	-28,766	253,725	-20,040	-37,959	-2,305
2048	0.80	67,452	-9,505	-31,844	-17,998	1.30	0.94	0.67	0.19	-28,422	255,924	-20,049	-37,561	-2,194
2049	0.80	68,034	-9,605	-32,140	-18,163	1.30	0.94	0.67	0.19	-28,077	258,081	-20,055	-37,158	-2,089
2050	0.80	68,625	-9,706	-32,439	-18,329	1.30	0.94	0.67	0.19	-27,731	260,213	-20,057	-36,754	-1,988