

**A MONEY'S-WORTH ANALYSIS OF SOCIAL SECURITY  
RETIREMENT BENEFITS**

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**ABSTRACT**

Many people are interested in the question as to whether workers get their money's worth from the taxes that they pay under the U.S. social security program. Analyses of this matter made by nonactuaries are usually faulty because of incorrect methodology or incorrect assumptions. This paper presents an analysis of the situation as to the cash retirement benefits for various cases of workers who have attained age 65 (in different years and at different earnings levels).

In summary, the vast majority of persons who retired in the past received benefits of far greater value than the employer-employee taxes paid. This situation will change in the future, especially if adequate tax rates to support the program over the long run are provided; many persons will not get their money's worth when the combined employer-employee tax is considered, although they generally will do so if only the employee tax is considered.

[NOTE: This paper was written in late 1982, so that references to "present law" are to the provisions as to both benefits and taxes as they were prior to the enactment of the Social Security Amendments of 1983. The effect of that very significant legislation is indicated by the analyses presented by the authors in their reply to the discussions (following this paper).]

One matter that is widely discussed in connection with the social security cash benefits program is whether individuals receive their money's worth from the social security taxes that they pay. As with many other things in life, such a question is easier to ask than to answer precisely, because of the many variables and intangibles involved. Nonactuaries frequently make such analyses in an inadequate manner, because they make inconsistent assumptions (such as using interest rates that are too high), ignore certain important benefit features, or have incorrect methodology. It is possible, however, to analyze the situation adequately, given certain assumptions. Of course, no analysis can provide precise answers to this "money's worth" question, but a proper analysis can yield approximate ratios that can be used to make valid comparisons among various classes of workers retiring at various times.

## I. METHODOLOGY

A major element in any analysis of this matter is whether only the employee tax rate should be considered or whether the combined employer-employee tax should be the basis for comparison between accumulated taxes and the present value of future benefits. Some individuals (including many economists) believe that the latter basis is the appropriate one, because they believe that the employer tax is borne entirely by the employee through lower wages than would otherwise be paid. Others believe, however, that—at least in part—the employer tax is passed on to consumers in general (who, in the aggregate, consist largely of employees and their families) in the form of higher prices; under these circumstances, it is not possible to state that each employee fully bears, in an indirect manner, the employer taxes on his or her wages; rather, it could be more or less so. Still others believe that some portion of the employer tax may be reflected in lower corporate profits, which would imply that the stockholders (who also may consist partially of employees, at least through employee pension funds) may bear some of the burden. For purposes of this analysis, the combined employer-employee tax is used. Obviously, all of the results shown can be adjusted to an employee-tax basis by dividing the accumulated tax figures by two, thus doubling the ratios of the value of the benefits to the value of the taxes.

Another problem involved in such money's-worth comparisons is the technical one of precisely evaluating the very complex social security benefit structure. A proper analysis must consider not only the complex provisions in regard to computations of initial benefits but also the automatic-adjustment provisions applicable to benefits in payment status. Moreover, the possible entitlement of other family members to auxiliary or survivor benefits should properly be considered as well.

In order to simplify the concept (and the computations), such comparisons frequently deal only with the retirement benefits and are made applicable to individuals who have attained retirement age. The failure to consider disability benefits, survivor benefits possibly payable in the case of death occurring before attaining retirement age, and hospital insurance benefits can be mitigated to a considerable extent by taking into account only the old-age and survivors insurance (OASI) portion of the total social security tax, which supports the old-age, survivors, and disability insurance (OASDI) program and the hospital insurance (HI) program. The procedure then is to compare (1) the OASI taxes accumulated with interest to the retirement age with (2) the present value of the future benefits, measured as of that same time. Nonetheless, there is still incomplete compara-

bility, because the death benefit prior to attaining retirement age is thereby presumed to be the accumulated taxes as of the time of death, whereas in actual practice the value of the death benefits under the social security program during that period could range from zero if no spouse or children are left, to a very high figure if such beneficiaries are present and are young.

Another technical problem involves choosing the appropriate interest rates for the preretirement and retirement periods. In accumulating taxes during the preretirement period, it seems reasonable to use the yearly average interest rate on new special-issue investments of the social security trust funds—an assumed rate of 2.25 percent for 1937–50, the actual experience for 1951–81, and the assumed rates in the Alternative II-B (intermediate) assumptions in the 1982 OASDI trustees report for 1982 and after (see Table 1).

The same interest rates could be used to discount the stream of future benefits that increases over the years as a result of the Consumer Price Index benefit indexing. An equivalent procedure, however, is to use a

TABLE 1  
INTEREST RATE USED TO ACCUMULATE TAXES IN PRERETIREMENT PERIOD\*

Year	Interest Rate	Year	Interest Rate	Year	Interest Rate
1937–50 .....	2.250%	1965 .....	4.198%	1980 .....	11.000%
1951 .....	2.188	1966 .....	4.948	1981 .....	13.333
1952 .....	2.250	1967 .....	4.958	1982 .....	13.000
1953 .....	2.354	1968 .....	5.490	1983 .....	11.400
1954 .....	2.302	1969 .....	6.594	1984 .....	9.300
1955 .....	2.292	1970 .....	7.260	1985 .....	8.000
1956 .....	2.469	1971 .....	5.979	1986 .....	7.100
1957 .....	2.500	1972 .....	5.927	1987 .....	6.800
1958 .....	2.562	1973 .....	6.646	1988 .....	6.600
1959 .....	2.625	1974 .....	7.490	1989 .....	6.500
1960 .....	2.917	1975 .....	7.396	1990 .....	6.400
1961 .....	3.812	1976 .....	7.146	1991 .....	6.300
1962 .....	3.854	1977 .....	7.083	1992 .....	6.200
1963 .....	3.906	1978 .....	8.198	1993 and	
1964 .....	4.136	1979 .....	9.115	later .....	6.080

\* Rate for 1937–50 is assumed to represent rates available during that period. Rates for 1951–81 are the actual average annual rates that were available on new trust fund investments. Rates for 1982 and later are those shown under the Alternative II-B estimate of the 1982 OASDI trustees report.

“real” interest rate (relative to the CPI) and apply it to the initial benefit amount. The interest rate used in this analysis for obtaining the present

value of benefits after retirement, either in the past or in the future, is 2 percent in all instances. This is a good approximation of the real interest rate relative to the CPI—and thus allows for benefit increases after retirement (whether on an ad hoc basis, as was the case before 1975, or on an automatic-adjustment basis, as has been the case in 1975 and after). It should be noted that the results are highly sensitive to the real interest rate chosen. Although 2 percent is an appropriate rate generally, there were periods when a slightly higher or lower rate might have applied (for example, in 1969–72, the benefit increases far exceeded the increases in the CPI).

The choice of 2 percent as the real interest rate could be questioned. This is the long-range rate used in the Alternative II-B cost estimates in the 1982 trustees report. Some years ago, many people believed that a 3 percent rate was the proper one, but the experience in the 1970s, when the “real” interest rate was less than 1 percent, caused them to lower their sights. The use of an interest rate higher than 2 percent for obtaining the present value of the benefits would, of course, result in lower ratios of benefits to taxes.

Another problem is the selection of an appropriate mortality basis for the valuation of the future retirement benefits, especially considering the increases in longevity that have occurred in the past and those that are likely to occur in the future. The procedure followed here is to consider the decreases in mortality rates that occurred or will occur, as the case may be, after the date of retirement, rather than merely the mortality conditions prevailing at the time of retirement. Such cohort mortality rates have been developed, from the “period” rates derived from several decennial life tables developed in the past (the latest ones available being those for 1969–71) and from projected tables developed by the Office of the Actuary, Social Security Administration (see, for example, its *Actuarial Study No. 87*).

This analysis focuses on workers retiring at age 65 at the beginning of various quinquennial years from 1960 through 2025. It is assumed that such individuals are steadily employed beginning with age 21 (or 1937, if later) and up to the time of retirement, with the following two alternatives for earnings level:

1. The average wage for all covered workers, as shown by the wage-indexing series for 1951–80, extended back to 1937 on the basis of experience data and extended forward after 1980 on the basis of the Alternative II-B assumptions in the 1982 OASDI trustees report.
2. The maximum taxable wage in each year (extended beyond 1982 on the basis of the Alternative II-B assumptions).

The average and maximum earnings levels resulting, as well as the OASI and OASDI-HI tax rates, are shown for each year in the period 1937-2025 in Table 2.

It is important to note that no periods of unemployment are assumed. Thus, contributions are made continuously in every year. If periods of unemployment were assumed, these would reduce the accumulated taxes, but not necessarily the benefits payable (because, in the computation of benefits, the dropout-years provision has a much greater effect for a fluctuating-earnings history than for a steady one).

It is perhaps even more important to note that the two hypothetical earnings patterns chosen for this analysis are really not "typical" ones. The relative earnings levels of workers tend to vary over their lifetimes, with earnings usually being below average in the early working years, above average in the middle years, and declining somewhat in later years. These patterns are those often followed by workers and reflect service increases, promotions, and the like.

If a typical average-earnings pattern could be developed, including periods of unemployment and a more usual trend of earnings, the results of a "money's worth" analysis would not be very different from those shown here for the steady average earner. The present value of benefits would be slightly higher (because of the dropout-years provision, which would tend to eliminate years with significant unemployment and the early years with low earnings), while the accumulated value of taxes paid would be somewhat lower (because of unemployment and because the relatively larger tax payments would be made in later years, when the effects of interest would be less). The overall effect might be an increase in the benefits/taxes ratios of about 10-20 percent relatively.

As to the maximum-earnings case, because of the many ad hoc increases in the maximum earnings base that occurred in the past ten years, few workers in their twenties are able to earn as much as the base today (although this was not so uncommon in the past). Thus, the lifetime maximum earner may not exist in the future at all, or at least such a worker would be very rare. Again, if a "typical" future maximum-earnings pattern could be developed, with maximum earnings not reached until perhaps age 30, the effect on the present value of retirement benefits would be insignificant, but the accumulated value of taxes would be somewhat lower. Therefore, the ratio of the value of the benefits to the value of the taxes would be higher than those shown in this analysis, by perhaps 5-10 percent relatively.

Separate calculations are made for female and male workers, and also for the case of a married couple where the spouses are the same age and

**TABLE 2**  
**AVERAGE AND MAXIMUM EARNINGS LEVELS AND OASI AND OASDI-HI**  
**TAX RATES FOR EMPLOYERS AND EMPLOYEES, EACH\***

Year	Average Earnings	Maximum Earnings	OASI Tax Rate	OASDI-HI Tax Rate
1937	\$ 1,150.45	\$ 3,000	1.000%	1.000%
1938	1,053.23	3,000	1.000	1.000
1939	1,142.35	3,000	1.000	1.000
1940	1,195.01	3,000	1.000	1.000
1941	1,276.03	3,000	1.000	1.000
1942	1,454.27	3,000	1.000	1.000
1943	1,713.52	3,000	1.000	1.000
1944	1,936.32	3,000	1.000	1.000
1945	2,021.39	3,000	1.000	1.000
1946	1,891.76	3,000	1.000	1.000
1947	2,175.32	3,000	1.000	1.000
1948	2,361.66	3,000	1.000	1.000
1949	2,483.19	3,000	1.000	1.000
1950	2,543.95	3,000	1.500	1.500
1951	2,799.16	3,600	1.500	1.500
1952	2,973.32	3,600	1.500	1.500
1953	3,139.44	3,600	1.500	1.500
1954	3,155.64	3,600	2.000	2.000
1955	3,301.44	4,200	2.000	2.000
1956	3,532.36	4,200	2.000	2.000
1957	3,641.72	4,200	2.000	2.250
1958	3,673.80	4,200	2.000	2.250
1959	3,855.80	4,800	2.250	2.500
1960	4,007.12	4,800	2.750	3.000
1961	4,086.76	4,800	2.750	3.000
1962	4,291.40	4,800	2.875	3.125
1963	4,396.64	4,800	3.375	3.625
1964	4,576.32	4,800	3.375	3.625
1965	4,658.72	4,800	3.375	3.625
1966	4,938.36	6,600	3.500	4.200
1967	5,213.44	6,600	3.550	4.400
1968	5,571.76	7,800	3.325	4.400
1969	5,893.76	7,800	3.725	4.800
1970	6,186.24	7,800	3.650	4.800
1971	6,497.08	7,800	4.050	5.200
1972	7,133.80	9,000	4.050	5.200
1973	7,580.16	10,800	4.300	5.850
1974	8,030.76	13,200	4.375	5.850
1975	8,630.92	14,100	4.375	5.850
1976	9,226.48	15,300	4.375	5.850
1977	9,779.44	16,500	4.375	5.850
1978	10,556.03	17,700	4.275	6.050
1979	11,479.46	22,900	4.330	6.130
1980	12,513.46	25,900	4.520	6.130

\* The average-earnings figures are those used for indexing earnings in the OASDI benefit computation, extended back to 1937 by using a comparable series of first-quarter average-taxable-earnings data. The figures for 1981 and later are those under the Alternative II-B estimate of the 1982 OASDI trustees report.

The figures for the maximum taxable earnings are those that actually applied in 1937-82. The figures for 1983 and later are those under the Alternative II-B estimate of the 1982 trustees report. The tax rates are those that actually applied for 1937-82, with rates for future years being those scheduled under present law.

TABLE 2—Continued

Year	Average Earnings	Maximum Earnings	OASI Tax Rate	OASDI-HI Tax Rate
1981	\$ 13,594.27	\$ 29,700	4.700%	6.650%
1982	14,495.68	32,400	4.575	6.700
1983	15,663.97	35,100	4.575	6.700
1984	16,926.39	37,500	4.575	6.700
1985	18,099.11	40,500	4.750	7.050
1986	19,329.42	43,800	4.750	7.150
1987	20,609.56	46,800	4.750	7.150
1988	21,968.00	50,100	4.750	7.150
1989	23,364.00	53,400	4.750	7.150
1990	24,768.00	57,000	5.100	7.650
1991	26,189.00	60,600	5.100	7.650
1992	27,629.00	64,200	5.100	7.650
1993	29,149.00	67,800	5.100	7.650
1994	30,752.00	71,400	5.100	7.650
1995	32,443.00	75,300	5.100	7.650
1996	34,227.00	79,500	5.100	7.650
1997	36,110.00	84,000	5.100	7.650
1998	38,096.00	88,500	5.100	7.650
1999	40,191.00	93,300	5.100	7.650
2000	42,402.00	98,400	5.100	7.650
2001	44,734.00	103,800	5.100	7.650
2002	47,194.00	109,500	5.100	7.650
2003	49,790.00	115,500	5.100	7.650
2004	52,528.00	121,800	5.100	7.650
2005	55,417.00	128,400	5.100	7.650
2006	58,465.00	135,600	5.100	7.650
2007	61,681.00	143,100	5.100	7.650
2008	65,073.00	150,900	5.100	7.650
2009	68,652.00	159,300	5.100	7.650
2010	72,428.00	168,000	5.100	7.650
2011	76,412.00	177,300	5.100	7.650
2012	80,615.00	187,200	5.100	7.650
2013	85,048.00	197,400	5.100	7.650
2014	89,726.00	208,200	5.100	7.650
2015	94,661.00	219,600	5.100	7.650
2016	99,867.00	231,600	5.100	7.650
2017	105,360.00	244,200	5.100	7.650
2018	111,155.00	257,700	5.100	7.650
2019	117,268.00	271,800	5.100	7.650
2020	123,718.00	286,800	5.100	7.650
2021	130,523.00	302,700	5.100	7.650
2022	137,701.00	319,200	5.100	7.650
2023	145,275.00	336,900	5.100	7.650
2024	153,265.00	355,500	5.100	7.650

only one of them has been in the paid labor force. Note that it makes no difference in the benefit results for the married-couple case whether the husband or the wife was the covered worker. It is very significant that, as the experience will likely unfold, the cases of single persons will be of much more significance than the married-couple cases, because over the long run, in a very large proportion of the cases, both husband and wife will have social security benefits based on their own earnings records and thus either will not receive spouse benefits at all or else will receive only small residual ones.

In all of these cases, no children who would be eligible for OASDI benefits are assumed to be present. This assumption, which was made in order to simplify the calculations, does not introduce a significant distortion of the results. The Office of the Actuary, SSA, estimates that, over the long run, benefits to children of retired workers will represent about 1 percent of the total cost of retirement benefits. Therefore, the ratios of benefits to taxes would be only slightly effected if there were included the effects of having eligible children present. Of course, the actual effects on individual workers would vary much more than that, because eligible children are not present in most cases.

Figures were developed only for retirement age 65, the "normal" retirement age. The ratios of the present value of future benefits to the accumulated taxes would not be changed very much if retirement at ages 62-64 had been assumed, because the reduction factors are close to being "actuarial," and the amount of the taxes not paid in the several years before age 65 is, in part, counterbalanced by the lower benefits resulting from not having earnings in such years (which, under the assumptions made, would be somewhat higher than in the previous years and thus would produce a larger benefit). In balance, such ratios would be slightly higher for retirement at ages 62-64 than at age 65. On the other hand, the ratios would be significantly lower for retirement at ages beyond 65, because the delayed-retirement credits (applicable only to worker and widowed-spouse benefits) are far less than the actuarial equivalent—and because the additional taxes paid more than counterbalance the effect of the increase in the primary insurance amount resulting from the higher additional earnings.

With regard to future economic conditions, it is assumed that the wage and CPI increases will be in accordance with the assumptions underlying the Alternative II-B cost estimate in the 1982 OASDI trustees report. It is further assumed that no changes in the law as it was at the end of 1982 will be made, even though this is not a valid assumption with regard to the tax rates if the benefit structure remains unchanged, because higher



tax rates would be necessary early in the next century, if the self-supporting nature of the program is to be continued.

## II. RESULTS AND INTERPRETATION

Table 3 presents the figures for the average-wage case described previously. It shows the initial monthly primary benefit (i.e., the amount payable to a single worker or to the survivor in the married-couple case; the amount payable while both of the married couple are alive is  $1\frac{1}{2}$  times such amount), the combined employer-employee OASI taxes accumulated at interest to age 65, the present value of future benefits as of age 65 (including in the case of the married couple not only the retired-worker benefits but also the spouse and widow[er] benefits), and the ratio of the present value of benefits to the accumulated taxes.

First, considering single male average-earnings workers, the ratio of the present value of the monthly retirement benefits to the taxes accumulated at interest was about 700 percent for the 1960 case, but this steadily decreased to 275 percent for the 1980 case—that is, the value of the benefits was 7 times the value of the combined employer-employee taxes for the 1960 case and  $2\frac{3}{4}$  times for the 1980 case. This ratio is expected to decrease in the future, until it stabilizes at about 110 percent for those retiring in 2010 and later.

This would appear to indicate that *all* average-earnings workers get more than their money's worth! How can this be in a system that is supposed to be self-supporting from the payroll taxes that are scheduled? The answer primarily is that the scheduled OASI payroll tax rates are, according to the Alternative II-B estimate, insufficient to finance the program. For example, considering only the first twenty-five years of the seventy-five year valuation period, the tax rates are inadequate by about 2 percent; for the first fifty years, they are inadequate by about 12 percent; and for the entire seventy-five years, they are inadequate by about 25 percent.

The corresponding ratios for single female average-earnings workers are about 30 percent higher *relatively* than for male workers. This is due entirely to the greater longevity of women.

Finally, for married couples with average earnings—a category that is more appropriate for consideration in past years and currently than is likely to be the case in the future—the ratios are, of course, much higher than for the other two categories. The ratio for 1980 cases is somewhat over 500 percent, indicating that the value of the benefits is 5 times the value of the combined employer-employee taxes. This ratio eventually stabilizes at about 210 percent.

TABLE 3

COMPARISON OF COMBINED EMPLOYER-EMPLOYEE OASI TAXES ACCUMULATED WITH INTEREST AND PRESENT VALUE OF RETIREMENT BENEFITS FOR PERSONS ATTAINING AGE 65 IN VARIOUS YEARS, AVERAGE-WAGE EARNER

YEAR OF ATTAINING AGE 65	INITIAL MONTHLY PRIMARY BENEFIT	OASI TAXES ACCUMULATED WITH INTEREST TO AGE 65	PRESENT VALUE OF FUTURE BENEFITS, AT AGE 65		
			Single Man	Single Woman	Married Couple*
1960.....	\$ 107	\$ 1,972	\$ 14,008 (710)	\$ 17,501 (888)	\$ 25,995 (1,318)
1965.....	120	3,788	15,870 (419)	20,373 (538)	29,898 (789)
1970.....	168	6,991	23,360 (334)	30,049 (430)	44,124 (631)
1975.....	271	13,045	38,721 (297)	49,506 (380)	72,813 (558)
1980.....	451	24,206	66,499 (275)	85,328 (353)	125,125 (517)
1985.....	594	49,839	89,925 (180)	115,292 (231)	168,734 (339)
1990.....	803	79,565	123,518 (155)	158,011 (199)	231,043 (290)
1995.....	1,052	120,524	163,811 (136)	209,153 (174)	305,835 (254)
2000.....	1,378	174,860	216,700 (124)	276,417 (158)	404,204 (231)
2005.....	1,802	247,040	286,022 (116)	364,284 (147)	532,805 (216)
2010.....	2,355	338,063	377,239 (112)	480,379 (142)	702,343 (208)
2015.....	3,078	455,877	498,604 (109)	633,042 (139)	926,479 (203)
2020.....	4,023	593,144	656,521 (111)	834,651 (141)	1,220,115 (206)
2025.....	5,258	787,873	866,308 (110)	1,099,763 (140)	1,608,002 (204)

\* Assumes only one earner.

NOTE.—Figures in parentheses are present value of benefits as percentage of accumulated taxes.

It is important to bear in mind that the foregoing analysis is based on the tax rates scheduled in present law and that, according to the Alternative II-B cost estimate in the 1982 trustees' report, they are inadequate to finance the program over the long run. If the program is to be financed on a pay-as-you-go (or current-cost) basis completely through payroll taxes, according to that cost estimate the ultimate OASI tax rate (for 2030 and later) would be about 15¼ percent (see Table 27 of the 1982 trustees' report). On this basis, the ultimate benefits/taxes ratios would be about as follows for the average-wage cases described previously: 72 percent for single men, 92 percent for single women, and 134 percent for married couples with only one earner.

Table 4 presents the corresponding ratios for the maximum-wage case described previously. The benefits/taxes ratios are significantly lower than those for the average-earnings worker, which were shown in Table 3. This result, of course, reflects the weighted nature of the OASDI benefit formula, which favors lower-paid individuals over higher-paid ones.

Nonetheless, the benefits/taxes ratios have been well above 100 percent for all maximum-earnings retirees in the past, being 249 percent for single men retiring in 1980 (as opposed to 275 percent for the average-wage case;

TABLE 4

COMPARISON OF COMBINED EMPLOYER-EMPLOYEE OASI TAXES ACCUMULATED WITH INTEREST AND PRESENT VALUE OF RETIREMENT BENEFITS FOR PERSONS ATTAINING AGE 65 IN VARIOUS YEARS, MAXIMUM-WAGE EARNER

YEAR OF ATTAINING AGE 65	INITIAL MONTHLY PRIMARY BENEFIT	OASI TAXES ACCUMULATED WITH INTEREST TO AGE 65	PRESENT VALUE OF FUTURE BENEFITS, AT AGE 65		
			Single Man	Single Woman	Married Couple*
1960.....	\$ 119	\$ 2,753	\$ 15,579 (566)	\$ 19,464 (707)	\$ 28,910 (1,050)
1965.....	132	4,900	17,432 (356)	22,378 (457)	32,841 (670)
1970.....	190	9,000	26,329 (293)	33,868 (376)	49,731 (553)
1975.....	316	17,063	45,244 (265)	57,845 (339)	85,078 (499)
1980.....	572	33,865	84,359 (249)	108,245 (320)	158,730 (469)
1985.....	774	75,622	117,290 (155)	150,377 (199)	220,082 (291)
1990.....	1,080	128,856	166,070 (129)	212,446 (165)	310,637 (241)
1995.....	1,454	207,680	226,223 (109)	288,840 (139)	422,358 (203)
2000.....	1,975	318,422	310,439 (97)	395,987 (124)	579,051 (182)
2005.....	2,672	473,758	424,254 (90)	540,339 (114)	790,306 (167)
2010.....	3,593	688,030	575,567 (84)	732,931 (107)	1,071,589 (156)
2015.....	4,782	974,419	774,603 (79)	983,459 (101)	1,439,327 (148)
2020.....	6,274	1,347,509	1,023,852 (76)	1,301,647 (97)	1,902,783 (141)
2025.....	8,212	1,815,097	1,353,042 (75)	1,717,664 (95)	2,511,455 (138)

\* Assumes only one earner.

NOTE.—Figures in parentheses are present value of benefits as percentage of accumulated taxes.

TABLE 5

NUMBER OF MONTHS UNTIL TOTAL RETIREMENT BENEFITS PAID FIRST EXCEED COMBINED EMPLOYER-EMPLOYEE TAXES ACCUMULATED WITH INTEREST TO AGE 65, FOR PERSONS ATTAINING AGE 65 IN VARIOUS YEARS

YEAR OF ATTAINING AGE 65	AVERAGE-WAGE EARNER		MAXIMUM-WAGE EARNER	
	Single Person	Married Couple	Single Person	Married Couple
1960.....	19	13	24	16
1965.....	32	22	38	25
1970.....	42	28	48	32
1975.....	49	33	54	36
1980.....	54	36	60	40
1985.....	84	56	98	66
1990.....	100	67	120	80
1995.....	115	77	143	96
2000.....	127	85	162	108
2005.....	138	92	178	119
2010.....	144	96	192	128
2015.....	149	99	204	136
2020.....	148	99	215	144
2025.....	150	100	222	148

NOTE.—In the postretirement period, this analysis does not consider mortality, interest earnings on the accumulated taxes, or benefit increases.

the difference would have been larger except that, in 1951–72, the maximum taxable earnings base was not much higher than the average wage—the differential ranging from 3 to 40 percent). The ratios decrease significantly for retirees in the future and fall below the 100 percent break-even point by the year 2000 for single men and by 2020 for single women. Moreover, if the payroll-tax rates are increased in future to a level which, under the Alternative II-B assumptions, would adequately finance the program, these ratios would fall below 100 percent sooner and then would reach lower levels. Ultimately, the ratios would be 49 percent for single men, 62 percent for single women, and 91 percent for married couples with only one earner. Thus, if one considers only the employee taxes paid, the male maximum earner just about breaks even, and the other maximum-earnings cases do somewhat better.

Table 5 shows the number of months required for the benefits paid in the aggregate to at least equal the combined employer-employee OASI taxes accumulated at interest to age 65 for each of the cases described previously. These figures do not reflect (1) any interest earnings on the accumulated taxes for periods after age 65, (2) any increases in the monthly benefit amounts, or (3) mortality of the beneficiaries. For 1980 retirees, the “repayment period” for single average-wage earners is 4½ years, while for married earners it is 3 years (and slightly longer for maximum-wage earners). Ultimately, such period for average-wage earners will be about 12½ years for single persons and 8½ years for married persons; for maximum-wage earners, the period will ultimately be about 18½ years for single persons and 12½ years for married persons.

In summary, this analysis clearly shows that, on the average, the vast majority of individuals who retired in the past have received benefits of far greater value than the combined employer-employee taxes paid. Furthermore, this situation certainly will prevail in the near future. However, for each succeeding cohort of retirees, the proportion of “winners” will decrease, while the proportion of “losers” will increase. Over the long run, as can be seen from Table 4, this situation will eventually reach the point where the maximum-wage earner cannot expect to receive more in benefits than was “paid for” in taxes—not even with the inadequate tax rates scheduled in present law.

A “perfect” analysis of this situation would consider all members of a cohort, rather than just the hypothetical cases considered here. For example, to analyze the situations of workers retiring at age 65 in 2000, one could theoretically consider all persons born in 1935 and compare all of the taxes paid by those persons (including appropriate interest) with the present value of all of the benefits that they actually receive. Such an

analysis would show precisely the declining rate of return for succeeding cohorts, and even the relative proportions of “winners” and “losers.” Unfortunately, the Social Security Administration does not collect the required data, not even on a sample basis; therefore, such an analysis would seem to be impossible.

If the payroll-tax rates are increased in the future to a sufficiently high level so that the system will be on a self-supporting basis, the failure to receive one’s money’s worth will also apply for the average-wage earner. The explanation for this—which may, at first, seem surprising for a system with tax rates that are self-supporting—is that, for all workers in all periods combined (continuing into perpetuity), the accumulated value (at interest) of the taxes must *equal* the present value of the benefits; therefore, because those retiring in the early decades of operation received more than their money’s worth (on the basis of the combined employer-employee taxes), it follows that, in the aggregate, those retiring in the future—especially the distant future—must receive less than their money’s worth (on the basis that the real interest rate is 2 percent).

The question might be raised as to what will be the “rate of return” inherent in the social security retirement benefits that are “bought” by the OASI taxes over the long run for average-wage earners (as contrasted to the situation as to the money’s-worth aspects based on an interest rate of 2 percent being considered as a real interest rate). Such a computation has been made on the basis of the ultimate combined employer-employee OASI tax rate that would be required under the Alternative II-B cost estimate of the 1982 trustees report if the program is to be financed on a pay-as-you-go (or current-cost) basis—namely, 15¼ percent. Using the same assumptions as previously for the average-wage worker, the annual rate of return is about 1 percent for single men, 1¾ percent for single women, and 2¾ percent for married couples where one spouse does not engage in paid employment.



## DISCUSSION OF PRECEDING PAPER

ROBERT L. BROWN:

The authors should be congratulated for writing such a simple and coherent analysis of the American social security system. One hopes that this analysis will be read and used by a much wider audience than just the recipients of the *Transactions*.

It would be interesting to look at a comparable analysis of the Canadian social security system. Unfortunately, none exists and to do such an analysis would be most complex. However, what follows is a rough beginning.

Canadian retirees (starting at age 65) have three sources of government support. The Old Age Security is paid to all Canadians aged 65 and over who satisfy a residency requirement and is paid out of general tax revenues on a pay-as-you-go basis. The Guaranteed Income Supplement is available to those in need, using an income (not asset) test. It is also paid out of general tax revenues and has no prefunding. Finally, there is the Canada/Quebec Pension Plan (C/QPP). It is a government-sponsored earnings-related pension plan. Employees contribute 1.8 percent of wages up to the Year's Maximum Pensionable Earnings (YMPE), approximately equal to the Average Industrial Wage (AIW), less the Years Basic Exemption (10 percent of the YMPE). These contributions are matched by the employer. Self-employed contribute 3.6 percent of (YMPE-YBE).

To get the full C/QPP benefit, anyone attaining age 18 after 1965 must contribute for 39.95 years [equals 85 percent of (65-18)]. That is, one can "drop out" 15 percent of one's low-earnings years. For someone who earns the YMPE (AIW) for 39.95 years, the retirement pension is equal to 25 percent of the AIW, starting at age 65. The pension is automatically adjusted for inflation (measured by the Consumer Price Index).

If we assume that the full contribution cost is borne by the worker, we have the following equation for those whose earnings are some function of the AIW,  $f(\text{AIW})$ , for at least 39.95 years. For those whose earnings consistently exceed the AIW,  $f(\text{AIW}) = \text{AIW}$ :

$$\begin{aligned}
 & 3.6\% \text{ of } 90\% \text{ of } f(\text{AIW}) \times S_{x:39.95}^{(m)} \\
 & = 25\% \text{ of } f(\text{AIW}) \times a_{65}^{(m)}
 \end{aligned}$$

This reduces to:

$$(.9) (.036) S_{x:39.95} = .25 a_{65}$$

assuming the same rate of return,  $i$ , on both sides of the equation. (Despite the accumulation of a small fund in the early years of the C/QPP, it is basically a pay-as-you-go plan.)

Now, to keep the analysis as absolutely simple as possible, I substitute:

$$S_{\overline{39.95}|} \text{ for } S_{x:39.95|}$$

and  $a_{\overline{65}|}$  for  $a_{65}$ .

Both substitutions can be defended actuarially:

The C/QPP offers significant preretirement death benefits. If such death benefits were the return-of-premiums with interest, then  $S_{\overline{39.95}|}$  would be the correct accumulation factor.

Similarly,  $a_{\overline{65}|}$  can be defended as a replacement for  $a_{65}$  in that  $a_{\overline{65}|} > a_{65}$  and there are wider C/QPP benefits than just the retirement benefits. So, both adjustments are "in the right direction."

So, now we have:

$$(.9) (.036) S_{\overline{39.95}|} = .25 a_{\overline{65}|}$$

From the 1975-77 Canadian Life Tables

$$\ell_{65}^m = 13.95$$

If we now solve the above equation for  $i$ , we find  $i = 3.5$  percent.

Hence, even if we attribute the full 3.6 percent contribution to the worker, the male gets a real rate of return of 3.5 percent. Before retirement everything is indexed to the AIW and after retirement to the CPI, so this is a real rate of return. For a female  $\ell_{65}^f = 18.00$  and solving for  $i$ , we get  $i = 4.1$  percent.

If we analyze the benefit/cost ratio using  $i = 2$  percent (as suggested by the authors) we find a benefit/cost ratio of 1.54 for males and 1.92 for females. It is interesting how close this is to the comparable American figures for someone retiring in 1985 (i.e., 1.55 for males and 1.99 for females). It is also little wonder that so many people want to expand the C/QPP. The C/QPP contribution rate is destined to rise, as soon as our politicians decide to face reality.



Using a real rate of return,  $i = 2$  percent, at what contribution rate will the benefit cost/ratio equal one? That is, what value of  $x$  gives:

$$(.9)(x) S_{39.95} = .25 a_{\frac{x}{.02}} \text{ at } i = 2 \text{ percent.}$$

For males:  $x = 5.56$  percent.

For females:  $x = 6.90$  percent.

Hence, I would suggest that once the C/QPP contribution rates rise above 5.5 percent in total, we will start to get voter disapproval of the system, first from self-employed males, but as the contribution rate continues to rise, from others as well. We know that by the year 2030, the contribution rate will rise to around 9.3 percent in total assuming no change in the present benefit structure.

If we solve our equation now, we find the implied real rate of return for males will be  $i = 0.15$  percent and for females  $i = 1.0$  percent. If we look at the benefit/cost ratio using  $i = 2$  percent we find that it is 0.60 for males and 0.74 for females. This compares to the American figures for the year 2025 of 0.75 for males and 0.95 for females. Two important factors have been omitted. First, there has been no adjustment for mortality improvement. Second, the average worker will make contributions for more than 39.95 years. Regardless, it would appear that both systems are in for severe voter dissatisfaction in the years to come. One wonders if there are any palatable solutions.

#### A. HAEWORTH ROBERTSON:

In their abstract, the authors state that nonactuaries frequently make analyses of the relationship between social security taxes and benefits inadequately because they make inconsistent assumptions, ignore certain important benefit features, or use incorrect methodology. The authors state further that it is possible, however, to analyze the situation adequately and imply that they have done so in their paper. I would submit that the authors have committed many of the transgressions they attribute to nonactuaries and that they have not, in fact, analyzed the money's-worth question adequately. The paper's deficiencies may be obscured somewhat by the numerous tables and the expositions on selecting appropriate interest rates, mortality rates, and other factors that are of relatively little importance compared with some of the items that were ignored or dismissed as inconsequential.

Some of the paper's shortcomings are acknowledged by the authors; others are not. The more important deficiencies may be summarized as follows:

1. The authors state that Hospital Insurance and Disability Insurance were

not included in the analysis in order to simplify the calculations. Hospital Insurance and Disability Insurance accounted for 32 percent of the FICA taxes in 1982 and are projected to account for at least 40 percent of the total social security costs in the future. Furthermore, the paper also excludes the value of preretirement survivors' benefits (payable in the case of death before attaining retirement age), that is, a large portion of the Survivors Insurance benefits. Accordingly, the money's-worth analysis presented in the paper "ignores certain important benefit features" and deals with only about half of the future benefits and costs of the OASDI-HI program that is supported by FICA taxes. I maintain that the taxpayer pays one large tax for "social security benefits" and that it is inappropriate to make pronouncements about money's-worth that are based on only a fraction of the total taxes. It is true that the title of the paper refers only to "retirement benefits," but this is a subtle distinction that will be lost on all but the careful and informed reader.

2. An important methodological limitation of the paper is that it is based on the accumulation of OASI taxes only at interest and not with the benefit of survivorship. It seems clear that one ought to accumulate OASI taxes with the benefit of survivorship and then subtract the accumulated value of the survivors' benefits. This is a true actuarial calculation that is frequently overlooked by nonactuaries for obvious reasons. The authors state that "the failure to consider . . . survivor benefits payable in the case of death occurring before attaining retirement age. . . can be mitigated to a considerable extent by taking into account only the old-age and survivors insurance (OASI) portion of the total social security tax . . ." If the authors' technique (of accumulating taxes only at interest and ignoring the preretirement survivors' benefits) is to be used, it would be more proper also to exclude from the taxes being accumulated the portion of the Survivors Insurance tax associated with preretirement survivors' benefits.
3. The paper does not reflect the Social Security Amendments of 1983 enacted in April, 1983 (several months after the paper was submitted for publication, yet almost five months prior to the preprinting of the paper.) At least two of the provisions of these 1983 Amendments have an important bearing on the analysis contained in the paper; namely, the increase in the full-benefit retirement age for people aged 45 and under in 1983, and the decrease in benefits by virtue of taxation of a portion of social security benefits, heretofore untaxed. The authors do acknowledge that the benefit-cost ratios "would be significantly lower for retirement at ages beyond 65." Furthermore, while the taxation of benefits will

reduce benefits for only about 10 percent of current beneficiaries, based on the present law and the projections shown in Tables 3 and 4 of the paper, virtually all of today's young workers will have their benefits reduced by this provision. Accordingly, the benefit-cost ratios in the paper are not at all valid for persons aged 35 and under, and it is precisely this group that is asking the most compelling questions about money's-worth.

4. All of the tables in the report are based upon taxes scheduled in present law (before the 1983 Amendments) and not those that would be necessary to support the existing program. More or less as an afterthought, the authors state that if we collect sufficient taxes, the money's-worth ratios would be somewhat less favorable. The paper then gives a broad range within which these more realistic money's-worth ratios would fall but does not present complete tables. Unfortunately, because of this method of presentation, readers will focus on the tables themselves, which are based upon inadequate taxes, and not the more realistic benefit-cost ratios based upon adequate taxes.
5. The matter of "adequate taxes" is not elaborated upon in the paper. The authors seem to accept without question the appropriateness of the Alternative II-B (intermediate) assumptions in the OASDI trustees report. Assumptions closer to the so-called pessimistic assumptions would be nearer to the mark in my opinion.

If we would take all of the above-mentioned factors into account, I believe we would get a much less favorable answer to the question of whether today's young taxpayers get their money's-worth than is stated in the paper. On the other hand, offsetting what I consider to be an incomplete analysis that paints an inappropriately rosy picture of the money's-worth question, Table 5 of the paper paints what I think is an inappropriately gloomy picture about how much less valuable social security's benefits, relative to its taxes, become as time goes by. The figures in that table indicate, for example, that a single person who is a maximum-wage earner and who reaches age 65 in 1960, will receive benefits equal to his and his employer's accumulated taxes in 24 months. (The issue of whether it is "his" or "her" contributions is finessed by ignoring postretirement mortality.) For such a person reaching 65 in 1990, it will take 120 months, and for such a person reaching age 65 in 2025, it will take 222 months. I doubt that this is a fair representation of how the equity is shifting over time. Even an analysis of the figures in Tables 3 and 4 indicates a less severe equity shift over time than does Table 5. I believe, however, that all of the tables in the paper overstate the case,

and that there will be a tendency for these tables to be misused. As a public information officer with the Social Security Administration once said, "It is bad enough just to tell the truth."

The authors seem ambivalent about whether to consider only employee taxes or employer-employee taxes in making their analysis. At the beginning of the paper they state, "For purposes of this analysis, the combined employer-employee tax is used." But later in the paper the authors state, "Thus, if one considers only the employee taxes paid, the male maximum earner just about breaks even, and the other maximum-earnings cases do somewhat better."

One of the more interesting observations by the authors, at least to readers concerned with equality between sexes, is the following: "The corresponding ratios for single female average-earnings workers are about 30 percent higher *relatively* than for male workers. This is due entirely to the greater longevity of women."

In the final sentence of the paper, after having mentioned the concept of "rate of return" for one's OASI taxes, the authors state that ". . . for the average-wage worker, the annual rate of return is about 1 percent for single men, 1.75 percent for single women, and 2.75 percent for married couples where one spouse does not engage in paid employment." This statement appears to be designed to leave the reader with the final thought that social security is a "good deal." Given the deficiencies in the analysis contained in the bulk of the paper, it is difficult to give any credence at all to this summary statement about "rate of return" which is given without any substantiation or explanation. To what generation of employees does this statement apply? What would the return be if the 1983 Amendments were reflected? What would the return be for maximum-wage workers? What would the return be based upon all social security benefits and taxes, not just half of them? Was the return calculated by accumulating taxes at interest only, ignoring the possibility of death before retirement (in which event the return could be quite small)?

In the third from last paragraph of the paper, the authors discuss the possibility of a more theoretically perfect analysis of the money's-worth question. The Social Security Administration has done some important work in that area, some of which has been published (Actuarial Note No. 95, April 1978, by Richard G. Schreitmueller and Orlo R. Nichols). If the money's-worth question is really important, then I would urge the authors and the Social Security Administration and the Health Care Financing Administration actuaries to expand their work in this area. Perhaps the money's-worth question is neither important nor even appropriate. Even to discuss this question of money's-worth (from the viewpoint of individuals)

requires an underlying presumption that we have a national pension and social insurance program that provides—or should provide—benefits commensurate with an individual's contributions or a generation's contributions. This is, I believe, a false premise. We do not ask the question of individual money's worth about public education; we don't ask it about the national defense system; we don't ask it about the farm subsidy programs, or about Aid to Families with Dependent Children and a myriad of other welfare programs. And I am not sure that it is any more appropriate to ask the individual money's-worth question about social security than it is about any of these other national programs.

Of course, the question of money's worth keeps arising, and there is clearly a void of information. The answers are difficult to determine and, once determined, unpalatable to communicate. The intent of the authors seems to be to fill that void with valid information before it is filled with invalid information. However, the paper is not well suited to inform actuaries, much less the general public about the question posed in the opening sentence of the paper, as to "whether individuals receive their money's worth from the social security taxes that they pay." It will be unfortunate if, because of the authors' prominence and familiarity with social security, the general public assigns more significance to the paper than is justified or probably even intended by the authors.

ORLO R. NICHOLS AND RICHARD G. SCHREITMUELLER:

The authors have produced a fine paper on a tough subject. For Mr. Myers this is what we have come to expect over many years, while for Mr. Schobel we hope it is the first of many papers for the Society.

Money's-worth analyses often are made by nonactuaries who attach more importance to proving some point to the public than to presenting a complete and objective picture. A wide range of analytical approaches can be used, many of them too simple to give valid answers. Yet the answers are useful only to the extent that they are simple enough to be explained to nonactuaries. Although we agree with the authors that it is helpful if the results can be reproduced by independent analysts, this does not seem to be a major consideration as long as disclosure of methodology is adequate. Today much of the actuary's work simply cannot be reproduced by others in a practical sense, but this would hardly provide the actuary with a good reason for oversimplifying. Thus, although we like the paper's actuarial assumptions, a more complex approach might be well worth the effort.

The main problem with the individual-worker approach is that the cases used do not accurately fit the actual data for the covered population. Still,

a rough fit may be justified by ease of analysis and presentation if the overall results are free of systematic error or bias. The paper suggests that the steady-worker assumption used understates the benefit/tax ratios by some 10-20 percent of the calculated results, in comparison to a more realistic average-earnings pattern giving results that "would not be very different" from those shown. In this context some analysts would judge results deviating by 10-20 percent to be very different. We would prefer to include a rough adjustment for such an item, and then let the text discuss why the adjustment is rough, rather than to omit such an adjustment and rely on the text to state that the results are off the mark. It seems doubtful that those interpreting the results, especially as presented in the simplified article from the *Chicago Tribune* and other newspapers, would keep in mind such caveats appearing in the text of the paper. The 1983 Social Security Amendments pose a new problem with the individual-worker approach, in that one must now make some arbitrary assumptions as to the federal income tax payable on part of the social security benefits.

Our calculations for young workers and their families using the 1983 Social Security law indicate that on a present-value basis both the Disability Insurance (DI) benefits and the DI part of the payroll tax represent about 10 percent of the total for OASDI. These crude figures suggest that including DI in the benefit/tax ratios might not change them much, but our preference is to include DI in the calculations. It is true that in recent years the law and regulations governing the administration of DI claims have swung back and forth between liberalization and tightening up, so that DI experience now may seem especially hard to predict. But one can assume that the Congress will continue to adjust payroll tax rates for DI to keep the fund solvent. Under such conditions a lasting change in DI experience for better or worse would be balanced by a tax change, with little change in the OASDI benefit/tax ratios.

On a related subject mentioned in the paper, our present-value calculations for young workers under the 1983 law indicate that children's benefits under OASDI represent a little more than 3 percent of the total benefits, with this figure rising to around 4 percent if one includes mothers' or fathers' benefits payable only when there are eligible children. This agrees with the 4 percent figure for children given in the paper, although computed in a different way. We would prefer to provide for these survivorship benefits directly, rather than to assume a preretirement death benefit equal to the return of payroll taxes with interest.

We are now developing a cohort analysis of current young workers which, for future years, proceeds along the ideal lines that the paper suggests. It may later be possible to work backwards in time from this on a rough basis

to extend the analysis to the earliest years of the program. There seems to be no inherent barrier to making such an analysis provided one is willing to live with approximations of some historical items for which exact records are not kept; note that Table 1 in the paper uses such a technique to estimate certain historical interest rates. The real question is whether reasonable allocations can be made of historical benefits and taxes among different cohorts, and we are not yet ready to deny this. An analogous question for a life insurance company actuary would be to split prior years' profits between term and permanent insurance; we expect that many actuaries could develop reasonable estimates of such figures for internal company use. Of course, a social security allocation would be subject to public scrutiny and criticism, especially if done by federal employees, so that very crude estimates would be unacceptable.

(AUTHORS' REVIEW OF DISCUSSION)

ROBERT J. MYERS AND BRUCE D. SCHOBEL:

We thank Messrs. Brown, Robertson, Nichols, and Schreitmuller for their discussions. Before responding to their points, however, we would like to update the information in our paper to reflect the effects of the Social Security Amendments of 1983 (Public Law 98-21, enacted into law on April 20, 1983).

These amendments made many significant changes to the Old-Age, Survivors, and Disability Insurance (OASDI) program. These changes are described in detail in the report of the Conference Committee (House Report 98-47) and in the *Social Security Bulletin*, July 1983. Three (and possibly four) of the changes have a major effect on the ratios of the present value of benefits to the accumulated value of taxes, both as of age-65, as they were presented in our paper:

1. The OASI tax rates were increased in 1983 and later (the OASDI-HI tax rates were increased in 1984, 1988, and 1989; the increases in the OASI rates are primarily the result of reallocations of the combined rates). The effect of this change is to increase the accumulated OASI tax amounts for all steady-earner age-65 retirees in 1984 and later.
2. The effective date for cost-of-living adjustments was changed, in 1983 and later, from June to December. The effect is to decrease the present value of retirement benefits by about 2 percent for those retiring after 1982.
3. The normal retirement age, that is, the age at which unreduced retirement benefits are first payable, will be increased gradually from the present age 65 to age 67. This change will first affect persons who attain age 65

in 2003, and it will be fully effective for persons who attain age 67 in 2027 (or age 65 in 2025). For persons who decide to retire at age 65 despite this change in the law, the ultimate effect is a relative reduction of 13 1/3 percent in the present value of benefits. For persons retiring at age 65 before 2003, there is no effect.

Tables 1A, 2A, and 3A present figures comparable to those shown in Tables 2, 3, and 4 of our paper, but revised to reflect the three changes in law mentioned above. In order to maintain consistency with the figures in our paper, we have not reflected changes in actual experience (for example, the maximum earnings figures for 1983 and 1984 are now known to be \$35,700 and \$37,800, respectively, whereas we had used \$35,100 and \$37,500, respectively—all of our figures were based on the Alternative II-B assumptions of the 1982 trustees report). Nor have we changed the economic assumptions to reflect the relatively minor modifications included in the 1983 trustees report.

We have not included the effects of a fourth provision of the Social Security Amendments of 1983—namely, the provision for federal income taxation of a part of OASDI benefits received after 1983 by persons with relatively high incomes (the thresholds are not indexed, however; thus, an increasing proportion of future cohorts of retirees will pay some additional income tax as a result of this provision). We chose not to adjust our figures for this item, primarily because it would be practically impossible to estimate the “other” incomes of the hypothetical retirees considered in our analysis. In addition, for purposes of comparison with other investment media (for example, IRAs), the before-tax analysis avoids consideration of the many complicated differences in the income-tax treatment of retirement benefits from these various sources. In general, a retiree will pay less income tax on OASDI benefits than on other types of retirement benefits simply because no more than 50 percent of the OASDI benefits are ever included in taxable income, while all of the benefits from other sources are generally taxable (after the return of the individual’s contributions, in certain cases).

The revised figures shown in Tables 2A and 3A indicate that the OASI program remains a “good buy,” even for a maximum-earner single man retiring at age 65 in 2025, if only the employee taxes are considered. If both the employee and employer taxes are considered, the benefit/tax ratios gradually drop below 100 percent for single maximum earners, and even for single male average earners. This result, however, is unfortunately somewhat distorted in that a worker with average earnings in every year from age 21 through age 64 is not average at all! As noted in our paper, if both occasional unemployment and the usual lifetime earnings patterns are taken into ac-



TABLE 1A  
 AVERAGE AND MAXIMUM EARNINGS LEVELS AND OASI AND OASDI-HI TAX RATES  
 FOR EMPLOYERS AND EMPLOYEES, EACH

Year	Average Earnings	Maximum Earnings	OASI Tax Rate	OASDI-HI Tax Rate
1983	\$ 15,663.97	\$ 35,100	4.775%	6.700%
1984	16,926.37	37,500	5.200	7.000
1985	18,099.11	40,500	5.200	7.050
1986	19,329.42	43,800	5.200	7.150
1987	20,609.56	46,800	5.200	7.150
1988	21,968.00	50,100	5.530	7.510
1989	23,364.00	53,400	5.530	7.510
1990	24,768.00	57,000	5.600	7.650
1991	26,189.00	60,600	5.600	7.650
1992	27,629.00	64,200	5.600	7.650
1993	29,149.00	67,800	5.600	7.650
1994	30,752.00	71,400	5.600	7.650
1995	32,443.00	75,300	5.600	7.650
1996	34,227.00	79,500	5.600	7.650
1997	36,110.00	84,000	5.600	7.650
1998	38,096.00	88,500	5.600	7.650
1999	40,191.00	93,300	5.600	7.650
2000	42,402.00	98,400	5.490	7.650
2001	44,734.00	103,800	5.490	7.650
2002	47,194.00	109,500	5.490	7.650
2003	49,790.00	115,500	5.490	7.650
2004	52,528.00	121,800	5.490	7.650
2005	55,417.00	128,400	5.490	7.650
2006	58,465.00	135,600	5.490	7.650
2007	61,681.00	143,100	5.490	7.650
2008	65,073.00	150,900	5.490	7.650
2009	68,652.00	159,300	5.490	7.650
2010	72,428.00	168,000	5.490	7.650
2011	76,412.00	177,300	5.490	7.650
2012	80,615.00	187,200	5.490	7.650
2013	85,048.00	197,400	5.490	7.650
2014	89,726.00	208,200	5.490	7.650
2015	94,661.00	219,600	5.490	7.650
2016	99,867.00	231,600	5.490	7.650
2017	105,360.00	244,200	5.490	7.650
2018	111,155.00	257,700	5.490	7.650
2019	117,268.00	271,800	5.490	7.650
2020	123,718.00	286,800	5.490	7.650
2021	130,523.00	302,700	5.490	7.650
2022	137,701.00	319,200	5.490	7.650
2023	145,275.00	336,900	5.490	7.650
2024	153,265.00	355,500	5.490	7.650

count, the benefit/tax ratios would need to be adjusted, and those adjustments would likely raise such ratios above 100 percent for all “average” earners. The effect of the 1983 law has been to lower these ratios to the extent that the effects of certain assumptions—for example, steady earnings in every year—are quite critical. As we will describe later, the Office of the Actuary,

TABLE 2A

COMPARISON OF COMBINED EMPLOYER-EMPLOYEE OASI TAXES ACCUMULATED WITH  
INTEREST AND PRESENT VALUE OF RETIREMENT BENEFITS FOR PERSONS  
ATTAINING AGE 65 IN VARIOUS YEARS, AVERAGE-WAGE EARNER

YEAR OF ATTAINING AGE 65	INITIAL MONTHLY PRIMARY BENEFIT	OASI TAXES ACCUMULATED WITH INTEREST TO AGE 65	PRESENT VALUE OF FUTURE BENEFITS, AT AGE 65		
			Single Man	Single Woman	Married Couple*
1985.....	\$ 594	\$ 50,124	\$ 88,127 (176)	\$112,986 (225)	\$ 165,359 (330)
1990.....	803	81,386	121,048 (149)	154,851 (190)	226,442 (278)
1995.....	1,052	124,590	160,535 (129)	204,970 (165)	299,718 (241)
2000.....	1,378	182,416	212,366 (116)	270,889 (149)	396,120 (217)
2005.....	1,742	259,323	270,958 (104)	345,098 (133)	504,744 (195)
2010.....	2,198	357,353	345,048 (97)	439,387 (123)	642,410 (180)
2015.....	2,873	485,433	456,056 (94)	579,022 (119)	847,419 (175)
2020.....	3,710	645,612	593,349 (92)	754,339 (117)	1,102,713 (171)
2025.....	4,557	853,834	735,784 (86)	934,065 (109)	1,365,730 (160)

\*Assumes only one earner.

NOTE.—Figures in parentheses are present value of benefits as percentage of accumulated taxes.

TABLE 3A

COMPARISON OF COMBINED EMPLOYER-EMPLOYEE OASI TAXES ACCUMULATED WITH  
INTEREST AND PRESENT VALUE OF RETIREMENT BENEFITS FOR PERSONS  
ATTAINING AGE 65 IN VARIOUS YEARS, MAXIMUM-WAGE EARNER

YEAR OF ATTAINING AGE 65	INITIAL MONTHLY PRIMARY BENEFIT	OASI TAXES ACCUMULATED WITH INTEREST TO AGE 65	PRESENT VALUE OF FUTURE BENEFITS, AT AGE 65		
			Single Man	Single Woman	Married Couple*
1985.....	\$ 774	\$ 76,275	\$ 114,944 (151)	\$ 147,369 (193)	\$ 215,680 (283)
1990.....	1,080	132,973	162,749 (122)	208,197 (157)	304,424 (229)
1995.....	1,454	216,960	221,699 (102)	283,063 (130)	413,911 (191)
2000.....	1,975	335,752	304,230 (91)	388,067 (116)	567,470 (169)
2005.....	2,583	501,988	401,910 (80)	511,881 (102)	748,683 (149)
2010.....	3,353	732,420	526,452 (72)	670,388 (92)	980,147 (134)
2015.....	4,463	1,042,507	708,504 (68)	899,537 (86)	1,316,504 (126)
2020.....	5,786	1,450,017	925,335 (64)	1,176,400 (81)	1,719,693 (119)
2025.....	7,117	1,967,234	1,149,184 (58)	1,458,869 (74)	2,133,063 (108)

\*Assumes only one earner.

NOTE.—Figures in parentheses are present value of benefits as percentage of accumulated taxes.

Social Security Administration, has recently produced an analysis that avoids some of these problems.

We would like to note that our calculation of the average-earnings figures for 1937-50 has recently been afforded official stature. As part of a "Final

Rule” concerning the calculation of benefits under international “totalization” agreements, the Secretary of Health and Human Services promulgated the average-earnings figures for years before 1951 (see *Federal Register*, July 24, 1984, 49 FR 29776). The figures for 1938-50 are all within a cent or two of ours; the 1937 figure differs slightly more, because comparable earnings data are not available from that year, and an approximation had to be used.

Mr. Brown’s analysis of the “money’s-worth” question in regard to the Canada Pension Plan was very interesting and produced results somewhat similar to ours for the OASI program. Unfortunately, one important difference is that we assumed future reductions in mortality rates (as projected on the basis of the Alternative II-B assumptions of the 1982 trustees report), whereas Mr. Brown assumed static mortality. His benefit/tax ratios would obviously be significantly higher if increases in life expectancy had been assumed, as seems most likely to occur.

Mr. Robertson makes several very important points and raises some valid questions. We will address these issues in the same order that he presented them.

First, he questions our omission of the taxes and benefits related to the Disability Insurance and Hospital Insurance programs. We purposely chose not to consider these programs, although for different reasons. In regard to HI, the program is acknowledged to be very far out of actuarial balance, over both the short-range and the long-range. Either future taxes will need to be raised significantly, or future benefit costs (those related to either the benefit provisions or the reimbursement-to-provider provisions, or both) will need to be reduced. Otherwise, the program will certainly go bankrupt within about ten years, and possibly sooner. To compare the very inadequate taxes with the arguably “too rich” benefits would have been very misleading. Moreover, we know that the HI program will change in the near future. The 1983 law included some changes, and the 1982 Advisory Council on Social Security recommended further changes (its report was issued on February 21, 1984). A money’s-worth analysis of HI might be useful in the future, but not now.

In regard to DI, our methodology did not lend itself to the inclusion of disability benefits. In considering hypothetical workers with steady earnings, the results would depend primarily on the assumed age at disability onset. Obviously, a person disabled at age 22, after earning the minimum 6 quarters of coverage required, could receive thousands of times more in benefits than was paid in taxes, if the disability continues to age 65. At the other extreme, a person disabled at age 64 would receive only a small percentage of the

accumulated DI taxes (DI benefits are automatically converted to OASI benefits when the disabled-worker beneficiary attains normal retirement age, currently age 65). Such results would not be meaningful.

The DI program could be considered in another way—by calculating the value of the disability protection in each year and comparing that time series with the time series of tax payments for DI. Such an analysis would require the use of assumed disability-incidence and termination rates. The determination of appropriate rates would be very difficult at this time, when the administration of the DI program is changing so rapidly. Obviously, with high assumed incidence rates, the DI program would look like a bargain. Likewise, with low assumed incidence rates, it would appear to be overpriced.

Mr. Robertson also criticizes our failure to accumulate OASI taxes with survivorship during the preretirement period. We acknowledged in our paper that this approximation implied that the value of preretirement survivor benefits is equal to the accumulated taxes, in the aggregate, and we believe that any error introduced by this methodology must be fairly small. Of the total long-range cost of the OASI program, only about 4 percent is attributable to survivor benefits payable on the accounts of workers who died before attaining age 65.

We believe that our analysis of the money's-worth question after the enactment of the Social Security Amendments of 1983 satisfies Mr. Robertson's objections to the fact that the original analysis was based on the law in effect when we submitted the paper (December 1982). In regard to the appropriateness of the Alternative II-B assumptions, we simply disagree with Mr. Robertson's contention that those assumptions are too optimistic. This is just a matter of opinion.

We agree wholeheartedly with Mr. Robertson when he states that the money's-worth question is really not very relevant to a national social insurance system. We believe that social security serves many worthwhile social purposes, whether or not individuals can expect to receive benefits roughly equal in present value to their taxes. Still, we recognize that these sorts of analyses are going to be made—if not by actuaries, then by less qualified persons. We tried to provide an analysis that would be not only reasonably valid, but also understandable and reproducible by laymen.

In addition to their discussion of our paper, Mr. Nichols and Mr. Schreitmüller have recently prepared a "cohort" money's-worth analysis of the type that we described in our paper. Their analysis shows that the cohort of workers at ages 18-22 as of January 1, 1983, can expect to receive OASDI benefits with a present value equal to 103 percent of the present value of their OASDI taxes (before adjustment for taxation of benefits). (More details

on their analysis and its results were presented at the 1983 Annual Meeting of the Society in Hollywood, Florida.)

Understandably, Mr. Nichols and Mr. Schreitmueller prefer the cohort approach to our hypothetical-worker approach. The two approaches have very different advantages and disadvantages. The cohort approach has clear technical advantages, but the results are probably not reproducible by anyone outside of the Office of the Actuary, SSA, and therefore must be accepted "on faith" by actuaries and nonactuaries alike (not that we doubt, in any way, the validity and accuracy of their figures). The hypothetical-worker approach introduces some troublesome distortions, as noted earlier, but the size of such distortions can be estimated, and adjustments can be made. The results are easily reproduced, even by a layman, and are easily understood. Taking all of these factors into consideration, we continue to prefer the hypothetical-worker approach.

The points raised by Mr. Nichols and Mr. Schreitmueller in regard to the exclusion of DI taxes and benefits and the implicit approximation used for preretirement survivor benefits have already been addressed in our response to similar points made by Mr. Robertson.

