

SOCIAL SECURITY: A FINANCIAL APPRAISAL ACROSS AND WITHIN GENERATIONS****

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ABSTRACT

This paper computes the expected present value of Social Security retirement benefits and taxes for households of different marital circumstances, incomes, and age cohorts. Also computed are the net gain or loss from participation in the system, the expected internal rate of return it offers various participants, and the marginal linkage between benefits and contributions. All computations are made for the 1985 Social Security and income tax laws. The general results are that Social Security offers vastly different terms to households in different circumstances. The net gain or loss varies by \$200,000 and the real internal rate of return on contributions ranges from negative numbers to 6.3 percent for households of different ages, income levels, and marital status. These differences are far greater than the widely debated distributional effects of relevant income tax alternatives. We also find that there is a great deal of variance in the marginal linkage of benefits and taxes with most households facing a situation where the incremental present value of benefits is only zero to thirty cents per extra dollar of taxes paid.

1. Introduction

FOR most Americans, anticipated Social Security retirement benefits have a value larger than the total value of their other financial assets.¹ Likewise, more than half of the workers in the United States pay more in OASDHI "contributions" than they pay in personal income taxes. Because the program looms so large in the financial picture of so many, it is reasonable to assume that there is a sig-

nificant demand for an investment evaluation of the deal it offers Americans. However, the program is extremely complex, with the expected benefits depending on one's marital status, sex, age-earnings profile, length of career, number of children, and other factors.

In this paper we simplify the analysis by exclusively evaluating the retirement portion of the program. We also only examine it from the perspective of the household or the individual and our study is partial equilibrium in the sense that we do not tackle the consequences of the program for labor force participation or private saving behavior. Further, the household or individual is not particularly concerned about whether the program is fully funded or on a pay-as-you-go basis. What the participant is interested in is how large are his or her taxes (or "contributions" or "investments") and what is the expected value of benefits to which he or she will be entitled. The economically sophisticated household will also be interested in the marginal linkage between taxes and benefits. That is, they would like to know the incremental value of the retirement benefits for an incremental payment of Social Security taxes. We calculate this marginal linkage as well as the expected present value of taxes and benefits for households of different income levels, marital status, and belonging to different age cohorts. In computing the present value, we use a three percent real discount rate, although some sensitivity analysis to that figure is presented in the Appendix to the paper. We also calculate the present value of transfers offered by Social Security as the difference between the present value of benefits and taxes. The transfer figure is the surplus or gain one receives from participating in the system (if the figure is positive). Finally, we compute the internal rate of return offered by the retirement portion of Social

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Security. That is, we calculate the rate of discount which equates the expected present value of benefits with the expected present value of taxes. Throughout the analysis, we assume the participant bears the burden and effectively pays both the employer and the employee contributions to the system.

The emphasis of the paper is to calculate the financial terms of Social Security for households in different circumstances. Our results indicate that the "deal" varies enormously by marital status, income, and cohort. The difference in the transfer figures for different households examined can approach 200,000 1985 dollars. The internal rate of return ranges from over six percent to negative numbers. And, the linkage between incremental taxes and benefits can be significant or zero, depending on the particular household's circumstances. While some of these differences are undoubtedly intentional, others are probably not. It is our feeling that both participants and analysts of Social Security need this information in order to evaluate the current structure of the program.

The remainder of the paper is laid out as follows: the next section contains a brief survey of related literature. Then, section three describes our methodology and data. The intergenerational results are contained in section four, while the intragenerational results are presented in section five. Section six looks at the marginal linkage of taxes and benefits. Section seven considers the relationship of benefits to remaining lifetime taxes. The paper concludes with some observations on the importance of our findings.

2. Literature Review

Several studies have attempted to estimate the "deal" various households have received or can expect to receive from Social Security's retirement program.² One conclusion of this literature is that the early cohorts of retirees had very large rates of return on their taxes and that future retirees, especially well off ones, are likely to fare poorly, with a rate of return below that available on private assets.

Hurd and Shoven (1985) document this pattern of rates of return for various cohorts and earnings levels, but their analysis was made prior to the 1983 amendments and hence does not include consideration of the increased age of eligibility for future retirees or the partial taxation of benefits. Also, there have been some changes in the economic and demographic assumptions used by the Social Security Administration.

Boskin, Avrin, and Cone (1983) report the average transfer per household for succeeding ten-year age cohorts, with transfers defined as the difference in the expected present value of benefits and taxes. They also present estimates of how different cohorts and the system finances as a whole would be affected by various policy changes, such as increases in the retirement age. They conclude that those retiring recently are receiving benefits which are about three times as large as the sum of their employee and employer contributions plus three percent real interest. Thus, about two-thirds of their benefits are transfers as defined above.

These results are updated to the present, post-1983-amendments case in Boskin (1986). The pattern of transfers remains qualitatively similar to that mentioned above, but attention is called to the fact that OASDI is unlikely to be financially solvent over the next 75 years, despite the 1983 amendments. The financial solvency problem is much worse if HI, hospital insurance, is included.³ Moreover, *how* and *when* the financial solvency issue is addressed will matter for the Social Security benefits, taxes and transfers of individuals of various ages. For example, whether changes are made in the tax rates, benefit formulas, the age of eligibility for full retirement benefits, or else the method of financing Social Security will impact various cohorts quite differently.

Variation among households within a cohort is shown in the studies of Bennett (1979), the Congressional Budget Office (1986), and Pellechio and Goodfellow (1983). The latter study examines the net impact of the 1983 amendments on various types of households and is similar in

spirit to the analysis presented here.

We go beyond these previous studies in considering a wider range of cases, updating to the Social Security Administration's 1985 assumptions, and in using a simulation which more precisely models survival probabilities and income taxation of benefits.

Studies by Gordon (1983), Burkhauser and Turner (1985) and Browning (1985) examine the marginal linkage between taxes paid and benefits received. We differ from these studies in considering specific wage histories, a distribution of possible ages of death, the upcoming increase in retirement age, and income taxation of benefits.

A further innovation in our work is a computation of the relationship between one's *future* taxes (treating past taxes as "sunk") and benefits. The significance of such a calculation received ample treatment in the analytical study of Browning (1975).

3. Methodology and Data

In the present study, we use a computer simulation to convert assumptions about households' wages, expected mortality, and economy-wide growth in real wages into expected values of Social Security taxes, benefits, net transfers (positive or negative) and internal rates of return. Assumed wage histories lead in a straightforward manner (following legal provisions) to derivation of taxes paid during working lives and benefits received after retirement.⁴ A separate procedure, described below, determines income-taxation of benefits. These taxes and net-of-income-tax benefits are weighted by the probabilities of household members remaining alive at each age and discounted (we consider real rates of 0 percent, 2 percent, 3 percent, and 4 percent) to a common year. We also derive the transfer, or difference between discounted expected taxes and benefits, and the internal real rate of return, the rate at which discounted expected taxes equal discounted benefits.

We consider typical households which differ in a number of respects: in marital

status, the amount of total household earnings, and the division of total earnings between wife and husband. We also compare households born in 1915, 1930, 1945, 1960, 1975, and 1990, since these cohorts differ in the tax rates they pay, the economy's level of real wages, and life expectancy.⁵

We assume that individuals work, and pay Social Security taxes, from age 21 until they become eligible for full retirement benefits—at age 65 for those born in 1915 and 1930, 66 for those born in 1945, and 67 for later cohorts. We do not consider unemployment.

Wages vary for individuals both with economy-wide wage growth (as indexed by the Social Security Administration's "Average Wage Series") and according to their age: we assume that male wages increase one percent per year of age beyond the economy-wide growth in wages until age 50 and that female wages increase one-half percent per year of age until age 50, and then flatten until retirement. The "earnings levels" reported in the tables below correspond to the 1960 cohort—25-year-olds in 1985. By 2010, when the 1960 cohort is 50 years old, its real wages will have increased 45 percent with economy-wide wage growth plus an additional 28.4 percent for males and 13.3 percent for females in keeping with their age-profile of wages. The 1930 and 1945 cohorts have wages in 1985 which vary by the age-profile from the "earnings level" listed. All cohorts other than the 1960 cohort have age-25 wages which differ from that reported as the "earnings level" by the difference in the wage index between 1985 and the year they are 25. In our principal research we follow the Social Security Administration's intermediate assumption (Assumption II-B), 1.5 percent growth per annum, for future wage growth; however, we do consider other assumptions as well below.

The figures we present are *ex ante* (or expected value) calculations for each cohort as of age 25. Taxes and benefits for higher ages are weighted by the probabilities of individuals remaining alive at each age. Since wives may collect spouse or survivor benefits based on their hus-

bands' earnings histories, we derive their benefits as the weighted average of benefits for each age of husband death, including death before retirement.

Husbands and wives are assumed to be born in the same year. Marriages are assumed to take place at age 25, widows are assumed to remain single, and divorce is not considered.

Mortality probabilities are considered separately for males and females. Separate mortality tables are used for each cohort. The tables used are those used for the intermediate assumption (Assumption II) in the 1983 Annual Report of the Board of Trustees of the Old Age and Survivors' Insurance and Disability Insurance Trust Funds.⁶ The male and female life expectancies implicit in these tables, conditional on survival to age 25, are 70.4 and 78.2 years for those born in 1915, 72.0 and 79.6 for 1930, 74.0 and 81.8 for 1945, 74.6 and 82.1 for 1960, 75.3 and 82.9 for 1975, and 76.0 and 83.6 for 1990.

The recent legislation of taxation of Social Security benefits has added substantial complication to our derivations. The law provides for the taxation as ordinary income of half one's benefits to the extent that this portion of one's benefits, plus other adjusted gross income, exceeds the un-indexed threshold levels of \$25,000 for singles and \$32,000 for couples. The chief difficulty arises in deriving adjusted gross income and marginal tax rates for retired households for which we otherwise make assumptions only about wage income in pre-retirement years. Our procedure is as follows: Census Bureau data are used to determine the percentile rankings of the household earnings levels we consider.⁷ IRS data are used to determine the adjusted gross income and taxable earnings of taxpayers over age 65 which correspond to these same percentile rankings.⁸ These figures for adjusted gross income and taxable earnings are assumed to vary with our wage index from the year of the data to the year five years after a cohort's retirement, but to vary for each given cohort only with the Consumer Price Index. The figures for adjusted gross income determine the amount of benefits subject to taxation, while the figures for taxable

earnings determine the marginal tax rate which is applied. Since tax brackets are indexed by the CPI a common marginal tax rate is thus derived for all years of one's retirement. We have not added the complication of considering that part of benefits will generally fall within higher brackets.

4. Intergenerational Transfers in Social Security

Social Security—when it was introduced and each time it has expanded—has been a major vehicle for transferring resources from the younger, richer, working generation to the older, poorer, retired generation. While part of this public redistribution of wealth between generations may be offset by private intrafamily intergenerational transfers, it is unlikely that this offset is sufficient to alter our general conclusions.⁹ While the percentage of transfers in benefits is largest for the first cohort of retirees (who receive virtually a complete windfall), the positive intergenerational transfers received by retirees may continue to be substantial for decades, turning negative for subsequent retirees.

Tables 1A and 1B highlight the expected intergenerational transfers under current law and the Social Security Administration's intermediate (II-B) economic and demographic projections.¹⁰ Table 1A compares the expected present value of benefits, taxes, and transfers (the difference between benefits and taxes) across six cohorts of current and future retirees at various earnings levels. It also presents the internal rate of return on the taxes paid, i.e. the rate which equates the expected present values of taxes and benefits. The dollar figures are discounted at a real 3 percent rate; sensitivity analyses to variations in the discount rate are discussed in the appendix.

The three earnings levels presented (\$10,000, \$30,000, and \$50,000) are wage indexed levels for 1985, and represent, roughly, the poverty line, median income, and well-paid professionals, respectively. For the 1960 cohort, they represent actual 1985 wages at age 25. For the 1945

Table 1A
Comparison Across Cohorts of
Single-earner Couples, Various Earnings Levels
(1985 dollars discounted at rate 3% to 1985)

Year of Birth		Earnings Level (at 1985 wage index)		
		10,000	30,000	50,000
1915	P.V. Benefits	84,356	129,703	118,160
	P.V. Taxes	35,649	67,189	71,053
	P.V. Transfer	48,707	62,514	47,107
	Rate of Return	6.34%	5.46%	4.83%
1930	P.V. Benefits	72,943	117,089	107,963
	P.V. Taxes	48,029	110,155	110,428
	P.V. Transfer	24,914	6,934	-2,464
	Rate of Return	4.37%	3.22%	2.92%
1945	P.V. Benefits	57,932	101,554	93,783
	P.V. Taxes	48,951	136,498	140,253
	P.V. Transfer	8,981	-34,944	-46,470
	Rate Of Return	3.50%	2.07%	1.74%
1960	P.V. Benefits	42,356	75,845	69,801
	P.V. Taxes	41,263	123,788	138,302
	P.V. Transfer	1,093	-47,943	-68,501
	Rate of Return	3.08%	1.54%	1.02%
1975	P.V. Benefits	33,522	60,886	56,315
	P.V. Taxes	33,273	99,819	112,081
	P.V. Transfer	249	-38,933	-55,766
	Rate Of Return	3.02%	1.54%	1.03%
1990	P.V. Benefits	27,291	48,873	45,467
	P.V. Taxes	26,399	79,196	88,866
	P.V. Transfer	892	-30,323	-43,399
	Rate of Return	3.10%	1.58%	1.09%

Table 1B
Comparison Across Cohorts of
Single-earner Couples, Various Earnings Levels
 (1985 dollars discounted at rate 3%
 to the year in which cohort is age 25.)

Year of Birth (Year Age 25)		Earnings Level (at 1985 wage index)		
		10,000	30,000	50,000
1915 (1940)	P.V. Benefits	22,307	34,299	31,246
	P.V. Taxes	9,427	17,768	18,789
	P.V. Transfer	12,880	16,531	12,457
	Rate of Return	6.34%	5.46%	4.83%
1930 (1955)	P.V. Benefits	30,052	48,239	44,480
	P.V. Taxes	19,787	45,383	45,495
	P.V. Transfer	10,265	2,856	-1,015
	Rate of Return	4.37%	3.22%	2.92%
1945 (1970)	P.V. Benefits	37,184	65,184	60,196
	P.V. Taxes	31,420	87,613	90,023
	P.V. Transfer	5,764	-22,429	-29,827
	Rate of Return	3.50%	2.07%	1.74%
1960 (1985)	P.V. Benefits	42,356	75,845	69,801
	P.V. Taxes	41,263	123,788	138,302
	P.V. Transfer	1,093	-47,943	-68,501
	Rate of Return	3.08%	1.54%	1.02%
1975 (2000)	P.V. Benefits	52,226	94,859	87,737
	P.V. Taxes	51,839	155,515	174,618
	P.V. Transfer	387	-60,656	-86,881
	Rate of Return	3.02%	1.54%	1.03%
1990 (2015)	P.V. Benefits	66,241	118,628	110,360
	P.V. Taxes	64,077	192,229	215,700
	P.V. Transfer	2,164	-73,601	-105,340
	Rate of Return	3.10%	1.58%	1.09%

cohort, actual earnings levels at the age of 40 for low-wage males in 1985 would be \$11,610, which exceeds the \$10,000 figure by 15 years of movement along their age earnings profile. For the 1915 cohort, which is 70 in 1985, these figures must be deflated by the real wage index to ascertain their actual wages earlier in their lives; similarly, for cohorts not yet working, these figures would be compounded at real wage growth projections (1.5 percent/annum in the II-B scenario) to ascertain the actual future real wages at age 25, and at real wage growth plus the movement along the age-earnings profile from age 25 to 50. Thus, as one moves down a column across cohorts, we are, roughly speaking, maintaining the relative position in the income distribution.

Table 1A reveals, reading down each column (within earnings classes, across age cohorts), that the internal rate of return declines rapidly for the first four cohorts; for example, from 6.3 percent to 3.0 percent for the \$10,000 earnings level and from 4.8 percent to 1.0 percent for the \$50,000 earnings level. The youngest two cohorts are presently expected to receive rates of return about equal to the 1960 cohort. This occurs because their increasing life expectancy offsets increased taxation of benefits. However, the returns of 9 percent¹¹ or so received by the 1905-1910 cohort (who paid taxes for five to ten fewer years than the 1915 cohort) are no longer evident, despite successive expansions of the system. The start-up effect is roughly over by the 1945 cohort.

Next, notice that future poor families will receive only very small transfers—amounting to a present value of no more than about \$1,000 from 1960 onwards. Despite the progressive nature of the benefit formula, current Social Security law does little for working families earning about poverty line incomes in the future. Of course, the *very* poor do “better,” as a larger share of their average indexed monthly earnings will be on the 90 percent replacement rate segment of the primary insurance amount formula (rather than the 32 percent segment).

The present value of transfers turns negative as early as the 1945 cohort for

the earnings levels above \$10,000. Correspondingly, the internal rates of return drop below 3 percent. For the \$50,000 earnings level, the (negative) transfer peaks at over \$68,000 for the 1960 cohort (the real wage growth of 1-1/2 percent does not offset the higher discount rate, so later cohorts appear to do better, discounted to 1985).

Looking across columns within each age cohort reveals some interesting results. First, while for the 1915 cohort, the rates of return are highest for the poorest families, the absolute dollars of transfers are higher for the middle-income family. The reason is that the level of participation in Social Security is related to earnings. Higher wage workers in this cohort were allowed to play in a favorable game for higher stakes. The deal for the rich, absolutely and relatively, worsens dramatically relative to the other earnings levels in succeeding cohorts.

Table 1B presents numbers analogous to those in Table 1A, but discounted to the year each cohort reaches age 25—roughly speaking when they “enter” the system. Thus, the table shows the increasing scale of participation in the Social Security system for succeeding cohorts, as real wages and tax rates both rise.

In summary, the intergenerational transfers in Social Security have been, and continue to be, substantial. The size of such transfers varies substantially by cohort and earnings level. In the next section, we will see that it also depends heavily on family status. Before doing so, we note two points. First, the expected present value of benefits may underestimate the value to the recipient because benefits are paid as indexed annuities. In the absence of a well-functioning market for real annuities, risk averse households will value the benefits at more than their expected present value. Because the long-run financial solvency of Social Security is uncertain, considerable uncertainty exists concerning future benefits, especially for those retiring many years from now.¹² This risk discount probably partly offsets the annuity bonus for those in the 1945 cohort or younger. Of course, for those already retired, the annuity bonus dominates, and

Table 2
Comparison of Assumptions About Real Wage Growth
for Single-earner Couples of Low and High Earnings
(1985 dollars discounted at rate 3% to 1985)

Earnings Levels:		-----\$10,000-----	---\$50,000---		
SSA Assumptions:		I	III	I	III
Year of Birth					
1945	P.V. Benefits	74,378	49,398	120,627	81,735
	P.V. Taxes	51,505	47,664	150,071	134,449
	P.V. Transfer	22,873	1,733	-29,444	-52,714
	Rate of Return	4.13%	3.11%	2.30%	1.47%
1960	P.V. Benefits	62,968	34,089	105,645	56,124
	P.V. Taxes	48,242	37,809	163,045	125,528
	P.V. Transfer	14,726	-3,720	-57,400	-69,404
	Rate of Return	3.81%	2.70%	1.69%	0.72%
1975	P.V. Benefits	59,551	25,520	99,100	42,366
	P.V. Taxes	44,828	28,366	152,446	94,274
	P.V. Transfer	14,723	-2,846	-53,346	-51,908
	Rate Of Return	3.86%	2.70%	1.72%	0.76%
1990	P.V. Benefits	55,743	19,353	92,874	31,714
	P.V. Taxes	41,345	20,922	140,546	69,484
	P.V. Transfer	14,398	-1,569	-47,671	-37,770
	Rate of Return	3.90%	2.78%	1.77%	0.81%

the deal is probably better than the figures presented in the tables indicate.

One type of uncertainty is over future economic and demographic conditions. In Table 2, we present estimates similar to those in Table 1A for the four cohorts beginning with 1945 under two alternative real wage growth assumptions: the 2-1/2 percent per year growth assumed by SSA in their optimistic scenario (I) and the 1 percent per year assumed in their pessimistic scenario (III). The rates of return decline as we move from the optimistic to the intermediate to the pessimistic real wage growth scenarios. The dollar amounts of transfers also follow this path except for the wealthy group in the 1975 and 1990 birth cohorts. This anomaly is similar to that reported above for the 1915

cohort, but in reverse: this group is playing for higher stakes for longer in a disadvantageous system, and therefore does better—in terms of Social Security transfers as opposed to lifetime earnings—with slower wage growth.

5. Intragenerational Transfers

The current Social Security system not only offers different rates of return to different generational cohorts, but also presents different households within a cohort with significantly different expected rates of return. We have examined the present value of expected benefits, taxes, and transfers for single men and women of different income levels and for married couples with different levels and compo-

sition of income. The results are shown in Table 3 for the cohort born in 1945.¹³

The uppermost segment of the table compares each expected present value of retirement benefits and Social Security taxes for singles and one-earner couples with the same level of earnings. In comparing the single male with the one-earner couple with the same earnings history, note that while the expected present value of taxes paid is the same, the expected present value of benefits is more than twice as great for the married couple. This is due to the fact that the couples receive an inflation-indexed joint survivor annuity with the initial benefit level set at 150 percent of the single person's benefit (as long as both spouses survive). The surviving member of the couple receives a benefit exactly equal to that of the single person. Thus, the benefits for couples are 50 percent greater for a period of time, and have a longer expected period of receipt. Naturally, these extra benefits for the same tax payments translate into a higher expected real rate of return. In fact, couples, regardless of the division of earnings, never do worse than two singles, because the system permits couples to claim their own benefits as if they were single. Of course, the fact that half of benefits may be subject to the personal income tax alters this relationship somewhat.

A second fact which is evident in the upper most panel of Table 3 is that single women receive a larger transfer (or a smaller negative transfer) and a higher rate of return than single men. This is primarily a consequence of the longer life expectancy of women and the fact that the benefit levels do not differ according to sex. Finally, that panel, and the rest of the table, illustrates that higher income households in this cohort receive a lower real rate of return and larger negative transfers than lower income households. At a three percent real discount rate (i.e. if the opportunity cost of funds is three percent), the single male loses \$21,326 from the system if his wage at 25 is \$10,000, but \$87,112 if his wage at that age is \$30,000, and \$94,469 if his wage is

\$50,000. The middle and upper income single males actually have a negative expected real rate of return indicating that they cannot even expect to recoup the purchasing power of their Social Security taxes.

How Social Security treats various members of the same cohort differently can be expressed in several ways. If we still concentrate on the upper panel of Table 3, note that the rate of return ranges from $-.79$ percent to 3.50 percent. Given that this is a large program which covers one's entire adult lifetime, these rates of return differences translate into transfers ranging from $+\$8,981$ to $-\$94,469$. These figures are large relative to the typical value of a private pension and even relative to the median value of a house in the United States in 1985.

The remainder of Table 3 explores the situation of two-earner couples and compares their outcomes to singles with the same earnings record. Note that the expected present value of taxes paid by the couples is in all cases equal to the sum of the singles with the same earnings levels. The couples with a two-third/one-third income split still benefit from the spousal survivor benefit, and thus they do better than their "component singles." The final panel of Table 3 compares two-earner couples with a one-half/one-half earnings split with the corresponding singles. The general result is that the one-half/one-half couples do somewhat worse than the two-third/one-third couples and that they gain very little from the wives collecting survivor benefits as widows rather than benefits based on their own earnings histories.¹⁴

6. Marginal Linkage

Results reported thus far deal with the total or average relationship between Social Security taxes paid and benefits received. In this section we consider the marginal linkage between taxes and benefits.¹⁵

The marginal linkage between Social Security taxes and benefits, and the pub-

Table 3
 Comparison Across Family Types of
 1945 Cohort, Various Earnings Levels
 (1985 dollars discounted at rate 3% to 1985)

Earnings Level (at 1985 wage index) (Husband-Wife earnings split)			
Family Type	10,000	30,000	50,000
Single-earner Couple	(10,000-0)	(30,000-0)	(50,000-0)
P.V. Benefits	57,932	101,554	93,783
P.V. Taxes	48,951	136,498	140,253
P.V. Transfer	8,981	-34,944	-46,470
Rate of Return	3.50%	2.07%	1.74%
Single Male	(10,000)	(30,000)	(50,000)
P.V. Benefits	27,625	49,386	45,784
P.V. Taxes	48,951	136,498	140,253
P.V. Transfer	-21,326	-87,112	-94,469
Rate of Return	1.16%	-0.44%	-0.79%
Single Female	(10,000)	(30,000)	(50,000)
P.V. Benefits	37,584	68,411	66,104
P.V. Taxes	46,900	130,802	144,723
P.V. Transfer	-9,316	-62,391	-78,617
Rate of Return	2.34%	1.00%	0.53%
Two-earner Couple	(6667-3333)	(20,000-10,000)	(33,333-16,667)
P.V. Benefits	49,144	87,287	100,414
P.V. Taxes	48,264	144,759	218,118
P.V. Transfer	880	-57,472	-117,704
Rate of Return	3.05%	1.46%	0.57%
Single Male	(6667)	(20,000)	(33,333)
P.V. Benefits	23,011	42,720	49,129
P.V. Taxes	32,635	97,871	139,970
P.V. Transfer	-9,624	-55,151	-90,841
Rate of Return	1.89%	0.31%	-0.53%
Single Female	(3333)	(10,000)	(16,667)
P.V. Benefits	21,280	37,579	50,252
P.V. Taxes	15,630	46,889	78,148
P.V. Transfer	5,650	-9,310	-27,896
Rate of Return	3.90%	2.34%	1.68%
Two-earner Couple	(5000-5000)	(15,000-15,000)	(25,000-25,000)
P.V. Benefits	48,066	80,777	103,178
P.V. Taxes	47,926	143,777	233,433
P.V. Transfer	140	-63,000	-130,253
Rate of Return	3.01%	1.22%	0.44%
Single Male	(5000)	(15,000)	(25,000)
P.V. Benefits	20,114	34,869	47,297
P.V. Taxes	24,476	73,427	119,304
P.V. Transfer	-4,362	-38,558	-72,007
Rate of Return	2.38%	0.59%	-0.05%
Single Female	(5000)	(15,000)	(25,000)
P.V. Benefits	27,847	47,013	65,742
P.V. Taxes	23,450	70,351	114,129
P.V. Transfer	4,397	-23,338	-48,387
Rate of Return	3.50%	1.80%	1.45%

lic's perception of this linkage, determine the extent to which individuals treat Social Security taxes as wage taxes or as forced savings (analogous to pension contributions) in their household economic decisions. To the extent that Social Security taxes are treated as wage taxes they add to the distortionary effects of income taxes (Auerbach and Kotlikoff (1985)). Since the distortionary effect of taxation rises with the square of the marginal tax rate, the 10.4 percent of most people's wage income currently contributed to Old Age and Survivor's Insurance could be nearly doubling the labor supply distortionary effects of income taxation. It may well be that uncertainty and lack of information about the benefits which one may expect reduce the perceived linkage between taxes and benefits (Boskin, Kotlikoff, and Shoven (1985)); here we consider the actual extent of linkage.

Table 4 presents the ratios of marginal discounted expected benefits divided by marginal discounted expected taxes for households of various composition and various total earnings. The marginal taxes are distributed over one's life in the same proportions as all one's Social Security

taxes. The marginal benefits which result from these taxes depend on three factors: (1) one's bracket of the graduated, or "piece-wise linear," formula which converts one's earnings history into retirement benefits, (2) whether one collects benefits based on one's own or one's spouse's earnings history, and (3) the marginal income-tax rate which is applied to up to half one's benefits.

The formula which determines one's Primary Insurance Amount, the monthly benefit one can get based on one's own earnings when one does not retire early, has brackets in which a function of one's earnings history is multiplied by 90 percent, by 32 percent, and by 15 percent. Only those with very low earnings histories have marginal benefits determined within the 90-percent bracket; this bracket does not apply to any of the cases in Table 4.

Single males in the 32-percent bracket have a *gross-of-income-tax* marginal linkage ratio of 0.368; in the 15-percent bracket the linkage ratio is 0.173. Single females with a higher life expectancy, have linkage ratios of 0.503 in the 32-percent bracket and 0.236 in the 15-percent

TABLE 4
DISCOUNTED EXPECTED MARGINAL BENEFIT PER MARGINAL TAXES PAID, WITH EXTRA TAXES SPREAD OVER LIFETIME, NET OF INCOME TAXATION FOR 1960 COHORT AT 3% REAL DISCOUNT RATE

Earnings Level; Derived Marginal Income Tax Rate Post-Retirement	Contributor	1-earner Couple	2-earner Couple	Single Male	Single Female
\$10,000 Couples .08* Singles .113*	Male Female	.730† 0	.546† .301†	.348† —	— .474†
\$20,000 Couples .14 Singles .16	Male Female	.357‡ 0	.529† .292†	.159‡ —	— .462†
\$30,000 Couples .18 Singles .26	Male Female	.338‡ 0	.517† .286†	.150‡ —	— .205‡
\$50,000 Couples .38 Singles .42	Male Female	* 0	.216‡ .119‡	* —	— *

*At maximum tax.

† = 32% Social Security bracket.

‡ = 15% Social Security bracket.

Note: *Tax rates below 12% reflect an adjustment for the proportion of low-income households which owe taxes at all.

bracket. In contrast to these numbers the figures reported in Table 4 reflect the reduction of these linkage ratios due to income taxation of half one's benefits; hence, they are slightly smaller.

In single-earner couples, wives receive both spouse benefits of half their husband's benefits while their husbands live and survivor benefits, equal to their husbands' full benefits, after their husbands die. As a result of the "joint survivor annuity" which such couples get for the same taxes as are paid by single males, the marginal linkage is more than twice that for single males. *Gross* of income taxation it is 0.760 in the 32-percent bracket and 0.356 in the 15-percent bracket.

Wives in our two-earner couple examples have histories of earnings slightly lower than those of their husbands. As a result, they can receive higher benefits based on their own earnings histories rather than on their husbands' earnings histories while their husbands live, but higher benefits based on their husbands' earnings histories after they are widowed. Thus, the linkage ratios for such couples due to additional tax paid by the husband are between those for single males and for one-earner couples—0.568 in the 32-percent bracket and 0.266 in the 15-percent bracket—while the linkage ratios due to additional tax paid by the wife are below those for single females—0.314 in the 32-percent bracket, 0.147 in the 15-percent bracket.

In cases (not shown) where wife and husband earnings are exactly equal, each receives benefits based only on their own earnings, and the marginal linkages are the same as for singles (except that as a couple with a combined income they will be subject to a higher marginal income-tax rate). Where the wife's earnings are greater than the husband's earnings, the husband will receive survivor benefits based on the wife's earnings.

Where the husband's benefits are more than twice those of the wife, so that the wife gets a greater benefit as a spouse than she would based on her own earnings history, there is, of course, *zero* marginal linkage from her tax to benefits.

The most striking result in Table 4 is

that in no case is the marginal linkage as high as one. Single-earner couples in the first row of the Table have a linkage of nearly three-fourths; all others do substantially worse. Family status has a substantial effect on linkage. Thus, the provision of a joint-survivor annuity to married males produces more than a doubling of the marginal linkage (as also the total benefit) given to single males. In contrast to the male in the 2-earner \$30,000 couple whose marginal linkage is .517 the corresponding single male's is only .150. It might also be noted that the sum of the linkages for husband and wife in two-earner couples is often about the same as the linkages for single males and females with comparable earnings.¹⁶

It should also be noted that the extent of linkage varies with age. For the computation of benefits one's earnings history is indexed to wages, which are assumed to grow at a real rate of 1-1/2 percent. Our real discount rate is 3 percent. Thus one's later taxes "receive too low an interest rate" for a shorter period and one's later marginal taxes yield a greater amount in discounted marginal benefits. Furthermore, in the benefit computation formula only the 35 highest years of indexed earnings are considered, so that marginal taxes in other years have *no* linkage to benefits. Because we assume that wages increase with age as well as with economy-wide wage growth, in our examples all taxes paid through age 31 have no marginal linkage to benefit (the retirement age for the 1960 cohort is 67). For taxes paid at age 40, the marginal linkages for men are about 1.23 times those reported for taxes proportionally distributed over one's lifetime; for women the corresponding multiple is about 1.21 (these figures differ by sex because mortality varies by sex). For taxes paid at age 55, marginal linkages are 1.64 times greater for men and 1.55 times greater for women than the proportionately distributed taxes.

7. Sunk Taxes as a Political Problem

Table 5 considers the importance of "sunk" taxes in determining a family's in-

Table 5
The Political Issue in Social Security:
Transfers and Rates of Returns Considering
All Taxes Paid (A) vs. Only Taxes from 1987 on (B),
1945 Cohort. (Transfers in 1985 dollars, discounted
at rate 3% to 1985)

Earnings Level	1-earner Couples		2-earner Couples		Single Males		Single Females	
	A	B	A	B	A	B	A	B
\$10,000								
P.V. Transfer	8,981	33,658	140	24,555	-21,326	3,352	-9,316	14,835
Rate of Return	3.50%	6.94%	3.01%	6.29%	1.16%	3.61%	2.34%	5.22%
\$20,000								
P.V. Transfer	-11,807	37,515	-32,029	16,801	-55,149	-5,827	-36,518	11,764
Rate of Return	2.61%	5.57%	1.76%	4.38%	0.31%	2.40%	1.53%	4.01%
\$30,000								
P.V. Transfer	-34,944	28,734	-63,000	10,244	-87,112	-23,434	-62,391	165
Rate of Return	2.07%	4.48%	1.22%	3.61%	-0.44%	1.19%	1.00%	3.01%
\$50,000								
P.V. Transfer	-46,470	19,698	-130,253	-14,376	-94,469	-28,301	-78,617	-11,871
Rate of Return	1.74%	4.04%	0.44%	2.42%	-0.79%	0.77%	0.53%	2.29%

terest in relation to possible changes in the Social Security system. It compares transfers and internal rates of return which various mid-career households can expect based only on future taxes with transfer and internal rates of return based on past taxes as well.¹⁷

For nearly all households the internal rate of return (where positive) at least doubles. For higher-income single-earner couples a "bad deal" becomes, treating by-gones as by-gones, a "good deal" while for higher-income households of other configurations a very bad deal becomes only moderately bad. Thus the \$30,000 two-earner couple finds that its present value of sunk taxes exceeds by \$10,000 its expected \$63,000 net loss from Social Security. Single males with negative rates of return can expect positive rates of return on their remaining contributions—while their losses are reduced by seventy percent or more. For low-income households of all configurations and all moderate-income households other than single males, net transfers considering only future taxes are solidly positive.

The result of this is that many for whom Social Security is a bad deal over their

lives as a whole would vote to continue the system in its present form.¹⁸

8. Conclusion

The results of this research certainly indicate that Social Security offers vastly different terms to households in various circumstances. The declining rates of return and transfers for later cohorts are probably inescapable given the maturing and the pay-as-you-go nature of the system. However, the magnitude of the differences in treatment of households of different income or marital status are enormous and receive little attention relative to the much smaller distributional issues which are prominently debated when considering income tax reform. Our belief is that the desirability of the transfers of the existing Social Security system deserves more attention.

Our examination of the marginal linkage of taxes and benefits indicates that only the extremely poor receive an extra dollar's worth of benefits for an extra dollar of taxes. For many households, the marginal benefit is only 15 to 30 cents, indicating that most of their Social Se-

curity contributions are correctly viewed as taxes; the marginal linkage is zero for most workers for the first decade or so of contributions.

The paper also offers a possible explanation of why Social Security retains widespread political support despite modest and very uneven expected rates of return. The reason offered is that it is completely rational for voters to treat their past Social Security taxes as "sunk" and simply evaluate the program according to future benefits and taxes. Since the tax payments precede the retirement benefits, any evaluation which truncates the early years will bias the resulting rates of return upwards.

Combined with the inevitable reexamination of the long-run financial solvency of Social Security, these results suggest that explicit recognition of the immense distributional impact of Social Security be an important input into decisions concerning future reforms.

FOOTNOTES

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¹This value may very well be enhanced by the fact that the benefits are paid out as an inflation adjusted life annuity.

²See Thompson (1983) for an overview of the broader context of the issues discussed in this paper.

³HI is expected to begin running large deficits in the 1990s, whereas OASDI is then expected to be running surpluses. The ultimate HI deficit is several times the projected maximum OASDI surplus.

⁴A discussion of the provisions of Social Security benefit and tax formula may be found in Boskin (1986) or any recent report of the Trustees of the Social Security system.

⁵A matter of some importance which we do not consider is the existence of beneficiaries other than retirees and their spouses—especially the young children of retirees and deceased persons. Currently about 7% of OASI benefits go to (or to surviving spouses on behalf of) such beneficiaries, and about 4% of benefits are expected to go to such beneficiaries in the long-run future. (Derived from Social Security Bulletin, 1982 Annual Statistical Supplement, Table 54, and 1985 Report of the Trustees of the Old Age and Survivors and Disability Insurance Trust Funds, Table A3.) For further consideration of this issue see Bennett (1979).

⁶Social Security Administration, Actuarial Studies No. 88 and No. 89, 1983.

⁷"Money Income of Households, Families, and Persons in the United States: 1983," Bureau of the Census, Current Population Reports, Series P-60, No. 146, Table 34. The figures are for wage, salary, and self-employment income for all married households and unrelated individuals ages 25-64 with some such income.

⁸Dan Holik and John Kozelec, "Taxpayers Age 65 or Over, 1977-81," Internal Revenue Service, Statistics of Income Bulletin 4.1 (Summer 1984): 1-16, Table 2. The figures are for all income-tax returns filed for 1981 by those age 65 or over.

⁹The two sides of this argument are made most forcefully by Barro and Feldstein (1978); see Boskin and Kotlikoff (1986) for an empirical refutation of the Barro model.

¹⁰There is some ambiguity concerning these assumptions due to the fact that the OASDI system is not actuarially solvent over the next 75 years. See Boskin (1986) for a discussion of the magnitude, sources and implications of this problem.

¹¹As reported in Hurd and Shoven (1985).

¹²See Boskin (1986).

¹³Our standard assumption has been that individuals enter the work force at age 21. We also looked at three alternative initial ages, 18, 25, and 30 for members of the 1945 birth cohort. The principal result is that those who delay entry into the labor force earn a higher rate of return and higher transfers. The reason is that only the highest 35 years of earnings are used in the calculation of Social Security retirement benefits. Thus, the "missing years" do not depress benefits. Looking at it the other way around, the taxes paid in the years in the labor force before age 30 have no effect on benefits and, therefore, no linkage.

Comparable results which eliminate the age-profile of wages reduce both the taxes one pays, especially in one's later working years, and one's benefits. Although one's marginal linkage of benefits to taxes is greater in one's later years, the result of this reduced participation in the Social Security system is still, usually, to increase both one's internal rate of return and one's net transfer.

¹⁴We also derived similar intragenerational transfer data for the cohort born in 1960. This cohort works one more year, and hence doesn't retire until age 67. This implies more taxes and a shorter annuity period. Offsetting this, however, is the fact that this generation is projected to have a longer life expectancy than the 1945 cohort. However, the range of transfers and rates of return is even wider. For the table as a whole, the rate of return varies from -1.40 percent to 3.08 percent and the transfer figures go from \$1,093 to -\$126,666. The general patterns are still that single women do better than single men, that single earner couples do better than two earner couples and that higher earnings households do worse than lower earnings households. The important point, however, is the enormous magnitude of the differences, which are larger than those which generate intense debate in the personal income tax, such as changing the exemption level.

¹⁵Gordon (1983), Burkhauser and Turner (1985), and Browning (1985) give substantial consideration to

marginal linkage and the extent to which the payroll tax is seen as a tax or as forced saving. We concur with Browning that the former two studies are flawed by their consideration of only the 32% bracket in benefit determination (discussed below) and by their use of extremely low real interest rates: 1% by Burkhauser and Turner and not much more by Gordon. Together these considerations multiply the derived linkage by a factor of three or four compared to our calculations, for households in the 15% bracket.

We go beyond Browning's work by considering future increased retirement age and income taxation of benefits and by considering a true distribution of possible ages of death, before and after retirement. The latter consideration captures the impact of more years of discounting of benefits received later.

Browning has an excellent treatment of the analytical issues and significance of marginal linkage. He also shows how use of various discount rates affects one's results.

¹⁶In viewing Table 4, one should be aware of the following anomaly. The net-of-tax linkages for one-earner couples with earnings levels of \$20,000 or more are not based simply on the gross-of-tax linkages for the 15-percent bracket. There is some possibility that the husband will die before retirement with an earnings history which puts the determination of his widow's benefit in the 32-percent bracket. The linkages for such cases are weighted by their probability.

¹⁷See Browning (1975) for an excellent analytical treatment of the issues discussed here.

¹⁸Indeed they might vote to increase both taxes and benefits, leaving later generations with greater negative transfers.

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Appendix

Sensitivity of Results to Real Discount Rates

The extent of one's gains or losses under the Social Security system depends in large part on the real discount rate one applies to one's expected streams of taxes and benefits. Because benefits come later in life than taxes, a higher discount rate corresponds to a lower net transfer.

Economists differ in the discount rate they consider appropriate for calculations such as those in this paper. Some argue for a zero-percent real return as comparable to what is presumably available for truly safe assets in the market, while others argue that a rate as high as six percent corresponds to people's observed behavior (Browning (1985)). While we believe a real rate of three percent is most reasonable, we here present results for zero, two, and four percent as well.

Table 6 examines some of the cases from Table 3 to compare the present values of taxes, benefits, and transfers which result from applying these different real discount rates. The low-income couples, whose internal rates of return are between three percent and four percent have negative transfers when the higher discount rate is used instead of the three percent used in Table 3. The higher-income single-earner couple, which has a negative transfer at a discount rate of three percent, has a positive transfer at a rate of two percent. The

Table 6
Sensitivity of Present Values of Benefits, Taxes, and Transfers
to Different Discount Rates for
1945 Cohort, Various Family Types and Earnings Levels
(1985 dollars discounted to 1985)

Earnings Level and Family Type	Discount Rates			
	0%	2%	3%	4%
\$10,000 Single-earner Couple (Rate of Return 3.50%)				
P.V. Benefits	172,388	82,483	57,932	41,069
P.V. Taxes	54,976	50,097	48,951	48,553
P.V. Transfer	117,412	32,386	8,981	-7,484
\$10,000 Two-earner Couple (Rate of Return 3.01%)				
P.V. Benefits	141,126	68,152	48,066	34,206
P.V. Taxes	53,666	48,991	47,926	47,597
P.V. Transfer	87,460	19,161	140	-13,391
\$30,000 Single-earner Couple (Rate of Return 2.07%)				
P.V. Benefits	301,694	144,517	101,554	72,029
P.V. Taxes	157,995	141,229	136,498	133,830
P.V. Transfer	143,699	3,290	-34,944	-61,801
\$30,000 Two-earner Couple (each earns .5) (Rate of Return 1.22%)				
P.V. Benefits	237,034	114,512	80,777	57,496
P.V. Taxes	160,999	146,973	143,777	142,791
P.V. Transfer	76,035	-32,460	-63,000	-85,295

higher-income two earner couple, however, has a negative transfer even at a rate of two percent.

It will be noted that the present values of taxes for the cases here are roughly equal at

each of the four discount rates. This is because discounting is done to about the middle of their taxpaying years. While later taxes are discounted more heavily at higher discount rates, earlier taxes are also grossed up more heavily.