DISENTANGLING THE ANNUITY FROM THE REDISTRIBUTIVE ASPECTS OF SOCIAL SECURITY IN THE UNITED STATES*

BY RICHARD V. BURKHAUSER

Vanderbilt University

AND

JENNIFER L. WARLICK

University of Wisconsin and Institute for Research on Poverty

In the United States, the life-cycle relationship between initial Social Security contributions and subsequent benefits causes the effect of Social Security on income distribution to be overestimated in a single-period analytical framework. By separating the annuity from the redistributive aspects of Social Security we provide a life-cycle framework for measuring its net effect on redistribution. To this point in its history, we find all income classes have received positive net life-cycle income transfers and, in an absolute sense, upper-income groups have done at least as well as lower-income groups. This suggests a reason for the near-universal support of Social Security by past generations, as well as the controversy which now surrounds it. As it becomes apparent to younger cohorts of taxpayers that many of them will be net losers, it is inevitable that Social Security will be subject to the same controversy as other welfare programs which attempt to redistribute income.

Few government programs reach the proportion of the Social Security system with so little controversy. Second only to the federal income tax in size, OASI (old-age-survivor's insurance) taxes in the United States were over $100 billion in 1980, and yet only recently has there been more than token opposition to further increases in this tax. Classified as a social insurance system, OASI is nevertheless credited by many analysts as being the most successful U.S. government program in redistributing income (Bridges, 1974; Danziger, 1977; Ozawa, 1976). This paper argues that the single-period analysis used in such studies greatly overstates the true impact of OASI on income distribution. Because benefits are based on contributions made at younger ages, they are a mixture of the return on past contributions, redistribution within an age cohort and redistribution across cohorts.

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To achieve an accurate measure of the true redistributive impact of the transfer portion of OASI, we must first distinguish its annuity aspects. We do so by using data from the 1973 Social Security Exact Match File (Kilss and Scheuren, 1978) to compare the present pattern of OASI benefits with that which would result from a fair market return on individual lifetime taxes paid into the system. We then determine the incidence of redistributive benefits in the present system where such benefits are defined as the difference between actual benefits received and fair annuity benefits. Because our analysis takes a life-cycle approach to income distribution, in addition to showing the incidence of benefits across current income groups, we show the incidence of OASI across permanent income groups.

The results suggest a reason for the past near-unanimous support of this program and offer a clue to the erosion of that support. Despite the redistributive aspects of the system, up to 1972 all income classes were net gainers at about the same absolute amount. This net across-generation gain is decreasing, however, and will eventually disappear.

The remainder of the paper is organized as follows: in section 1 we discuss differences between a single-period and a life-cycle analysis of the impact of government programs on income distribution in the context of the OASI system. In section 2 we describe the methodology employed to estimate the annuity and redistributive (transfer) elements of OASI. The results of our estimation are presented in section 3. In section 4 we show how the methodology developed in this paper provides an insight into the current controversy over "double-dippers." Concluding remarks follow in section 5.

1. The Dual Nature of OASI: Social Insurance Versus Welfare

Taxonomies of government programs usually make a distinction between social insurance programs and transfer or welfare programs. In principle this is a useful distinction, but in fact government programs are rarely one or the other.[1] Rather than consider in detail the differences between these two types of programs, we focus on one factor that we consider to be crucial to the difference between the two: the relationship between contributions made into a program and the benefits derived from that program.

We define a pure social insurance program as one in which the potential benefits that an individual expects to receive exactly match the contributions that he makes. Such a program would perform in exactly the same way as a private insurance system: actual benefits might not equal actual payments, but the expected value of all future benefits would be equal to such payments. A pure transfer program, in contrast, is defined as one in which benefits are completely divorced from contributions. The actual method of redistribution is not crucial: benefits could be means-tested as in the Supplemental Security Income program or they could be related solely to age as in some universal payment proposals.

[1]Food stamps are generally considered a part of the welfare system. Yet, until recently, recipients were required to purchase them at some fraction of their market value.

Focusing on the relationship between OASI contributions and benefits forces a change from a single-period analytic framework to a life-cycle one, especially in determining the real effect of this government program on income distribution. A pure social insurance system will significantly affect the pattern in which income is received over an individual's lifetime, but will have no impact on income distribution across individuals. While it will affect statistical measures of inequality (e.g. Gini coefficients), this effect is a statistical mirage in the sense that it does not represent an increase in the well-being of some individuals at the expense of others but merely a change in the timing of income receipt across individual lifetimes. In contrast, increasing the welfare of some individuals at the expense of others is the raison d'etre of pure welfare systems.

A pure social insurance program whose purpose is to provide benefits to workers at older ages would, in effect, take a form equivalent to an actuarially fair annuity. While the initial 1935 Social Security Act which established OASI had many of the characteristics of this type of publicly administered annuity system, the 1939 Amendments to the Act incorporated that objective within a much broader mandate. Certain aspects of the system—i.e. the earmarked nature of the tax and the use of a worker's wage history as a determinant of benefits—distinguish it from a pure transfer program, but such mechanisms as the progressive benefit formula, the minimum benefit, the uniform dependent's benefit, and the work test attempt to redistribute income across individuals. The result is a mixture of annuity and redistributive forces which clearly distinguish this program from either of the two pure systems discussed above.

Recognition of the link between an individual's OASI taxes (contributions) and benefits has important implications for studies of income distribution.[2] The pay-as-you-go financing scheme of OASI encourages a single period perspective in which benefits are viewed as a pure transfer and contributions as a pure tax. Because most OASI tax-payers in any single period are young, full-time workers, while those receiving OASI benefits are old, mostly retired workers, the system appears to transact large intergenerational transfers which, in a one period framework, have a great impact on income inequality. But if we adopt a life-cycle perspective, it becomes clear that this conclusion overestimates both the level of true redistribution among individuals and the real change in lifetime income inequality.

Measuring Redistribution under an Actuarially Fair System

An actuarially fair system alters the pattern of an individual's lifetime income, but not the distribution of lifetime income between individuals. This pattern of distribution is illustrated by Table 1. In this simple two-person, two-period model, retirement insurance taxes of $1,000 are assessed on person *A* in period 1, but benefits are received by that person in period 2. As a result of his participation in the retirement program person *A*'s pattern of post-tax

[2]Recognition of the link between OASI taxes and benefits has previously led some economists to consider the impact of OASI on labor supply from a life-cycle perspective. To the degree that OASI benefits are positively related to OASI taxes, the effect of the tax on labor supply is decreased. Were OASI a pure social insurance system, it would be neutral with respect to a worker's labor supply decision. (See Browning, 1975; Burkhauser and Turner, 1978).

TABLE 1

LIFETIME INCOME IN AN ACTUARIALLY FAIR SYSTEM

	Period 1 Post-tax Income Received	Period 2 OASI Benefits Received	Total Lifetime Income
Person *A*	\$9,000 (\$10,000)	\$1,000	\$10,000
Person *B*	\$10,000	\$0	\$10,000

Note: The table assumes no growth, a zero interest rate, and no change in prices.

income has changed (from \$10,000/\$0 to \$9,000/\$1,000) but there has been no change in his lifetime income position via-a-vis person *B*, who did not participate. Growth in the size of this actuarially fair system would continue to change an individual's lifetime income pattern, but would have no effect on comparisons of the lifetime income of several persons.

Now consider the first row in Table 1 as two generations. The first generation in period 1 pays \$1,000 in retirement insurance taxes; this will be returned in period 2. The second generation receives \$1,000 in retirement benefits, on the basis of contributions from the previous generation. Consider the second row as the same society in the absence of retirement insurance. Single-period analysis of these two worlds proclaims the former more equal than the latter. But from the perspective of the individual's life cycle (total lifetime income), they are identical. Table 1 shows that, to the degree that OASI is actuarially fair, single-period analysis of OASI confuses a more equal distribution of income across an individual's life with a measure of income equality across individuals.

To disentangle the annuity and redistributive aspects of OASI, it is necessary to differentiate payments going to OASI recipients on the basis of contributions during earlier periods from those resulting from transfers both within and across generations. Such a disentanglement is useful in calculating the initial incidence of OASI benefits within age cohorts as well as in estimating its trend over time.

The value of an individual's total contributions (C_{Ri}) at the point of retirement (R) is equal to the sum of OASI taxes paid by both the individual ($t_{ak}w_k$) and by the individual's employer ($t_{bk}w_k$), compounded by a rate of interest (r_k).[3] Thus,

$$C_{Ri} = \sum_{k=1}^{R} w_k(t_{ak} + t_{bk}) \prod_{j=k}^{R} (1 + r_j). \tag{1}$$

The expected present value of future benefits (B_{Ri}) at the point of retirement is equal to the sum of expected OASI benefits over the worker's remaining life (b_k), discounted by the probability of survival (p_k) in each period (k) and the

[3]This assumes that the full incidence of the Social Security payroll tax is shifted to the employee, following Brittain (1971). The more recent studies of Hammermesh (1979) and Vroman (1974) suggest that the tax is only partially shifted onto labor. Because of the taxable maximum, taxes are paid into the system only up to W_{max} for those earning above the maximum.

interest rate (r):

$$B_{Ri} = \sum_{k=1}^{99-R} p_k b_k/(1+r)^{k-1}. \tag{2}$$

Thus in such a system, at any age of retirement,

$$C_{Ri} = B_{Ri}. \tag{3}$$

Measuring Redistribution Within the OASI System

OASI, of course, functions differently. Because it incorporates several mechanisms which redistribute benefits toward the low-income classes of the aged population, OASI may not be actuarially fair for individuals within an age cohort ($C_{Ri} \lessgtr B_{Ri}$). Nor, of course, has it been intergenerationally neutral. Since its inception, the system has paid benefits to individuals as if they had contributed over their entire lives. As we will show this resulted in a redistribution across generations which is narrowing as the system matures.[4] Thus the summation of aggregate contributions for any age cohort may be greater than, equal to, or less than its aggregate benefits—that is,

$$\sum_{i=1}^{n} C_{Ri} \gtrless \sum_{i=1}^{n} B_{Ri}. \tag{4}$$

2. Methodology

The 1973 Social Security Exact Match File merges individual records from the 1973 Current Population Survey with OASI earnings and benefit records. Consequently, both OASI benefits currently received and the lifetime contributions on which these benefits are based can be identified for each individual on the file. We use these data to estimate the annuity value of each individual's total OASI contributions. Then, uniting spouses, we compare the distribution of this annuity aspect with the distribution of reported OASI benefits by household income class, holding all decision variables constant. We denote the difference between reported benefits and the estimated annuity value the "transfer component" of OASI benefits and analyze its distribution to determine if and how the OASI system redistributes income both within and across cohorts.[5] Our

[4]In this case, as in all cases which will be discussed, we consider only the initial change in distribution caused by the system. Barro (1974) and others argue that the final intergenerational incidence of transfers could be zero.

[5]Throughout this paper, a standard of actuarial fairness is used to determine what participants would have received in a private market transaction. In the Social Security literature, a replacement-rate concept is often used as the measure of equity. In general, a replacement-rate concept is not equivalent to a fair-market-return measure since it has no adjustment for the timing of contributions. Thus, even if a lifetime average wage is used in the replacement-rate measure, those whose earnings increase over time will pay lower total costs for equivalent benefits.

sample consists of 5,405 individuals age 65 years or older and 3,502 couples in which at least one member is 65 years or older.

Reported benefits include retired worker, spouse, survivor and special age-72 benefits. Under OASI, a worker's wage history is capsulized into an average monthly wage (AMW) which is then adjusted by a progressive benefit formula to arrive at a primary insurance amount (PIA). Benefits actually received are a percentage of this PIA. This percentage may be less than 100 percent if a worker retires early or has earnings in excess of allowed limits. It may be greater than 100 per cent if spouse's benefits are paid in addition to a retired worker benefit.[6]

The actuarial element of an individual's OASI benefit is defined as the annuity value which satisfies equation (3). When comparing the distributions of reported benefits and the actuarial element, it is not B_{Ri}, the stock value of all expected future benefits, which is employed, but rather its flow equivalent b_k. The procedures used to compute b_k follow the provisions of the current OASI program as closely as possible with two major exceptions: (1) the full benefit is not based on the worker PIA, but is a function of actual contributions into the system; and (2) the actuarially fair annuity is fixed in nominal value and is based on a single rate of return.[7] These exceptions aside, the computation rules resemble OASI provisions by maintaining the relationship among worker, spouse and survivor benefits: a married worker and spouse receive a full benefit with two-thirds accruing to the survivor. In addition, annuity values are reduced where appropriate to reflect early acceptance or earnings in excess of the allowable limits. A detailed explanation of the derivation of b_k is provided in Appendix A.

Tax considerations have been ignored in this analysis, as have behavioral adjustments. It is assumed that the acceptance behavior of all recipients would not change under an actuarially fair system.[8]

[6]The 1972 Amendments to the Social Security Act provide for an increase in benefits equal to $\frac{1}{12}$ percent of the PIA for each month between ages 65 and 72 for which no benefits are received. This delayed retirement credit was increased to $\frac{1}{4}$ percent by the 1977 Amendments. The 1977 Amendments also revised the computation of monthly earnings by indexing wages in a given year by the ratio of average wages in the second year before retirement to average wages in the year in question. These adjustments and revisions are not reflected in our data which refer to calendar year 1972.

[7]Estimates of the actuarial component of OASI benefits are sensitive to the rate of return used on contributions, the discount rate used in estimating expected benefits, life expectancy tables used, and assumptions about future benefit changes. In the tables shown in the paper the rate of return on contributions into the system equals the annual yield plus the rate of increase of average stock prices. The discount rate on expected benefits was 5 percent. Life expectancies were differentiated by sex and based on Bureau of Vital Statistics figures for 1972. See Appendix A, Table A2 for estimates of the actuarial component under alternative interest rate assumptions.

[8]By ignoring behavioral responses, our estimates provide only an approximation of the effects of changing the current OASI system to an actuarially fair system. Recent studies by Boskin (1977), Burkhauser (1980), Pellechio (1978), Burkhauser and Quinn (1981) all attribute labor supply adjustments to the current OASI system. Browning (1975) and Burkhauser and Turner (1978) argue that an actuarially fair system would have important labor supply effects across the life cycle. Savings behavior would also be expected to change in such a system. Our simulations also assume that individuals purchase a whole life annuity immediate upon retirement and consequently, they ignore cohort members who die before reaching retirement age. See Appendix A for the rationale underlying and implications of this assumption.

3. Results

According to our simulations (Table 2), in 1972 retired individuals and couples received approximately $27.1 billion in OASI benefits.[9] Had their benefits equalled the fair annuity value of their lifetime contributions this sum would have been reduced to $7.4 billion. The remaining $19.7 billion, or 73 percent of reported benefits, represents a large intergenerational transfer from workers to the retired population. The relative size of this transfer can be explained in part by the fact that most of these beneficaries entered the labor force prior to OASI's enactment and therefore did not contribute to the system over their entire worklives. OASI's pay-as-you-go financing system allows payment of benefits equivalent to those under a mature system, however. As future

TABLE 2

Distributional Impact of Social Security Benefits: Comparison of Annuity Values and Actual OASI Benefits by Household Income Class, 1972

	OASI Benefits (1)	Acturially Fair OASI[a] (2)	Transfer Component (1)–(2) (3)	Transfer Component as a % of OASI Benefit (3÷1)×100 (4)	Population by Income Class (%) (5)
Total Program Benefits	$27.1[b]	$7.4[b]	$19.7[b]	73	100%
Mean Benefit	$1,652	$454	$1,198	73	
Mean Dollar Benefit by Household Income Class: (includes OASI benefit)					
$0–500	13	1	12	92	3
501–1,000	622	35	587	94	5
1,001–1,500	934	107	827	89	9
1,501–2,000	1,337	249	1,088	81	13
2,001–2,500	1,540	350	1,190	77	13
2,501–3,000	1,769	421	1,348	76	8
3,001–3,500	2,034	532	1,502	74	7
3,501–4,000	2,193	666	1,427	65	6
4,001–5,000	2,331	746	1,585	68	9
5,001–6,000	2,396	824	1,572	66	8
6,001–8,000	2,200	771	1,449	65	7
8,001–10,000	1,941	697	1,244	64	4
10,000–20,000	1,780	609	1,171	66	6
20,001+	1,721	526	1,195	69	2

Note: For a complete description of the methodology used to estimate the variables, see Appendix A.

[a]Actuarially fair benefits, assuming OASI contributions yielded a rate of return equal to the annual yield plus the rate of increase of average stock prices.

[b]In billions of dollars.

[9]Total cash benefits paid to individuals during 1972 from the OASI trust fund amounted to $37.1 billion (U.S. HEW, 1977, Table 110). Excluded from our estimate are lump-sum death payments, and retired workers', dependents', and survivors' benefits when no one in the household is 65 or over.

cohorts of workers who have spent their entire worklives in covered employment reach retirement age, this source of transfers will decline in importance. This trend is evident in Table 3 which presents estimates of the actuarial and transfer components of total OASI benefits received by three cohorts of retired couples. As is shown there, the oldest cohort (81–85) have experienced the largest intergenerational transfer with $0.9 billion or 90 percent of their current $1.0 billion of OASI benefits having no basis in contributions. This percentage declines to 70 percent for the 72 to 75 year old cohort, and again by 20 percentage points to 50 percent among the youngest cohort of retired couples who were aged 31–32 when OASI contributions were first collected in 1937. The tradition of large intergenerational transfers helps explain the strong support of the system by previous generations of taxpayers. Similarly, the fact that the relative size of the transfers is diminishing may explain the growing lack of confidence in and discontent with OASI voiced by current taxpayers.

Although we have not attempted to measure intracohort redistribution directly, some indication of the net effect of the progressive benefit schedule, the minimum benefit and other provisions designed to redistribute income within a cohort can be obtained by comparing the size of the transfer component of OASI across household income classes. As is shown in column 3 of Table 2, every income class, even those in the $20,000 and above category, received positive redistributive benefits. In terms of absolute dollars, redistribution was at least as great for higher-income classes as it was for lower-income classes. Although those in the very highest income categories receive more than those in the lowest, those in the middle of the distribution ($3,000–8,000) received the largest absolute transfers.[10] Apparently, to this point in its history, OASI has yielded a positive return to beneficiaries in all income classes despite its many intracohort transfer mechanisms. However, when the relative size of the transfer component (measured as the quotient of this component and reported OASI benefits) is compared across income classes (Table 2, column 4), it is clear that these mechanisms have operated to the greatest benefit of the lowest income classes. These same general patterns of greater absolute transfers to middle income classes and greater relative transfers to the lowest income classes are repeated among retired couples in each age cohort (Table 3).[11]

[10]Employing alternate assumptions regarding the interest rates used to compute the present value of contributions and benefits does not change distributional impact across income groups. Tables demonstrating that this is so available from the authors upon request.

[11]The dramatic decline in average OASI benefits and annuity values experienced by the two uppermost income classes among the 66–67 age cohort may reflect the fact that a substantial number of the couples counted in these categories received zero or trivial OASI benefits after their entitlements have been reduced for earnings in excess of allowable limits. These zero amounts lower the average for the class as a whole.

The earnings test has long been a controversial aspect of OASI, its critics complaining that it is a form of means testing which discourages work at older ages, while its supporters argue that it is necessary to accomplish redistributive goals. In 1972, the earnings test was waived for workers aged 72 and above. Comparing the pattern of benefits for workers aged 66–67, who are subject to the earnings test, with that for workers aged 72 and over who are not affected, we can see that the dramatic decline occurs only among the former. This result emphasizes the problem caused by the dual nature of OASI. In order to provide increased benefits for low-income people in the name of social welfare, OASI benefits have been increased across the board. At the same time, to maintain the actuarial aspect of the system, the work test has been relaxed. It is clear that both goals can be accommodated only by continually increasing the system's expenditures.

TABLE 3

DISTRIBUTIONAL IMPACT OF SOCIAL SECURITY BENEFITS FOR MARRIED COUPLES BY HOUSEHOLD INCOME CLASS AND AGE COHORT, 1972

	Age 66–67			Age 72–75			Age 81–85		
	OASI Benefits, 1972 (1)	Actuarially Fair OASI[a] (2)	Transfer Component (1)–(2) (3)	OASI Benefits, 1972 (4)	Actuarially Fair OASI[a] (5)	Transfer Component (4)–(5) (6)	OASI Benefits, 1972 (7)	Actuarially Fair OASI[a] (8)	Transfer Component (7)–(8) (9)
Total Program Benefits	2.2[b]	$1.1[b]	1.1[b]	3.1[b]	0.9[b]	2.2[b]	1.0[b]	0.1[b]	0.9[b]
Mean Benefit	$1,874	904	970	2,710	781	1,929	2,585	317	2,268
Mean Dollar Benefit by Household Income Class:									
$0–500	43	0	43	0	0	0	0	0	0
501–1,000	244	18	226	547	19	528	323	0	323
1,001–1,500	969	227	563	894	44	850	646	78	568
1,501–2,000	1,227	377	850	1,216	142	1,074	1,413	31	1,382
2,001–2,500	1,430	507	923	1,646	243	1,403	1,846	76	1,770
2,501–3,000	2,138	761	1,377	2,213	423	1,790	2,303	187	2,116
3,001–3,500	2,094	888	1,206	2,669	707	1,920	2,802	409	2,393
3,501–4,000	2,213	1,086	1,127	2,815	780	2,035	2,594	256	2,338
4,001–5,000	2,420	1,098	1,322	3,103	997	2,106	2,922	396	2,526
5,001–6,000	2,607	1,395	1,212	3,186	1,039	2,147	2,940	434	2,506
6,001–8,000	2,116	1,141	975	2,913	934	1,979	2,903	301	2,602
8,001–10,000	2,018	1,019	999	2,762	932	1,830	2,173	233	1,940
10,000–20,000	1,333	682	651	2,949	799	2,150	3,268	532	2,736
20,001+	1,208	642	566	3,266	909	2,357	3,626	631	2,995

[a]Actuarially fair benefits, assuming OASI contributions yielded a return equal to the annual yield plus the rate of increase of average stock prices.
[b]In billions of dollars.

Distributional Impact Under a Permanent Income Concept

In Tables 2 and 3, households are ranked according to their reported annual income for 1972. But because most people in this age cohort no longer work, current income may be an imprecise indicator of both an individual's absolute and relative lifetime economic well-being, particularly with reference to his own age cohort. For this reason we have computed a measure of economic well-being based on reported earnings for the ten years prior to retirement (see Appendix B). Married couples have been reranked according to this measure, which we denote "permanent income," in Tables 4 and 5. These tables follow the format of the previous tables, showing reported OASI benefits and our estimates of the annuity and transfer components of these benefits for successively greater permanent income classes. Unlike current income, permanent income does not include reported OASI benefits.

The patterns of redistribution shown in Tables 4 and 5 bear striking resemblance to those established by Tables 2 and 3. Intergenerational transfers dwarf redistribution within a cohort, even for those just retiring. There is less

TABLE 4

DISTRIBUTIONAL IMPACT OF SOCIAL SECURITY BENEFITS FOR MARRIED COUPLES BY HOUSEHOLD PERMANENT INCOME CLASS

	OASI Benefits, 1972	Actuarially Fair OASI	Transfer Component	Population by Income Class (%)
Total Program Benefits	$14.2[a]	$4.6[a]	$9.6[a]	100%
Mean Benefits	$2,301	$749	$1,552	
Mean Dollar Benefit by Household Permanent Income Class[b]				
$0	1,280	271	1,009	6
1–500	1,393	239	1,154	4
501–1,000	1,791	260	1,531	3
1,001–2,000	2,003	300	1,703	7
2,001–3,000	2,016	356	1,660	7
3,001–4,000	2,217	489	1,728	6
4,001–5,000	2,160	498	1,662	6
5,001–6,000	2,375	735	1,640	6
6,001–7,000	2,392	779	1,613	8
7,001–8,000	2,864	1,117	1,747	14
8,001–9,000	2,240	1,085	1,155	11
9,001–10,000	2,547	1,160	1,387	5
10,001–12,500	2,732	1,244	1,488	7
12,501–15,000	2,876	1,402	1,474	3
15,001–17,500	3,228	1,470	1,758	2
17,501+	2,577	336	2,241	5

[a]In billions of dollars.

[b]The average of the ratio of Social-Security-earned income over median Social-Security-earned income during the last ten years of work prior to acceptance of OASI benefits for a worker and spouse multiplied by median Social-Security-earned income in 1972 (See Appendix B for a fuller description).

TABLE 5

DISTRIBUTIONAL IMPACT OF SOCIAL SECURITY BENEFITS FOR MARRIED COUPLES BY HOUSEHOLD PERMANENT INCOME CLASS AND AGE COHORT

	Age 66–67				Age 72–75			
	OASI Benefits, 1972	Actuarially Fair OASI	Transfer Component	Population by Income Class	OASI Benefits, 1972	Actuarially Fair OASI	Transfer Component	Population by Income Class
Total Program Benefits	$2.2[a]	$1.1[a]	$1.1[a]	100%	$3.1[a]	$0.9[a]	$2.2[a]	100%[c]
Mean Benefits	$1,874	$904	$970		$2,710	$781	$1,929	
Mean Dollar Benefit by Household Permanent Income Class[b]								
$0	628	210	418	4	1,116	241	875	5
1–500	784	189	595	4	1,180	170	1,010	4
501–1,000	1,157	390	767	2	1,486	225	1,261	3
1,001–2,000	1,365	402	963	4	1,972	275	1,697	6
2,001–3,000	1,298	315	983	7	2,253	264	1,989	7
3,001–4,000	1,788	637	1,151	7	2,472	406	2,066	7
4,001–5,000	1,578	579	999	7	2,641	410	2,231	7
5,001–6,000	1,842	856	986	7	2,898	784	2,114	7
6,001–7,000	1,911	920	991	7	2,834	748	2,086	11
7,001–8,000	2,403	1,166	1,237	11	3,248	1,161	2,087	21
8,001–9,000	2,061	1,158	903	18	2,915	1,081	1,834	8
9,001–10,000	1,966	1,020	946	5	3,188	1,208	1,980	6
10,001–12,500	2,059	1,169	890	10	3,670	1,467	2,203	6
12,501–15,000	2,785	1,624	1,161	5	3,718	1,609	2,109	2
15,001–17,500	3,008	1,929	1,079	2	4,393	1,351	3,042	1
17,501+	2,656	1,172	1,484	[d]	2,737	591	2,146	[d]

[a]In billions of dollars.

[b]The average of the ratio of Social-Security-earned income over medium Social-Security-earned income during the last ten years of work prior to acceptance of OASI benefits for a worker and spouse multiplied by median Social-Security-earned income in 1972.

[c]May not sum to 100 percent due to rounding.

[d]Less than 1 percent.

variation in the size of the absolute transfer component across income classes although the very lowest classes receive the smallest absolute transfers as before.

4. "Double-Dippers" and the OASI System

Federal government employees as well as some state and local government employees are not covered by OASI, but rather by various civil service pension plans. Consequently their earnings are not subject to the payroll tax and these employees are not entitled to OASI benefits on the basis of their government service. It is often the case that government workers have brief periods of OASI covered employment however which do entitle them to OASI benefits. Because such workers receive benefits from both OASI and their civil service plans upon retirement, they are referred to as "double-dippers."

The phenomenon of double-dipping has become the focus of considerable controversy in recent years because, like long-term low-wage earners, government workers with brief periods of covered employment receive heavily weighted social security benefits, sometimes termed windfall benefits. Critics contend that the progressive benefit formula is intended to advantage full-time low-wage workers rather than government employees with intermittent covered employment.

Table 6 illustrates the magnitude of the problem by comparing double-dippers with other recipients of OASI retirement benefits. The mean reported annual income of double-dippers receiving very low ($1–1,500) OASI benefits in addition to a government pension is twice that of other recipients of minimum OASI benefits. Note however that this windfall is not restricted to the minimum benefit level: Table 6 shows that government workers have a special advantage at all OASI benefit levels. At each benefit level, their mean annuity value is lower, and thus their redistributive share is greater than that of other OASI beneficiaries, owing in part to the ability of government workers to shelter a portion of their earnings from the OASI payroll tax. Since benefits are based on only a portion of their lifetime earnings, they may selectively contribute to the system.[12]

The 1977 Amendments to the Social Security Act attempt to reduce the windfall to double-dippers in two ways. First, the minimum benefit is frozen at its June 1978 level of $122 per month. Second, the benefits of full-time, low-wage workers are positively adjusted by years of coverage to distinguish them from other beneficiaries with low lifetime average wages. Consequently the windfalls to double-dippers will decrease through time, although those entitled to low benefits above the minimum will continue to benefit from the progressive benefit formula. This would not be the case in an actuarially fair system since OASI benefits would be directly related to lifetime contributions.

[12]It is important to note that not all government pensionholders were in jobs not covered by OASI. Many state and local government pensioners paid OASI payroll taxes throughout their working lives. Assuming no significant difference between the contribution and benefit relationship for this type of government pensioner and nongovernment pensioners who receive OASI benefits, the true advantage for those able to avoid payroll taxes by working in noncovered employment is underestimated in Table 6.

TABLE 6

THE TREATMENT OF GOVERNMENT PENSIONERS BY OASI, 1972

Mean Dollar Benefit by Household OASI Benefit Class[a]	Government Pensioners				All Others			
	Acuarially Fair OASI	Transfer Component	Reported Household Income	Population by Current Benefit Class	Actuarially Fair OASI	Difference	Reported Household Income	Population by Current Benefit Class
$0	—	—	$7,407	22%	—	—	$5,591	14%
1–1,500	$148	$886	5,802	29	$135	$910	2,820	32
1,501–1,750	335	1,301	5,869	7	346	1,285	3,293	10
1,751–2,000	453	1,411	6,224	8	525	1,346	3,928	10
2,001–2,250	383	1,740	8,272	7	605	1,515	4,721	8
2,251–2,500	483	1,929	7,020	6	752	1,620	5,018	5
2,501–2,750	587	2,023	9,712	4	936	1,675	6,408	4
2,751–3,000	1,021	1,822	7,001	3	828	2,050	5,771	3
3,001–3,250	861	2,272	9,419	3	950	2,172	6,419	3
3,251–3,500	935	2,407	7,935	2	1,108	2,271	7,070	4
3,501–3,750	1,075	2,542	7,485	3	1,422	2,193	6,960	3
3,751–4,000	1,107	2,756	9,601	2	1,750	2,108	8,098	2
4,001–4,250	1,246	2,880	11,842	2	1,697	2,420	7,707	1
4,251+	1,261	3,267	14,779	2	1,942	2,812	12,394	1

[a]Annual reported OASI benefits.

5. Conclusions

The current OASI system has properties of both a pure social insurance system and a pure social transfer system. Because future benefits are based on contributions made into the system during the work life, a single-year approach to measuring the impact of OASI on the distribution of household income will mix the program's social insurance effect of smoothing income across a single individual's lifetime with its social transfer effect of redistributing income across individuals. After establishing the distinction between the social insurance and social transfer effects, this paper estimates the actuarially fair annuity which could be purchased with a household's lifetime OASI contributions. The difference between this annuity value and reported OASI benefits is denoted the transfer component of OASI. Examination of the distribution of this transfer component by both current and permanent income class reveals that all income classes have received large intergenerational transfers. Although specific OASI provisions such as the minimum benefit and progressive benefit formula do redistribute income within a single retired cohort, the magnitude of this redistribution is dwarfed by the intergenerational transfer. This is especially true of the oldest cohorts for whom the overwhelming share of OASI benefits (90 percent in 1972) are in the form of pure transfers. As is to be expected of a maturing system, this share is shown to be diminishing among subsequent cohorts, the members of which have spent greater portions of their worklives in covered employment. A surprising finding is that upper income classes have received absolute transfers equal to those received by lower income classes. These findings provide a rationale for the near universal support of OASI by past generations, as well as for the controversy which now surrounds the program. As it becomes apparent to younger cohorts of taxpayers that many of them may be net losers, it is inevitable that OASI will be subject to the same political controversy as other welfare programs which attempt to redistribute income.

The implications of this paper for future research are most relavent for those who would attempt to measure the extent to which OASI redistributes income within a single cohort in the future. Failure to recognize the annuity aspect of OASI, which will grow in relative size as intergenerational transfers decline, will result in an overestimate of the magnitude of intracohort redistribution. This in turn could lead to the paradoxical result that those who, in a lifetime sense, have received less than fair returns through OASI will be counted as positive recipients of government transfers in old age.

Appendix A
Algoriths Used to Establish Actuarially Fair Annuities

The algorithm used to calculate actuarially fair annuity values assumes that individuals puchase a joint and two-thirds whole life annuity immediate at the time of retirement.* The money available for this purchase is assumed to be

*A whole life annuity immediate is one under which the first payment is made to the annuitant one payment interval from the date of purchase. For example, if annual payments are specified, the first payment is due one year from the date of purchase. Periodic payments continue until the death of the designated person(s). This type of annuity is always purchased with a single premium.

equal to the present value at retirement of the sum of OASI contributions made over the worklife. The annual payment is then determined as that annuity which can be purchased with this single premium.

The cost to a household of purchasing an annuity varies with the probabilities of survival and rates of discount and return employed. The expected probabilities of survival used in this paper are taken from Public Health Service mortality tables and are a function of age and sex. It is assumed that each member of a couple purchases a joint and two-thirds annuity with his (her) compounded OASI contributions at his (her) retirement. Thus the date of the purchases may not coincide. The benefits payable under a joint and two-thirds annuity can be duplicated by purchasing a single-life annuity in the appropriate amount on each member of the couple along with a conventional joint-and-survivor annuity on both lives. For example, an immediate annuity on each life for $100 per month and a joint-and-survivor annuity of $100 per month would provide $300 per month as long as both members of the couple live and $200 per month to the survivor, the same amount as a $300 joint-and-two-thirds annuity.

The relationship between the joint-and-two-thirds annuity and the combination of single-life and joint-and-survivor annuities allows us to estimate the cost of a one-dollar joint-and-two-thirds annuity fora single-earner couple or a couple in which the male retires before his spouse as:

$$H_{J2/3} = \frac{H_M + H_F + H_{MF}}{3}$$

where

(1) H_M is defined as the cost of a one-dollar life annuity for a single man and is given by:

$$H_M = \sum_{k=0}^{99-R} PM_{(i+R|R)}(1+r)^{-k}$$

where $PM_{(i+R|R)}$ = probability that a male will live to age $(i+R)$ given that he is alive at age $62 \leq R < 100$, his age at retirment and r = rate of discount.

(2)
$$H_F = \sum_{k=m}^{99+j-R} PF_{(k+R-j|T)}(1+r)^{-k}$$

where $PF_{(k+R-j|T)}$ = the probability that a female will survive to age $(k+R-j)$ given that she is alive at age $T < 100$, her age of retirement, where R is her husband's age at retirement and $j \geq 0$ is the difference between the head and spouse's ages; $m = R - T \geq 0$; and r is defined as above.

(3) H_{MF} is the cost of a conventional joint-and-survivor annuity of one-dollar and is computed as:

$$H_{MF} = \sum_{k=0}^{99-R} PM_{(k+R|R)}(1+r)^{-k} + \sum_{k=m}^{99+j-R} (1 - PM_{(k+R|R)})PF_{(k+R-j|T)}(1+r)^{-k}$$

where R, T, PM, PF, r, m and j are defined as before.

If the spouse reaches retirement age and retires before her husband (m and $j \leq 0$), equation (2) becomes

$$H_F = \sum_{k=0}^{99+j-R} PF_{(k-j+R|T)}(1+r)^{-k}$$

and equation (3) becomes

$$H_{MF} = \sum_{k=0}^{99-R} PM_{(k+R|R)}(1+r)^{-k} + \sum_{k=0}^{99+j-R} (1-PM_{(k+R|R)})PF_{(k-j+R|T)}(1+r)^{-k}$$

where all terms are defined as above.

The results presented in this paper are based on the assumption that the rate of discount on future annuity values is fixed at 5 percent. OASI contributions are compounded at a rate of return equal to the annual yield plus the rate of increase of average stock prices. This is only one of several possible rates which could have been used. A lower rate of return results if contributions are compounded by U.S. Government bond interest rates prevailing in each year (see Table A1). Table A2 shows the effects of varying both the rate of return on OASI contributions and the rate of discount on future annuity values. Table

TABLE A1

ANNUAL INTEREST RATES FOR CALCULATING COMPOUNDED VALUE OF OASI CONTRIBUTIONS AT RETIREMENT

Period	Annual Rate of Return		Period	Annual Rate of Return	
	U.S. Government Bonds[a]	Stock Market[b]		U.S. Government Bonds	Stock Market
1937	2.74	4.38	1955	2.84	35.08
1938	2.61	−24.93	1956	3.08	9.20
1939	2.41	8.99	1957	3.47	8.38
1940	2.26	−3.71	1958	3.43	8.16
1941	2.05	−5.28	1959	4.07	24.09
1942	2.46	−5.79	1960	4.01	.90
1943	2.47	33.14	1961	3.90	20.18
1944	2.48	12.91	1962	3.95	−2.68
1945	2.37	23.72	1963	4.00	14.54
1946	2.19	15.89	1964	4.15	18.24
1947	2.25	−6.73	1965	4.21	11.13
1948	2.44	8.13	1966	4.66	.24
1949	2.31	8.58	1967	4.85	10.93
1950	2.32	25.18	1968	5.25	10.31
1951	2.57	25.52	1969	6.10	2.52
1952	2.68	14.73	1970	6.59	3.84
1953	2.94	6.42	1971	5.74	23.88
1954	2.55	23.06	1972	5.63	13.63

[a]Annual yield on U.S. Government bonds from U.S. Bureau of the Census, *Historical Statistics of the U.S. Colonial Times to 1957*, Washington, D.C., 1960, Series X-330. Later years from *Statistical Abstract of the U.S.*

[b]Yield is from Historical Statistics, Series X-339. Prices from Series X-351.

TABLE A2

TOTAL BENEFITS UNDER AN ACTUARIALLY FAIR OASI SYSTEM USING DIFFERENT RATES OF RETURN AND DISCOUNT

Rates of Interest Used to Discount Future Annuity Benefits	Interest Received on OASI Contributions	
	U.S. Government Bond Rate (billions)	Average Stock Market Rate (billions)
2%	$2.3	$5.7
5	3.0	7.4
10	4.3	10.6

entries are the total benefits which would be paid if benefits were calculated with the actuarially fair procedures described here.

Construction of Flow Estimates

In order to make actuarially fair benefits consistent with actual OASI benefits, adjustments were made to take into account the following problems: (1) *Age of acceptance.* Actuarial benefits were based on the age of the worker and spouse when OASI benefits were actually taken. (2) *Earnings test.* Since reported OASI benefits were affected by the earnings test, in the calculations actuarial benefits were reduced to take this into account. An estimate of the earnings-test effect on actual benefits was made and the same percentage decrease was used to decrease actuarial benefits. In the case where no benefits were accepted actuarial benefits were zero. (3) *Deceased spouse earnings records.* Since data did not exist for deceased spouses, it was necessary to estimate the contribution stream of these workers. For survivors whose benefits were at least partially based on their deceased spouse's earnings, the deceased spouse's PIA was known. Instrumental variable regressions were used to assign estimated contribution records to these deceased workers. If the survivor's benefits were based solely on his or her own record, it was assumed that the deceased spouse's earnings record was zero.

Consideration of Alternate Procedures

In our simulations, we assume that the workers purchase a whole life annuity immediate upon retirement. An alternative assumption is that workers purchase a deferred whole life annuity at the time they enter covered employment and pay periodic premiums over the worklife.* Both of these assumptions satisfy the definition of actuarially fairness specified by equation (3) in the text: at any age of retirement, the value of an individual's total contributions (C_{Ri}) equal the

*A deferred whole life annuity is one under which a period longer than one payment period must elapse after purchase before the first payment is made to the annuitant. Although this type of annuity may be purchased with a single premium, it is usually made with periodic premiums payable over a period of years up to the date of first payment. Once begun, payments continue as long as the designated person is alive.

expected present value of future benefits (B_{Ri}). Nevertheless, the choice between these assumptions is nontrivial, because they lead to markedly different estimates of the actuarial component of an individual's social security benefit. Under a deferred whole life annuity, the risk of survival can be spread across a larger cohort over a longer period of time than under a whole life annuity immediate. Consequently a fixed single premium (equal to the present value at the time of purchase of all periodic premiums) will purchase a larger annuity at the time a worker enters covered employment than n years later at retirement. Alternatively stated, survivors benefit at retirement from the contributions of nonsurvivors if they have purchased a deferred annuity at the beginning of their worklife. This is not the case for survivors if they wait to purchase an annuity immediate at retirement. This being the case, the actuarially fair social security benefit which we estimate is smaller than that which would result if we have chosen the deferred annuity assumption. Denoting the annual payment occurring from an annuity immediate A_I and that from a deferred annuity A_D, their relative size as measured by their ratio (A_I/A_D) can be calculated as

$$(1+i)^{x-R}(L_R/L_x)$$

where i is a constant interest rate, x is the age of entry to covered employment, R is age at retirement, and L_x and L_R are the cohort sizes at each of these ages.* For example, if we assume that $x = 25$, $R = 65$, and $i = 0.05$, then $A_I/A_D = 0.09$; that is, our estimate of the actuarially fair OASI benefit is only 9 percent of that which would be produced under the deferrred annuity assumption. This percentage rises as the number of years elapsing between entry to covered employment and retirement diminishes, or if a lower interest rate is employed. For example, for a span of 20 years and an interest rate of $2\frac{1}{2}$ percent (the latter is standard in the operation and public regulation of many of the phases of the business of insurance companies), $A_I/A_D = 0.38$. It follows that the proportion of current OASI benefits which we attribute to intergenerational and intracohort transfers is larger than that under the alternative procedure.

*The value of an annuity under a deferred whole life annuity which can be purchased with a single net premium H_D at age x with benefits beginning at age R is given by

(1) $$A_D = H_D \frac{D_x}{N_R}$$

where

$$D_x = (1+i)^{-x}L_x$$

$$N_R = \sum_{j=0}^{99-R}(1+i) - \sum_{j=0}^{99-R}(1+i)^{-(R+j)}L_{R+j}$$

The annuity purchasable under a whole life annuity immediate plan (both purchase and first payment occurring at age R) with the single net premium of H_I is given by

$$A_I = H_I \frac{D_R}{N_R}$$

where $D_R = (1+i)^{-R}L_R$ and N_R is defined as above. Constraining $H_D = H_I$, the relationship between A_I and A_D as given by

$$\frac{A_I}{A_D} = \frac{D_R}{D_X}\frac{(1+i)^{-R}}{(1+i)^{-X}}\frac{L_R}{L_X} = (1+i)^{X-R}\frac{L_R}{L_X} < 1.$$

Our choice of the annuity immediate assumption was made for both conceptual and pragmatic reasons. Conceptually, the alternate scenarios—OASI as a program of forced saving followed by purchase of immediate annuities vs OASI as a deferred annuity plan—are both appealing. In favor of the deferred annuity scenario, it can be said that the survivor's provision of OASI resembles certain provisions of the deferred refund annuities available in private markets. On the other hand, the periodic premiums of deferred annuities are normally regular, uninterrupted payments of a constant amount. Contributions to OASI usually fluctuate through time and are frequently interrupted by unemployment or employment in the noncovered sector of the labor market. This potentially sporadic pattern of OASI contributions suggests they be viewed not as premiums but as forced saving. We note that this scenario is consistent with that assumed by the Social Security Administration in the calculation of internal rates of return to social security (Freiden, Leimer and Hoffman, 1976; Freiden and Mackay, 1979).

On purely pragmatic grounds, the immediate annuity assumption is preferred because it can be empirically implemented whereas the deferred annuity assumption cannot. The latter requires data indicating the year of each individual's entry into covered employment. These data are not available for persons for whom this event occurred prior to 1951.

Appendix B
Algorithms Used to Calculate Permanent Income

The concept of permanent income is approximated by measuring an individual's earnings in each of the ten years immediately preceding the year of entitlement to Social Security as a percentage of the median earnings for all workers covered by Social Security in the corresponding year. The ratio of reported earnings to median earnings is summed over the ten years and a simple arithmetic mean is computed. This mean ratio is then multiplied by a constant equal, in all cases, to median reported earnings of all covered workers in 1972. It is this absolute dollar amount which is reported as permanent income in Table 4 and 5.

The Social Security Summary Earnings Record data tape reports a single total for all reported earnings from 1937–50. Only after 1950 can the earnings reported in any one particular year be identified. Consequently, reported earnings in *each* of the ten years preceding entitlement are not available for individuals whose entitlement occurred prior to 1950. When this is the case, earnings are created for the indistinguishable years among the ten years prior to entitlement by calculating the arithmetic mean for total earnings from 1937–50. This arithmetic mean then becomes the numerator in the ratio of reported earnings to median earnings for all covered workers, and the calculation of the mean ratio for the ten years prior to entitlement follows as before.

The algorithm described above applies exactly to the case of the single individual. The permanent income of a married couple is found by summing the permanent incomes of the individuals comprising the couple. This calculation involves a four-step procedure. First, the permanent income of each member of

the couple is calculated on the basis of his or her own year of entitlement. Second, these income amounts are compared to determine which is greater. Third, permanent income is recalculated for the member with the smaller income. The recalculation differs from the initial calculation in that it is based on reported earnings for the same ten-year period used for the spouse found (in step 2) to have the greater initial income. This revised permanent income amount is then added to the other spouse's permanent income, calculated in step 1, to arrive at total income for the couple. Couples are classified by this total income variable in Tables 4 and 5.

The purpose of the algorithm described above is to establish comparability of the earnings records of individuals retiring in different years. In the absence of some adjustment, older couples would appear poorer than younger couples because their nominal wages were lower. Use of this particular algorithm more than compensates older couples for their lower nominal wages, however, because maximum taxable earnings, and hence maximum credited earnings, have been falling through time as a percentage of median total earnings of all covered workers. The decrease is most dramatic for the period 1938–1950, when the ratio of maximum reported earnings to median total earnings fell from 4.48 to 1.56. Between 1950 and 1972 this ratio fluctuated between the relatively narrow boundaries of 1.56 and 1.98.

As one might expect, the maximum value of the average of this ratio calculated over the ten years prior to the year of entitlement displays a similar pattern over time. The maximum ten-year average for an individual retiring in 1947 is 3.17. This ratio falls consistently to a value of 1.60 for individuals retiring in 1958. It varies by only .01 to .02 thereafter until 1968, when the average ratio begins a steady climb reaching 1.72 in 1972.

To see how this variation in maximum average ratios biases upward the permanent income of older couples compared to that of younger couples, consider the case of two couples whose *actual* earnings as a percentage of total median earnings are equal to 2.0 in each of the ten years prior to entitlement. Thus each couple has a ten-year ratio of 2.0. If we assume that the year of entitlement of one of the couples is 1947, the algorithm yields a ten-year average ratio of reported earnings to total median earnings of 2.0. Now assume that the year of entitlement for the second couple is 1962. In each of the ten years preceding 1962, the ratio of maximum taxable earnings to median total earnings is less than 2.0. Thus in contrast to the *actual* ten-year average of 2.0, the algorithm yields a ten-year average equal to only 1.61. Although these two couples have identical actual earnings when measured as a percentage of total median earnings, the algorithm shows the older couple to have a higher ten-year average ratio and thus greater permanent income.

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