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CONTRACTING-OUT FOR SOCIAL SECURITY?

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ABSTRACT

The social security payroll tax frequently is attacked as being too burdensome for the lower-paid worker. A possible solution to this problem would permit workers to "contract out" of a portion of their tax in exchange for a reduced benefit at retirement. This system is used in the United Kingdom. This paper explores some of the implications of such a system for the United States. Specifically, the effect on the integration of private pension benefits with social security benefits, and the question of who might profit from contracting-out, are considered.

I. THE BRITISH SYSTEM

In 1942, Sir William Beveridge wrote *Social Insurance and Allied Services,* which formed the basis of British social insurance for a generation. This paper caught the imagination of the British public. It called for a completely universal system, and it abolished most of the previous system of social insurance. The new system was based on a flat-contribution, flat-subsistence-level-benefit concept. This, of course, implied that everyone would be treated exactly the same, which was the source of its appeal to the British. The benefit was set at the subsistence level to recognize voluntary forms of savings and to ensure that the benefit would be adequate for individuals who could not afford to save voluntarily.

This flat-contribution, flat-benefit concept, in combination with the need for an adequate benefit, resulted, to a large extent, in the demise of the Beveridge Plan and the rise of a graduated-contribution, graduated-benefit system. The flat contribution had to be at a level that low wage earners could afford, but such a level would not provide an adequate benefit. Beveridge also failed to recognize the effects of inflation and the resultant need for ad hoc increases in benefits and contributions. By 1958 it had become apparent to many that the system was a failure. In spite of this, the flat-contribution, flat-benefit concept remained. A new system was introduced, which stated that income below a specified level would be subject to a flat contribution in return for a flat benefit. Income above that level, up to a

specified maximum, would be subject to a graduated contribution in exchange for a graduated benefit.

Contracting-out came into existence at this time. The British government recognized the capital-producing potential of the private pension system and attempted to encourage it with this provision. The employee and employer were not required to pay the graduated contribution, but the employer was required to make up the lost benefit through a private plan. This system also failed, because the limit for the flat contribution could not be adjusted sufficiently for inflation, since the employer's decision to contract out was dependent upon that limit.

By 1970 the flat-contribution, flat-benefit concept had been thoroughly discredited. Contracting-out, however, remained. A new graduated system, similar to that in the United States, came into existence. To contract out of this system, one merely contributes a smaller fraction of earnings and, of course, receives a smaller benefit in return. How much smaller depends upon how much the government would like to force those who do contract out to subsidize those who do not. Since high wage earners are likely to benefit more than low wage earners from contracting-out, this subsidization is likely to be considerable. Therein lies one inherent difficulty of contracting-out.

Contracting-out, then, developed from two major sources. First, there was the tremendous psychological appeal that the flat-contribution, flat-benefit concept held for the British people. Second, there was the desire of the British government to recognize the capital-producing capabilities of the private pension system. After contracting-out had become part of the system, it remained, partly as a result of its own inertia.

II. ASSUMPTIONS

For the model constructed below, a number of assumptions are necessary. This model will consider only the OASI portion of social security. That is, neither disability nor health insurance will be considered. The assumptions are as follows:

1. Wages increase at rate $w = 5.75$ percent each year.
2. Prices increase at rate $c = 4.0$ percent each year.
3. Real interest is at rate $i = 2.5$ percent each year, except where noted.
4. Nominal interest is at rate $j = (1.04)(1.025) - 1 = 6.6$ percent each year, except where noted.
5. Expenses are ignored.
6. Mortality is from the 1969–71 United States Life Table.
7. Retirement is at age 65.

Assumptions 1–4 are the Alternative II ultimate assumptions from the 1979 trustees' report [3].

III. COMPUTATION OF SOCIAL SECURITY REPLACEMENT RATIOS, P AND P^*

To calculate the social security replacement ratio, it is first necessary to calculate the averaged indexed monthly earnings and then the primary insurance amount and finally compute their ratio. A simple function will then be developed to compute this ratio directly from final salary in 1982 dollars. The year 1982 was chosen as the appropriate starting point because it is the first year in which a retiree aged 65 can receive benefits based on the benefit formula from the 1977 amendments to the social security act.

Averaged Indexed Monthly Earnings (AIME)

The AIME is computed by first indexing annual earnings in covered employment to the time of retirement. (There is a time lag involved, which means that wages are not indexed completely forward. This will be ignored.) Then the average of the highest m-values of annual indexed earnings is calculated and divided by 12 to obtain the AIME. The value for m depends upon the year of retirement. In 1982, $m = 23$, and it increases by 1 each year to a maximum of 35.

Consider an individual earning S in 1982 who retires n years later and has worked k years previously, $n + k + 1 \geq m$. Again, salary increases at a rate $w = 5.75$ percent each year. This individual's salary history would be as follows:

Year	Earnings	Indexed Earnings
$1982-k$	$S(1+w)^{-k}$	$S(1+w)^n$
$1982-k+1$	$S(1+w)^{-k+1}$	$S(1+w)^n$
.	.	.
.	.	.
.	.	.
1982	S	$S(1+w)^n$
.	.	.
.	.	.
.	.	.
$1982+n$	$S(1+w)^n$	$S(1+w)^n$

It is easy to see that

$$(AIME)_n = \frac{1}{12m} mS(1 + w)^n = \frac{1}{12} S(1 + w)^n$$

$$= (AIME)_0(1 + w)^n ,$$

where $(AIME)_n$ is the AIME n years from 1982.

Table 1, column 2, shows the AIME for various salary levels in 1982, that is, for $n = 0$.

Primary Insurance Amount (PIA)

The monthly PIA, $(AIME\ PIA)_0$, will be determined by the following formula in 1982:

$$(AIME\ PIA)_0 = 90\%[\text{first \$180 of } (AIME)_0]$$
$$+ 32\%[(AIME)_0 \text{ between \$180 and \$1,085}]$$
$$+ 15\%[(AIME)_0 \text{ above \$1,085}] .$$

TABLE 1

SOCIAL SECURITY REPLACEMENT RATIOS COMPARED WITH CONTRACTED-OUT REPLACEMENT RATIOS

(1982 Wages) (1)	AIME (Average Indexed Monthly Earnings) (2)	PIA (Annual Primary Insurance Amount) (3)	$P = PIA/S$ (Social Security Replacement Ratio) (4)	$P^* = 0.8(PIA)/S$ (Contracted-out Replacement Ratio) (5)
$7,000	$ 583.33	$3,491.52	.4988	.3990
8,000	666.67	3,812.76	.4766	.3813
9,000	750.00	4,132.80	.4592	.3674
10,000	833.33	4,452.84	.4453	.3562
11,000	916.67	4,772.76	.4339	.3471
12,000	1,000.00	5,092.80	.4244	.3395
13,000	1,083.33	5,412.84	.4164	.3331
14,000	1,166.67	5,566.20	.3976	.3181
15,000	1,250.00	5,716.20	.3811	.3049
16,000	1,333.33	5,866.20	.3666	.2933
17,000	1,416.67	6,016.20	.3539	.2831
18,000	1,500.00	6,166.20	.3426	.2741
19,000	1,583.33	6,316.20	.3324	.2659
20,000	1,666.67	6,466.20	.3233	.2586
21,000	1,750.00	6,616.20	.3151	.2520
22,000	1,833.33	6,766.20	.3076	.2460
23,000	1,916.67	6,916.20	.3007	.2406
24,000	2,000.00	7,066.20	.2944	.2355
25,000	2,083.33	7,216.20	.2886	.2309
26,000	2,167.67	7,366.20	.2833	.2267
27,000	2,250.00	7,516.20	.2784	.2227
28,000	2,333.33	7,666.20	.2738	.2190
29,000	2,416.67	7,816.20	.2695	.2156
30,000	2,500.00	7,966.20	.2655	.2124
31,000	2,583.33	8,116.20	.2618	.2095
32,000	2,666.67	8,191.20	.2560	.2048
33,000	2,750.00	8,191.20	.2482	.1986
34,000	2,833.33	8,191.20	.2409	.1927
35,000	2,916.67	8,191.20	.2340	.1872
36,000	3,000.00	8,191.20	.2275	.1820
37,000	3,083.33	8,191.20	.2214	.1771
38,000	3,166.67	8,191.20	.2156	.1724

The bend points, \$180 and \$1,085, increase at the same rate as wages. If changes due to rounding are neglected, $(AIME\ PIA)_n$, the monthly PIA n years from 1982, will be determined as follows:

$$\begin{aligned}(AIME\ PIA)_n &= 90\%[\text{first \$180 of } (AIME)_0](1 + w)^n \\ &\quad + 32\%[(AIME)_0 \text{ between \$180 and \$1,085}](1 + w)^n \\ &\quad + 15\%[(AIME)_0 \text{ above \$1,085}](1 + w)^n \\ &= (AIME\ PIA)_0(1 + w)^n .\end{aligned}$$

Table 1, column 3, shows the annual PIA, 12 $(AIME\ PIA)_0$, for various wage levels.

Social Security Replacement Ratio

The social security replacement ratio, P_n, n years from 1982 can be computed by the following formula:

$$\begin{aligned}P_n &= \frac{(AIME\ PIA)_n}{(AIME)_n} \\ &= \frac{(AIME\ PIA)_0(1 + w)^n}{(AIME)_0(1 + w)^n} \\ &= \frac{(AIME\ PIA)_0}{(AIME)_0} \\ &= P_0 .\end{aligned}$$

Therefore, the replacement ratio remains constant over time with respect to the same relative income. Table 1, column 4, shows values of P_0 for various salary levels.

Simplified Replacement Ratio Formula

It would be convenient to have a formula that would relate the salary in 1982 to the replacement ratio. To develop such a formula, we use the method developed by Arthur W. Anderson [1]. For wages between \$7,000 and \$31,000, run a linear regression with the replacement ratio as the dependent variable. The lower limit is set at \$7,000 because that is close to the minimum wage, and \$31,000 is used as the upper limit because, under the assumptions of the model, the social security wage base will be \$31,500 in 1982. The result of this regression is

$$P = 0.53749 - 9.782(10^{-6})S .$$

A measure of the goodness-of-fit is the coefficient of determination, R^2, which ranges between 0 and 1. The closer it is to 1, the better the fit. It is computed as follows:

$$R^2 = \frac{(\text{Estimate of slope})^2 \Sigma (\text{Deviation from mean of } S)^2}{\Sigma (\text{Deviation from mean of } P)^2}$$

$$= \frac{(9.782)^2(10^{-6})^2 \Sigma (S - \bar{S})^2}{\Sigma (P - \bar{P})^2}$$

$$= 0.984 ,$$

a very good fit.

For salaries above $31,000, the replacement ratio is calculated as P = Constant/S.

For the analysis that follows, it will be helpful if P is continuous to its first derivative with respect to S; that is, k and c should be found so that P is continuous to its first derivative.

$$P = 0.53749 - 9.782(10^{-6})S , \quad 7{,}000 < S \leq k$$

$$= c/S , \quad k < S .$$

With a little manipulation, it is not difficult to show that k = 27,473 and c = 7,383, so that

$$P = 0.53749 - 9.782(10^{-6})S , \quad 7{,}000 < S \leq 27{,}473$$

$$= 7{,}383/S , \quad 27{,}473 < S .$$

Rationale for Calculation of Contracted-out Social Security Benefit

The British contract out of about 1.5 percent of their tax rate, but their tax rate is higher than that of the United States. They do not contract out of most of the contribution, because of the subsidy from the higher paid to the lower paid necessary for the continuation of the program. Thus, 1 percent appears to be a good starting place for the United States.

An average of the OASI tax rate over the next three decades reveals that it is roughly 5 percent of taxable wages. Thus, the tax for those contracted out is about 4 percent.

There exists a quantity $AIME^*$ such that, if it were taxed at the full tax rate, it would generate a contribution equivalent to that generated by the AIME taxed at the contracted-out rate. That is,

$$0.05(AIME^*) = 0.04(AIME) ,$$

$$AIME^* = 0.8(AIME)$$

If *AIME PIA** were defined in terms of *AIME** by the usual benefit formula, the resulting replacement ratio, $P^* = (AIME\ PIA^*)/AIME^*$, would be greater than P. Thus, the contracted-out individual would receive a greater return on his money simply by contracting out. This does not seem fair.

Equity might be achieved, in some sense, if *AIME PIA** were defined such that

$$\frac{AIME\ PIA^*}{AIME^*} = \frac{AIME\ PIA}{AIME} ,$$

that is, if

$$\frac{AIME\ PIA^*}{0.8(AIME)} = \frac{AIME\ PIA}{AIME} ,$$

or $AIME\ PIA^* = 0.8(AIME\ PIA)$. We then would have

$$P^* = \frac{AIME\ PIA^*}{AIME} = 0.8P ,$$

and, finally,

$$\begin{aligned} P^* &= 0.429975 - 7.825(10^{-6})S , \qquad 7{,}000 < S \leq 27{,}473 \\ &= 5{,}906/S , \qquad\qquad\qquad\quad 27{,}473 < S . \end{aligned}$$

Values of P^* for various wages are shown in column 5 of Table 1.

IV. TOTAL REPLACEMENT RATIO AND INTEGRATION

The IRS requires that pension plans be nondiscriminatory. A reasonable definition of nondiscrimination that is easily analyzed mathematically (as proposed in [1]) is that the total replacement ratio, that is, the ratio of benefits, both public and private, to final salary, be nonincreasing in relation to salary. If R is the total replacement ratio, this means that

$$\frac{\partial R}{\partial S} \leq 0 \quad \text{for all } S .$$

If B is the private pension benefit,

$$\begin{aligned} R &= [B + PIA(1 + w)^n]/S(1 + w)^n \\ &= B/S(1 + w)^n + P . \end{aligned}$$

To learn what this means to the private pension, an expression in terms of B, S, and $\partial B/\partial S$ was found:

$$\frac{\partial B}{\partial S} - \frac{B}{S} \leqslant S(1 + w)^n \left(- \frac{\partial P}{\partial S} \right).$$

After substituting for $\partial P/\partial S$,

$$\frac{\partial B}{\partial S} - \frac{B}{S} \leqslant 9.782(10^{-6})S(1 + w)^n, \qquad 7{,}000 < S \leqslant 27{,}473$$

$$\leqslant \frac{7{,}383}{S}(1 + w)^n, \qquad 27{,}473 < S.$$

Consider this result graphically, assuming $\partial R/\partial S = 0$ as in Figure 1. Thus, the private pension is allowed to pay more to the high wage earner in relation to salary, but only to the extent that social security pays less.

Now consider the benefit, B^*, payable to the contracted-out individual under the private pension plan. Proceeding as in our earlier analysis,

$$\frac{\partial B^*}{\partial S} - \frac{B^*}{S} \leqslant 7.825(10^{-6})S(1 + w)^n, \qquad 7{,}000 < S \leqslant 27{,}473$$

$$\leqslant \frac{5{,}906}{S}(1 + w)^n, \qquad 27{,}473 < S.$$

We now take up two methods of integration and consider the effects of contracting-out.

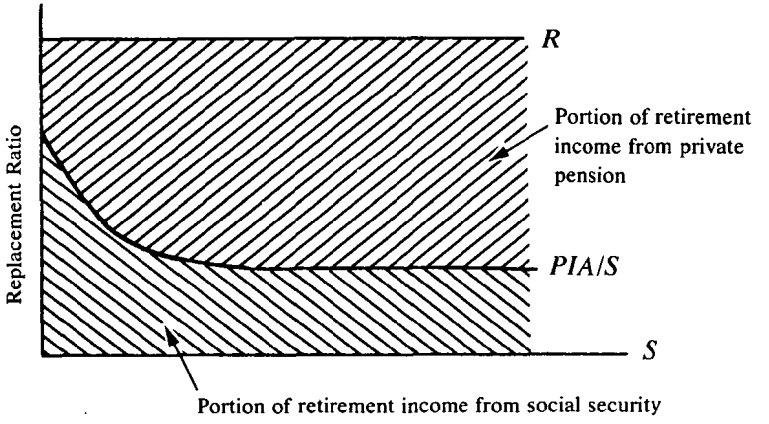

FIG. 1.—Distribution of retirement income between private pension and social security. R = total replacement ratio; S = salary.

V. TWO INTEGRATION METHODS[1]

Offset Method

For this method, assume a proportion, p, of final average income that is an appropriate total retirement income. Then subtract a proportion, q, of the social security benefit to give the private pension benefit.

A k-year final-average salary is given by

$$S(1 + w)^n \ddot{a}_{\overline{k}|}/k .$$

Remember that this is simply an average and that salaries are not indexed. The private pension benefit is given by

$$B = pS(1 + w)^n \ddot{a}_{\overline{k}|}/k - q(PIA)(1 + w)^n .$$

Thus,

$$\frac{\partial B}{\partial S} - \frac{B}{S} = q(1 + w)^n \left[P - \frac{\partial}{\partial S}(PIA) \right] .$$

But

$$\frac{\partial}{\partial S}(PIA) = S \frac{\partial P}{\partial S} + P ,$$

and, therefore,

$$\frac{\partial B}{\partial S} - \frac{B}{S} = q(1 + w)^n \left(-S \frac{\partial P}{\partial S} \right) .$$

By the criterion developed in Section IV,

$$q(1 + w)^n \left(-S \frac{\partial P}{\partial S} \right) \leq (1 + w)^n S \left(-\frac{\partial P}{\partial S} \right) ,$$

$$q \leq 1.00 .$$

A similar analysis for the contracted-out benefit yields

$$\frac{\partial B^*}{\partial S} - \frac{B^*}{S} = 0.8q^*(1 + w)^n \left(-S \frac{\partial P}{\partial S} \right) ,$$

assuming $PIA^* = 0.8(PIA)$. Using once again the criterion from Section IV, we have

$$0.8q^*(1 + w)^n \left(-S \frac{\partial P}{\partial S} \right) \leq (1 + w)^n \left(-S \frac{\partial P}{\partial S} \right) ,$$

$$q^* \leq 1.25 .$$

[1] This analysis is developed in greater detail in [1].

The difference between q and q^* can be explained graphically as shown in Figure 2. The difference arises from the shaded region. Since P^* is uniformly less than P, B^*/S can be uniformly greater than B/S.

Final-Pay Excess Method

For this method, the private pension benefit is some proportion, p, of the difference between the final-average salary and the social security wage base. Thus, the benefit is given by

$$B = p\left[S(1+w)^n \frac{\ddot{a}_{\overline{k}|}}{k} - SSWB_n\right],$$

where $SSWB_n$ is the social security wage base at time of retirement. Since the social security wage base increases at a rate $w = 5.75$ percent in this model, and will be \$31,500 in 1982, this formula can be rewritten as

$$B = p\left(S\frac{\ddot{a}_{\overline{k}|}}{k} - 31{,}500\right)(1+w)^n.$$

This becomes, after some manipulation,

$$\frac{\partial B}{\partial S} - \frac{B}{S} = p(1+w)^n \frac{31{,}500}{S}.$$

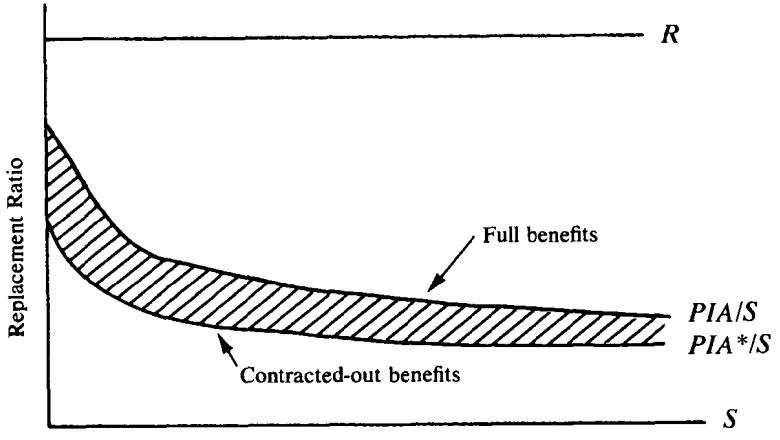

FIG. 2.—Difference between contracted-out benefits and full benefits—offset plans

Applying the criterion from Section IV results in

$$p(1 + w)^n \frac{31,500}{S} \leq \frac{7,383}{S}(1 + w)^n ,$$

$$p \leq \frac{7,383}{31,500} = 0.2344 .$$

Under contracting-out the benefit would become

$$B^* = p^*\left(S\frac{\ddot{a}_{\overline{k}|}}{k} - 31,500\right)(1 + w)^n ,$$

which, after manipulation, yields

$$\frac{\partial B^*}{\partial S} - \frac{B^*}{S} = p^*(1 + w)^n \frac{31,500}{S} .$$

Applying the criterion from Section IV, we have

$$p^*(1 + w)^n \frac{31,500}{S} \leq \frac{5,906}{S}(1 + w)^n .$$

$$p^* \leq 0.1875 .$$

Note that $p/p^* = 1.25$.

The difference between p and p^* is explained graphically in Figure 3. Clearly the area shaded \\\\ is larger than the area shaded ////. Since P^* is a flatter curve than P, the room for additional benefits is smaller under P^*.

Assuming that the IRS would allow the use of contracted-out benefits in the integration formula, the offset method offers improved integration for the employer, so that he can offer improved benefits to his higher-paid employees. The reverse is true for the excess method.

VI. BENEFIT/TAX RATIO

We now take up the question of which individuals would benefit from contracting-out. First, we consider the full benefit/full tax ratios, and then compare them with another, more realistic model to get a feel for the validity of the second analysis, the contracted-out benefit/contracted-out tax ratio.

Full Benefit/Full Tax Ratio

To compute these ratios, two functions, $C(x)$ and $B(x)$, were developed.

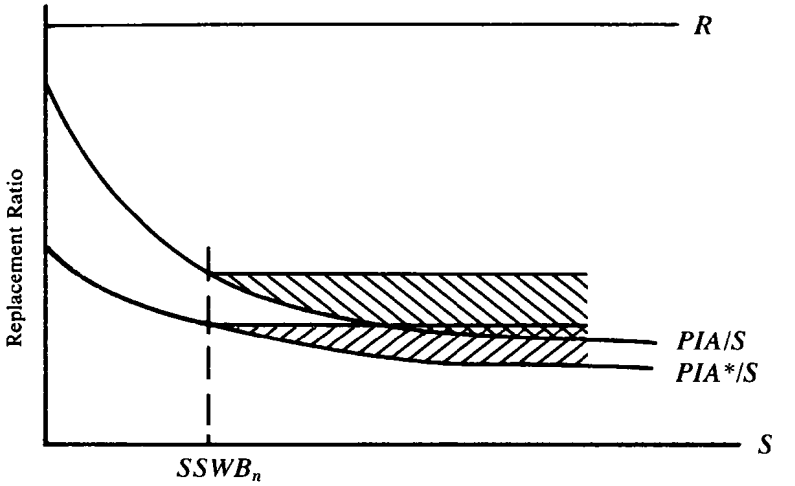

FIG. 3.—Difference between contracted-out benefits and full benefits—excess plans. Not drawn to scale—difference between areas exaggerated.

For the contributions,

$$C(x) = \sum_{t=0}^{65-x} (1 + w)^t (1 + j)^{-t} \, {}_tp_x \ddot{a}^{(12)}_{x+t:\overline{1}|} .$$

This is the present value, discounted with interest and mortality, of annual payments of $1 payable monthly in 1982 wages until retirement at age 65. For the benefits,

$$B(x) = \frac{D^j_{65}}{D^j_x} \sum_{t=0}^{\infty} (1 + c)^t (1 + j)^{-t} \, {}_tp_{65} \ddot{a}^{(12)}_{65+t:\overline{1}|} .$$

This is the present value, discounted with interest and mortality, of annual payments of $1 payable monthly in 1982 prices after retirement at age 65.

Since commutation functions were not available for the net rate of interest, $(1 + j)/(1 + w) - 1 \doteq 0.8$ percent, or the real rate of interest, $(1 + j)/(1 + c) \doteq (1 + i)$, a linear regression was run on the available rates and used to extrapolate for the necessary rates. Values for these functions are given in Tables 2–5.

To obtain the full benefit/full tax ratio, let t be the average tax rate; then

$$\frac{\text{Benefit}}{\text{Tax}} = \frac{PIA(1 + w)^{65-x} B(x)}{tSC(x)} .$$

Since P is the social security replacement ratio, then $PIA = PS'$; here $S' = 12(AIME) = dS$, where $d = (n + k + 1)/m \leq 1$. S' must be used in place of S, since the condition $n + k + 1 \geq m$ is not always satisfied in the following. (See Sec. III under "Averaged Indexed Monthly Earnings"). Also, t is not 5.00 percent in all cases but is given by the following:

$$\begin{aligned} t &= 5.02\% \quad \text{at age } 22 \\ &= 5.00\% \quad \text{at age } 32 \\ &= 4.96\% \quad \text{at age } 42 \\ &= 4.84\% \quad \text{at age } 52 . \end{aligned}$$

Different taxes are used to bring these results more in line with the realistic model used for comparison. This comparison is made in Table 6. The model used for comparison was constructed by Applebaum and Nichols in [2]. The major differences between the two models are in the assumptions concerning interest, wage inflation, price inflation, and improvements in mortality. The Applebaum and Nichols assumptions are consistent with the Alternative II assumptions in the 1979 trustees' report [3]. Since the inflation assumptions of the model presented in this paper are low, the results for the ages closest to retirement differ most from the corresponding results in the Applebaum and Nichols paper and are, therefore, less reasonable.

Contracted-out Benefit/Contracted-out Tax

We assume that the employee contracts out of 1 percent of the tax rate and 20 percent of his benefits; therefore,

$$\frac{\text{Benefit}}{\text{Tax}} = \frac{0.2(PIA)(1 + w)^{65-x}B(x)}{0.01\,SC(x)} .$$

If Benefit/Tax > 1, then the employee is better off remaining in the system. Recall that $PIA = PS' = dPS$. Through algebraic manipulation, this becomes

$$S < \frac{0.2(0.53749)(1 + w)^{65-x}B(x) - (0.01)C(x)/d}{0.2(9.782)(10^{-6})d(1 + w)^{65-x}B(x)} , \qquad 7{,}000 < S' \leq 27{,}473$$

$$< \frac{0.2(7{,}383)(1 + w)^{65-x}B(x)}{0.01C(x)} , \qquad 27{,}473 < S' .$$

If an individual earns a salary lower than S, then it is better for him to remain in the social security system. Table 7 presents these salaries for three different real interest rates. The nominal rate was adjusted accordingly, and

TABLE 2

VALUES OF $C(x)$*—MALE

INTEREST RATE (%)	AGE (x)			
	22	32	42	52
3.0	23.3765	20.0134	15.5776	10.0394
3.5	21.6508	18.8042	14.8761	9.7646
4.0	20.1207	17.7061	14.2231	9.5007
4.5	18.7593	16.7073	13.6148	9.2491
5.0	17.5444	15.7966	13.0465	9.0076
5.5	16.4565	14.9647	12.5160	8.7765
6.0	15.4790	14.2036	12.0197	8.5548
6.5	14.5987	13.5055	11.5551	8.3421
7.0	13.8033	12.8644	11.1196	8.1382
7.5	13.0826	12.2746	10.7111	7.9422
8.0	12.4273	11.7304	10.3274	7.7543
0.8	27.1414	23.0202	17.5921	10.9668
1.3	26.0654	22.2016	17.0715	10.7389
0.3	28.2174	23.8389	18.1136	11.1947

*Using the approximation $C(x) \doteq (13/24)\ddot{a}^{i}_{\overline{x:65-x}|} + (11/24)\,(1+w)a^{i}_{\overline{x:65-x}|}$.

TABLE 3

VALUES OF $B(x)$*—MALE

INTEREST RATE (%)	AGE (x)				
	22	32	42	52	65
$i=2.5$, $j=6.6$ ...	0.4541	0.8792	1.7189	3.5059	10.5515
$i=3.0$, $j=7.12$ ...	0.3627	0.7373	1.5134	3.2406	10.3900
$i=2.0$, $j=6.08$ ...	0.5756	1.0613	1.9759	3.8378	10.8390

*Using the approximation $B(x) \doteq (D^{i}_{65}/D^{j}_{x})\,[(13/24)\ddot{a}^{i}_{65} + (11/24)\,(1+i)a^{i}_{65}$.

TABLE 4

VALUES OF $C(x)$*—FEMALE

INTEREST RATE (%)	AGE (x)			
	22	32	42	52
3.0	24.1513	20.7326	16.2840	10.5494
3.5	22.3260	19.4475	15.5309	10.2534
4.0	20.7110	18.2824	14.8297	9.9699
4.5	19.2773	17.2243	14.1773	9.6988
5.0	18.0004	16.2620	13.5696	9.4394
5.5	16.8593	15.3840	13.0023	9.1910
6.0	15.8361	14.5826	12.4724	8.9529
6.5	14.9167	13.8486	11.9769	8.7248
7.0	14.0872	13.1749	11.5131	8.5050
7.5	13.3365	12.5561	11.0785	8.2962
8.0	12.6561	11.9865	10.6707	8.0946
0.8	28.0816	23.8934	18.4318	11.5445
1.3	26.9526	23.0294	17.8743	11.2997
0.3	29.2106	24.7575	18.9893	11.7893

*Using the approximation $C(x) \doteq (13/24)\ddot{a}^{i}_{\overline{x:65-x}|} + (11/24)\,(1+w)a^{i}_{\overline{x:65-x}|}$.

TABLE 5

VALUES OF $B(x)$*—FEMALE

INTEREST RATE (%)	AGE (x)				
	22	32	42	52	65
$i=2.5$ / $j=6.6$ ...	0.6862	1.3117	2.5304	4.9941	13.06778
$i=3.0$ / $j=7.12$ ...	0.5487	1.1013	2.2302	4.6213	12.8817
$i=2.0$ / $j=6.08$ ...	0.8729	1.5889	2.9187	5.4857	13.4700

*Using the approximation $B(x) \doteq (D^i_{65}/D^i_x)\,[(13/24)\ddot{a}^i_{65} + (11/24)\,(1+i)a^i_{65}]$.

TABLE 6

BENEFIT/TAX RATIOS FOR A WORKER BECOMING COVERED ON JANUARY 1 OF YEAR SHOWN

UNMARRIED MALE WORKER

Age	Low Earnings	Median Earnings	Maximum Earnings
	Anderson Model*		
January 1, 1982:			
22	1.72	1.52	0.86
32	2.14	1.90	1.12
42	2.31	2.13	1.57
52	2.61	2.49	2.16
	Applebaum-Nichols		
January 1, 1979:			
22	1.84	1.48	0.97
32	2.49	1.99	1.32
42	3.29	2.50	1.78
52	4.87	3.71	2.52

UNMARRIED FEMALE WORKER

Age	Low Earnings	Median Earnings	Maximum Earnings
	Anderson Model*		
January 1, 1982:			
22	2.52	2.21	1.27
32	3.09	2.74	1.63
42	3.20	2.99	2.20
52	3.51	3.37	2.90
	Applebaum-Nichols		
January 1, 1979:			
22	2.63	2.11	1.39
32	3.53	2.81	1.86
42	4.58	3.49	2.48
52	6.59	5.02	3.41

*Model developed in this paper using Anderson's methodology.

TABLE 7

SALARY LIMITS ABOVE WHICH CONTRACTING-OUT IS PROFITABLE

REAL INTEREST RATE (%)	AGE (x)							
	22		32		42		52	
	Male	Female	Male	Female	Male	Female	Male	Female
2.5	$27,473	$39,934	$35,686	$51,295	$52,197	$73,339	$ 97,640	$132,127
3.0	21,757	33,270	31,030	44,683	47,361	66,654	92,167	124,912
2.0	33,337	48,836	41,597	59,966	58,274	82,109	104,707	142,119

the other assumptions remained the same. Note that the salaries shown at the high ages would be even greater under the Applebaum-Nichols model.

VII. CONCLUSION

The analysis above gives two major reasons for rejecting the concept of contracting-out. First, there is the possibly detrimental effect (due to the omnipresent IRS) on pension plans employing the excess method of integration. This could cause those plans to be overhauled to avoid a tax problem. Although this would increase overall demand for enrolled actuaries, it would be a rather self-serving reason for recommending contracting-out. Second, considering the results displayed in Table 7, it appears that only the high-paid worker would ultimately benefit from contracting-out. Since social security is, after all, primarily a social program, major changes in it should be made with a social goal in mind. Increasing the benefits of high-paid workers is hardly a social goal, but it might be acceptable if the absolute position of other workers remained the same. However, since the decision to contract out probably would be left to the employer in order to avoid difficult administrative problems, many lower-paid workers would ultimately lose from this provision. Part of the purpose of contracting-out is to ease the burden of the payroll tax on the lower-paid, but the reduction in benefit probably is too high a price to pay. For these reasons, it would appear ludicrous to institute contracting-out, so another way must be found to reduce the payroll taxes.

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DISCUSSION OF PRECEDING PAPER

MICHAEL COHEN:

While agreeing with the author's conclusions in this paper, I would like to comment on two aspects: his view of "contracting-out" under the British social security system, and ways of reducing the burden of a payroll tax on the lower-paid. Indeed, I think these comments may do as much as the author's arithmetic to explain why contracting-out would be "ludicrous."

In order to contract out of the state scheme in the United Kingdom, it is not sufficient that "one merely contributes a smaller fraction of earnings." One must also be a member of an occupational pension scheme (i.e., a private pension plan) that provides benefits equal to or greater than those provided under the state scheme.

In the United Kingdom, as in Canada, the social security benefit is expressed as a flat benefit plus an earnings-related amount, as opposed to a variable percentage of earnings as in the United States. Since contracting-out in the United Kingdom is limited to the earnings-related portion of social security, the question of equity is less a question of low earners versus high earners than one of intergenerational equity, since social security is funded on a pay-as-you-go basis, whereas occupational schemes are funded in a manner similar to that used for private plans in North America. In addition, the social security system bears the risk of wage and price inflation above a certain limit for the "guaranteed minimum pension" in contracted-out schemes.

It is, of course, important to set contracting-out terms such that the estimated cost of this risk is not borne by the non-contracted-out employees.

In actual fact this contracting-out procedure means that by and large it is the higher-paid rather than the lower-paid who will be contracted out; thus the equity questions will be somewhat different from those discussed by Mr. Mange.

In regard to the problem that this paper attempts to address, namely, the burden of a payroll tax on the lower-paid, the author is quite right in concluding that the reduction in benefit (presumably not to be made up by a private plan) would be even more burdensome. This problem was solved in Canada by paying the flat-benefit element of social security out of consolidated revenue, which is of course mostly financed by personal taxes. While it is true that there is pressure in the United States, and no doubt

elsewhere, for contributors to social security to get "value for money," it is well to remember, as the author points out, that social security is a social program and therefore subsidies must be present, whether they be intergenerational or between high and low wage earners, and therefore individual equity should not be sought from such a system. Paying the portion of social security whose purpose is to alleviate poverty among the elderly (i.e., old age security in Canada) from general tax revenue has the effect of basing contributions on "ability to pay" rather than on a percentage of pay, which is basically regressive. This confines the subsidy between higher- and lower-paid employees to this portion of the program, leaving the earnings-related portion to provide a level of benefits that is proportionate to the level of contributions.

Finally, although it was not the author's intention to give a detailed description of the United Kingdom social security system and its development, the first section does not do justice to the debate that gave rise to the current system. While this system is far from perfect, its study is not without lessons for students of retirement policy in North America.

(AUTHOR'S REVIEW OF DISCUSSION)

JOHN I. MANGE:

I would like to thank Mr. Cohen for his discussion.

I will consider two points here: first, the nature of old age benefits in the United States and, second, the difficulties in setting terms of contracting-out such that the non-contracted-out workers do not bear the risks of wage and price inflation.

The United States social security benefit could, as of this writing, be described as a flat benefit plus an earnings-related amount. The flat benefit arises from the existence of a minimum benefit which is not explicitly recognized in the primary insurance amount formula. Consequently the distinction between the benefits of the United States and those of the United Kingdom is not as clear as one might think. However, if contracting-out is applied only to the earnings-related amount as in the United Kingdom, the objections to contracting-out presented in this paper are still valid, because the minimum benefit is so small that many relatively low-income workers would still be eligible for contracting-out.

In addition to the minimum benefit, the United States has another program designed to alleviate poverty among the elderly. This program, which is financed by general revenues, is called supplemental security income (SSI). Eligibility for SSI is based on need rather than on some function of work history as in the case of social security. Consequently, SSI does not have

precisely the same goals as social security and is, therefore, an ineffective means for reducing the payroll tax.

Now consider how one might set terms of contracting-out such that non-contracted-out workers do not bear the risk of wage and price inflation. Suppose that, in order to avoid imposing an extra burden on lower-paid workers, contracting-out is applied only to an earnings-related amount above a flat benefit, as in the British system. By the nature of this benefit, there is a certain income level below which it is impossible to contract out. This income level can either rise with inflation or remain fixed over time, depending on the terms of the contracting-out provision.

First, suppose that it remains fixed over time. Eventually lower-paid workers' incomes rise above that income level, and some of them, therefore, contract out. However, their relative income level has not changed, so their position after contracting-out is worse than before contracting-out. This is an unacceptable consequence of contracting-out. Now suppose that the income level below which it is impossible to contract out rises with inflation. This would mean that the flat benefit would rise with inflation. Clearly, then, the base on which the earnings-related amount is calculated must increase, or the flat benefit would eventually become the entire benefit. Lower-paid workers would no longer be in a worse position over time because of contracting-out (as they would be in the preceding case). However, in the British system, the pension provided by the employers to replace the contracted-out benefit is now indexed. Most employers would be unwilling to accept this risk. Consequently, the social security system would have to bear this risk if contracting-out were to succeed. This means that either the non-contracted-out workers and their employers would bear part of this risk through higher taxes, or the government would bear it through general revenues. Since it would be unreasonable to expect the non-contracted-out workers and their employers to bear this risk, a result of contracting-out in this way is the need for general revenues to help support the social security system.

Finally, such a system would not be viable in the United States, because there is a great deal of opposition to the concept of general revenue support of the social security system.