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APPENDIXES

APPENDIX A

DEDUCTIONS AND EXEMPTIONS AS A PER CENT OF INCOME

Information on the personal exemptions and the deductions from taxable income claimed by individuals having incomes of the same order of magnitude as those enjoyed by the executives in the sample was obtained from the *Statistics of Income* data published by the Internal Revenue Service for the six years 1944, 1947, 1950, 1953, 1956, and 1959. The ratio of the total of deductions and exemptions to the aggregate income received by all taxpayers with adjusted gross incomes greater than $25,000 in each of those years was computed. Aggregate income was defined as the sum of the reported adjusted gross income and the amount of net long-term capital gains not already included in AGI. The results were as follows (the underlying figures are recorded in Table A-1).

DEDUCTIONS AND EXEMPTIONS AS A PER CENT OF ALL INCOME

AGI Class ($000's)	1944	1947	1950	1953	1956	1959
25–50	10.8	11.9	13.7	18.3	16.4	18.1
50–100	9.9	10.8	11.3	15.7	14.1	15.8
100–150	10.1	11.0	10.7	14.3	14.8	15.6
150–200	10.7	11.5	10.4	14.6	15.3	16.2
200–500	10.9	11.0	11.1	16.0	15.4	16.0
500–1000	9.9	11.6	9.8	14.5	14.1	14.5
Over 1000	12.5	10.0	9.7	15.1	13.5	15.0

Clearly, the ratios within each year are quite uniform across a broad range of income classes, and they encourage the assumption of a single

TABLE A-1

Income Data
(dollar figures in millions)

AGI Class (thousand dollars)	Total AGI	Capital Gains (50%)	Total Income	Personal Exemptions	Deductions	Exemptions Plus Deductions	Exemptions and Deductions as % of Total Income
			1944 Data				
25–50	3,388.7	118.5	3,507.2	118.7	261.1	379.7	10.8
50–100	1,926.0	98.3	2,024.3	31.7	168.6	200.2	9.9
100–150	584.7	43.4	628.1	4.9	58.7	63.6	10.1
150–200	267.6	26.4	294.0	1.5	29.9	31.3	10.7
200–500	419.7	57.2	476.9	1.4	50.7	52.1	10.9
500–1000	149.0	31.7	180.7	0.2	17.7	17.9	9.9
Over 1000	109.6	19.8	129.4	0.1	16.1	16.2	12.5
			1947 Data				
25–50	4,923.4	201.5	5,125.0	180.2	431.3	611.5	11.9
50–100	2,525.7	176.3	2,702.0	41.9	250.4	292.3	10.8
100–150	759.9	89.4	849.3	6.3	87.3	93.5	11.0
150–200	352.6	51.0	403.6	1.9	44.6	46.5	11.5
200–500	573.6	127.1	700.7	1.7	75.0	76.7	11.0
500–1000	201.8	53.0	254.8	0.2	29.3	29.6	11.6
Over 1000	214.9	73.2	288.2	0.1	28.8	28.9	10.1
			1950 Data				
25–50	7,425.5	376.3	7,801.7	445.0	620.9	1,065.9	13.7
50–100	4,192.5	304.6	4,497.1	123.4	386.3	509.7	11.3
100–150	1,386.5	156.6	1,543.1	21.9	143.8	165.8	10.7
150–200	676.8	98.3	775.0	7.4	73.6	81.0	10.4
200–500	1,141.2	229.9	1,371.2	7.3	144.9	152.2	11.1
500–1000	419.5	132.4	551.8	1.1	52.8	53.8	9.8
Over 1000	433.4	131.3	564.7	0.3	54.3	54.7	9.7

(continued)

TABLE A-1 (concluded)

AGI Class (thousand dollars)	Total AGI	Capital Gains (50%)	Total Income	Personal Exemptions	Deductions	Exemptions Plus Deductions	Exemptions and Deductions as % of Total Income
			1953 Data				
25–50	6,355.7	191.2	6,546.9	546.5	651.8	1,198.3	18.3
50–100	5,682.1	212.7	5,894.8	310.7	612.8	923.5	15.7
100–150	3,994.6	239.3	4,233.9	120.2	484.2	604.5	14.3
150–200	1,638.7	184.0	1,822.6	23.6	243.3	266.9	14.6
200–500	753.1	148.1	901.2	4.9	138.7	143.7	16.0
500–1000	252.4	69.5	321.9	0.6	46.2	46.8	14.5
Over 1000	275.3	70.8	346.1	0.2	52.0	52.2	15.1
			1956 Data				
25–50	11,638.4	673.0	12,311.4	753.3	1,262.5	2,015.9	16.4
50–100	5,900.3	582.2	6,482.5	189.4	721.8	911.2	14.1
100–150	1,679.3	291.8	1,971.1	28.9	262.1	291.0	14.8
150–200	659.1	138.2	797.3	7.9	114.3	122.2	15.3
200–500	1,138.0	320.0	1,458.1	8.1	216.5	224.6	15.4
500–1000	396.6	154.2	550.8	1.2	76.3	77.5	14.1
Over 1000	549.6	241.1	790.8	0.5	106.0	106.5	13.5
			1959 Data				
25–50	14,148.9	919.6	15,068.5	956.3	1,766.7	2,723.0	18.1
50–100	7,549.5	799.6	8,349.1	255.5	1,060.4	1,315.9	15.8
100–150	2,080.6	394.2	2,474.8	37.0	348.0	385.0	15.6
150–200	764.3	192.0	956.2	9.5	145.2	154.7	16.2
200–500	1,361.9	457.4	1,819.4	9.9	281.3	291.1	16.0
500–1000	478.2	220.9	699.0	1.4	100.1	101.6	14.5
Over 1000	545.6	258.0	803.6	0.5	120.1	120.6	15.0

flat rate for all individuals. Moreover, there is a rather clear-cut difference between the experience of the years 1944, 1947, and 1950 and that observed thereafter. Almost all the figures in the earlier years fall between 9.5 and 11.5 per cent and in the later ones, between 14.5 and 16.0 per cent. Accordingly, the convention adopted in the study, that deductions and exemptions together amounted to 10 per cent of income through 1950 and 15 per cent from then on, seems not only a convenient but a fairly accurate characterization of the actual historical pattern. As long as corporate executives' behavior did not differ markedly from that suggested by the aggregate figures for all individuals with similar incomes, this convention should be a suitable approximation of their experience.

The supporting data from the *Statistics of Income* tabulations for the six years indicated consist of: (1) total adjusted gross income on all returns in each AGI class (2) the amount of net long-term capital gains included in the AGI figures; (3) total personal exemptions claimed by the taxpayers in each class; (4) total deductions claimed in each class.

Since just one-half of aggregate net long-term capital gains are counted in the reported AGI figures, the sum of items (1) and (2) represents the total income enjoyed by each AGI category.

APPENDIX B

MORTALITY EXPERIENCE TABULATIONS

Insurance companies compile, from their policy underwriting experience, a record of the rate at which their policyholders of various ages die. This information is organized and presented in the form of a "mortality table." Since the classes of people who purchase different kinds of insurance policies typically exhibit different longevity characteristics, there exist not one but several such tables, each of which is relevant to a particular type of insurance contract. All are revised periodically to reflect new information on longevity as it becomes available.

The tabulations are most commonly organized in the following manner: An arbitrary group of individual policyholders all of a particular—and equally arbitrary—age initially is hypothesized. The number out of this group who will, on the basis of current experience, attain successively higher ages is then recorded. For example, if the table is begun at age 5 with 10,000 persons, it might look like:

Age x	l_x
5	10000.00
6	9994.41
7	9989.22
8	9984.29
9	9979.49
10	9974.74
.	.
.	.
.	.

(Continued)

Age x	l_x
50	9371.75
.	.
.	.
.	.
75	5173.47
.	.
.	.
.	.
110	0.01
111	0.00

where l_x denotes the number of individuals who are expected to live to at least age x. According to this table, of every 10,000 policyholders who are now age 5, 9994.41 are expected to attain age 6, 9989.22 to attain age 7, 5173.47 age 75, 0.01 age 110, but none age 111.

From these figures, the probability that an individual of any given age at the present time will live to any other given age can readily be computed. Thus the probability that a child now age 5 will live at least one more year is

$$\frac{9994.41}{10000.00} = 0.999441.$$

Similarly, the chances of his attaining age 50 are

$$\frac{9371.75}{10000.00} = 0.937175.$$

And, of course, age 5 need not be the reference point in every case. The probability that a man age 50 will live to see his seventy-fifth birthday is

$$\frac{5173.47}{9371.75} = 0.552028.$$

In general, therefore, if we let ${}_np_x$ denote the probability that an individual of age x now will attain age $x + n$, we have

$${}_np_x = \frac{l_{x+n}}{l_x},$$

which permits us to utilize the raw data of the mortality table to analyze in any situation an executive's prospects for actually receiving the payments promised him under his company's pension plan.

For certain calculations—in particular, those concerned with the value of whatever death benefits may be associated with the compensation arrangement in question—it is useful to derive a second set of mortality tabulations from the information listed above: the number of individuals out of the original 10,000 who are, on average, expected to *die* after having attained various ages. Thus we may define the quantity d_x where

$$d_x = l_x - l_{x+1}$$

and construct an additional column in the mortality table:

Age x	l_x	d_x
5	10000.00	5.59
6	9994.41	5.19
7	9989.22	4.93
8	9984.29	4.80
.	.	.
.	.	.
.	.	.
50	9371.75	60.68
51	9311.07	66.92
.	.	.
.	.	.
.	.	.
75	5173.47	322.97
76	4850.50	331.52
.	.	.
.	.	.
.	.	.
110	0.01	0.01
111	0.00	—

The probability that an individual now age 5 will die after attaining age 7 but before attaining age 8 therefore is

$$\frac{4.93}{10000.00} = 0.000493.$$

If he reaches age 8, the likelihood that he will die between his fiftieth and fifty-first birthday is

$$\frac{60.68}{9984.29} = 0.006078.$$

In general, then,

$${}_nq_x = \frac{d_{x+n}}{l_x}$$

where ${}_nq_x$ denotes the probability that a man presently age x will die within a year after attaining age $x + n$.

APPENDIX C

1951 GROUP ANNUITY MORTALITY TABLE FOR MALES

Age x	l_x	d_x	Age x	l_x	d_x
5	9999.9999	5.5900	31	9837.6874	10.3689
6	9994.4099	5.1871	32	9827.3185	11.0263
7	9989.2228	4.9347	33	9816.2922	11.7599
8	9984.2881	4.8024	34	9804.5323	12.5596
9	9979.4857	4.7502	35	9791.9727	13.4542
10	9974.7355	4.7579	36	9778.5185	14.4233
11	9969.9776	4.8454	37	9764.0952	15.4956
12	9965.1322	4.9427	38	9748.5996	16.6799
13	9960.1895	5.0399	39	9731.9197	17.9943
14	9955.1496	5.1468	40	9713.9254	19.4279
15	9950.0028	5.2735	41	9694.4975	21.2503
16	9944.7293	5.4099	42	9673.2472	23.6995
17	9939.3194	5.5660	43	9649.5477	26.7196
18	9933.7534	5.7318	44	9622.8281	30.2830
19	9928.0216	5.9072	45	9592.5451	34.3413
20	9922.1144	6.1120	46	9558.2038	38.8541
21	9916.0024	6.3462	47	9519.3497	43.7795
22	9909.6562	6.5998	48	9475.5702	49.0835
23	9903.0564	6.8628	49	9426.4867	54.7396
24	9896.1936	7.1648	50	9371.7471	60.6821
25	9889.0288	7.4959	51	9311.0650	66.9186
26	9881.5329	7.8657	52	9244.1464	73.3800
27	9873.6672	8.2741	53	9170.7664	80.0700
28	9865.3931	8.7309	54	9090.6964	86.9343
29	9856.6622	9.2160	55	9003.7621	93.9633
30	9847.4462	9.7588	56	8909.7988	101.0906

(Continued)

Age x	l_x	d_x	Age x	l_x	d_x
57	8808.7082	108.3295	84	2152.3957	295.0353
58	8700.3787	115.7324	85	1857.3604	272.7571
59	8584.6463	123.4386	86	1584.6033	248.5228
60	8461.2077	131.6141	87	1336.0805	223.2858
61	8329.5936	140.4869	88	1112.7947	197.8404
62	8189.1067	150.2947	89	0914.9543	172.8523
63	8038.8120	161.3229	90	0742.1020	148.8612
64	7877.4891	173.8326	91	0593.2408	126.0963
65	7703.6565	188.1079	92	0467.1445	105.1827
66	7515.5486	204.3703	93	0361.9618	086.3366
67	7311.1783	220.1542	94	0275.6252	069.6684
68	7091.0241	233.9045	95	0205.9568	055.2016
69	6857.1196	246.4654	96	0150.7552	042.8831
70	6610.6542	259.8185	97	0107.8721	032.6014
71	6350.8357	274.2481	98	0075.2707	024.2007
72	6076.5876	288.4291	99	0051.0700	017.4928
73	5788.0955	301.4672	100	0033.5772	012.2712
74	5486.6283	313.1603	101	0021.3060	008.3208
75	5173.4680	322.9641	102	0012.9852	005.4275
76	4850.5039	331.5174	103	0007.5577	003.4017
77	4518.9865	339.5205	104	0004.1560	002.0331
78	4179.4660	345.5875	105	0002.1229	001.1413
79	3833.8785	348.6759	106	0000.9816	000.5866
80	3485.2026	347.4015	107	0000.3950	000.2653
81	3137.8011	341.0978	108	0000.1297	000.0988
82	2796.7033	329.9523	109	0000.0309	000.0269
83	2466.7510	314.3553	110	0000.0040	000.0040

APPENDIX D

PRESENT VALUE COMPUTATIONS

Illustrative Case

Consider the case of an executive who is now age 50 and who is promised under his corporation's pension plan a retirement benefit of \$20,000 per year to begin at age 65 and continue for life. Let us assume that our best estimate of the tax bracket he will be in upon retirement suggests that, after personal taxes, this benefit will amount to \$10,000 each year. If the annual discount rate which expresses the time value of money to the executive—his relevant "opportunity cost"—is r, the present value to him as of age 50 of the payment he expects to receive during the first year of his retirement is

$$PV(65) = (\$10{,}000)({}_{15}p_{50})(1 + r)^{-15}$$

where ${}_{15}p_{50}$ denotes the probability that he will in fact attain age 65 and is equal to the ratio l_{65}/l_{50} from the appropriate mortality table.[1] Thus this present value is really a present *expected* value. It represents the (discounted) mean payoff associated with a discrete probability distribution, which, as it applies to each potential retirement benefit, has but two possible outcomes: the man in question attains the age at which the benefit is to be paid; or he dies beforehand. The complete expression for $PV(65)$ in this case therefore is

$$PV(65) = (\$10{,}000)({}_{15}p_{50})(1 + r)^{-15} + (0)(1 - {}_{15}p_{50})(1 + r)^{-15}.$$

But since the value of the second term is—and, clearly, always will be—zero, it may be neglected.

Similarly, the present value of the benefit due at age 66 is

$$PV(66) = (\$10{,}000)({}_{16}p_{50})(1 + r)^{-16}.$$

[1] See Appendix B.

And, for the entire series of benefits:

$$PV = \sum_{n=65}^{w} PV(n)$$

where w refers to the highest age which, according to the relevant mortality table, the executive can possibly attain. In the instance of the mortality table depicted in Appendix B, for example, w is equal to 110.

The Noncontributory Pension

Since the only benefits due an employee under a noncontributory corporate pension plan are a series of equal annual payments beginning at retirement and continuing until he dies, the present value expression for such an arrangement is quite simple. It will be assumed here and in each of the subsequent appendixes dealing with the value of these plans that retirement is expected to occur at age 65. The actuarial symbols defined in Appendix B will be used throughout.

If the annual before-tax retirement benefit promised is \$1 and the applicable effective tax on it is denoted by t, the present value to a man now age x of the payment he expects to receive in the first year of his retirement (at age 65) is

$$PVRB(65) = (1 - t)\left(\frac{l_{65}}{l_x}\right)\left(\frac{1}{1 + r}\right)^{65-x};$$

that of the payment anticipated in the following year is

$$PVRB(66) = (1 - t)\left(\frac{l_{66}}{l_x}\right)\left(\frac{1}{1 + r}\right)^{66-x};$$

and, in general,

$$PVRB(65 + n) = (1 - t)\left(\frac{l_{65+n}}{l_x}\right)\left(\frac{1}{1 + r}\right)^{65-x+n}$$

for $0 \leq n \leq 35$, since age 110 is the ultimate age tabulated in the mortality table employed here. If we then define

$$v = \frac{1}{1 + r}$$

$$D_x = v^x l_x$$

and multiply both numerator and denominator of the expressions above by v^x, they can be rewritten as:

$$PVRB(65) = (1 - t)\left(\frac{v^x}{v^x}\right)\left(\frac{l_{65}}{l_x}\right)(v^{65-x}) = (1 - t)\left(\frac{D_{65}}{D_x}\right)$$

$$PVRB(66) = (1 - t)\left(\frac{D_{66}}{D_x}\right)$$

$$PVRB(65 + n) = (1 - t)\left(\frac{D_{65+n}}{D_x}\right).$$

This is a rather less cumbersome form with which to work.

The present value of the entire pension promise, comprised as it is of only the indicated payments, is, therefore,

$$PV = \sum_{n=1}^{35} PVRB(65 + n)$$

$$= (1 - t)\left(\frac{D_{65} + D_{66} + \cdots + D_{110}}{D_x}\right).$$

And, finally, defining the symbol

$$N_x = \sum_{n=x}^{110} D_n = D_x + D_{x+1} + \cdots + D_{110},$$

we can write, as the relevant after-tax present value formula per dollar of before-tax prospective retirement benefit,

$$PV = (1 - t)\left(\frac{N_{65}}{D_x}\right).$$

A tabulation of the values for N_x and D_x over the appropriate range of ages then permits a rapid and convenient computation of the worth of any noncontributory pension considered.

The Contributory Pension

The benefit format and tax treatment of a contributory corporate pension plan are considerably more complex than those of its noncontributory counterpart. There are three different sets of prospective payments under such a plan:

1. The annual retirement benefit itself, due to begin at age 65 and continue thereafter for the life of the employee;

2. A death benefit payment consisting of a return of the interest-accumulated value of the employee's contributions if he dies prior to retirement;

3. A death benefit payment equal to the difference between the interest-accumulated value of the employee's contributions as of age 65 and the aggregate retirement benefits he has received if he should die after retiring.

The three will be considered separately here. The analysis again will be cast in terms of a $1 annual before-tax retirement benefit promise to the employee.

THE ANNUAL RETIREMENT BENEFIT

Depending on the amount the employee contributes to the pension plan over the years, either of two tax rules applies to his retirement benefits. If the aggregate amount of his contributions is less than the total benefits he expects to receive during the first *three* years of retirement, the full amount of each receipt is tax-free until those contributions have been recouped. All subsequent payments are taxable in their entirety at regular personal income rates.

If the aggregate contributions exceed three years' worth of retirement benefits, the "life-expectancy" tax rule applies. Under that alternative, a portion of each benefit receipt is considered tax-free regardless of how long the employee lives to collect his pension. The relevant portion is determined as follows:[2] The maximum postretirement death benefit payable under the plan is divided by the amount of the annual retirement benefit due. The result denotes the number of years it takes to "earn out" that benefit—to reduce it to zero—given that every dollar of pension received automatically diminishes the prospective death benefit by $1. This figure is then rounded off to the nearest integer and an adjustment percentage obtained by entering Table III of IRS regulation 1.72-9 under the indicated number of years. This adjustment percentage is applied to the aggregate amount of the employee's lifetime contributions to the pension plan in order to reduce that total as the basis

[2] This is the procedure referred to in footnote 30 of Chapter 2.

for calculating the tax-free percentage according to the "life-expectancy" rule.

To illustrate: assume that an executive, now age 50, is required to contribute \$5,000 per year to his firm's pension plan and is promised thereunder an annual retirement benefit of \$20,000. By age 65, he will have contributed \$75,000 to the plan. Since he stands to receive only \$60,000 in benefits during the first three years of his retirement, the life-expectancy tax rule applies.[3] Suppose, further, that the \$75,000 in contributions will accumulate, at the rate of interest specified in the pension agreement,[4] to \$90,000 by age 65 if all fifteen payments are made. This amount then is the maximum postretirement death benefit payable under the plan and is the pertinent figure for our computations. Thus, the length of time it will take to recoup that sum in pension benefits is

$$\frac{\$90{,}000}{\$20{,}000/\text{yr.}} = 4.5 \text{ years.}$$

Rounding this off to five years and entering the designated IRS table for retirement at age 65 and a five-year recoupment period, the "adjustment factor" turns out to be 7 per cent. This means that the remainder, i.e., 93 per cent, of the executive's aggregate (unaccumulated) contributions of \$75,000 are the basis for determining the tax-free portion of his annual pension benefit. Because the IRS also specifies that fifteen years is the average life expectancy for a man age 65, the assumption for tax purposes is that our executive stands to receive a total of \$300,000 in pension benefits before he dies. Therefore, $\frac{(.93)(75{,}000)}{300{,}000}$, or .232, of each annual payment will be considered tax-free.

By way of general notation, then, we may express the after-tax present value to a man age x of a \$1 per year before-tax retirement benefit promise under a contributory pension plan as

[3] If his contributions amounted to \$2,000 per year instead, the total would come to \$30,000 by age 65. Thus the alternative tax treatment would take effect, all \$20,000 of the first pension receipt and \$10,000 of the second being tax-free.

[4] This rate will be assumed here to be equal to 2½ per cent. The rates for most pension plans are in fact very close to this figure.

$$PVRB = (1 - t_1)\left(\frac{l_{65}}{l_x}\right)(v^{65-x}) + (1 - t_2)\left(\frac{l_{66}}{l_x}\right)(v^{66-x})$$
$$+ (1 - t_3)\left(\frac{l_{67}}{l_x}\right)(v^{67-x}) + (1 - t_4)\sum_{n=68}^{110}\left(\frac{l_n}{l_x}\right)(v^{n-x})$$

where t_1 = effective tax rate on first year's benefit,
t_2 = effective tax rate on second year's benefit,
t_3 = effective tax rate on third year's benefit,
t_4 = effective tax rate on fourth and subsequent years' benefits.

These are determined by obtaining the appropriate tax-free portions from the procedures described above and calculating the regular personal income tax levies on the remainder. In the case of the life-expectancy rule, of course, $t_1 = t_2 = t_3 = t_4$.

If both numerator and denominator of each term on the right-hand side of the equation are multiplied by v^x, and the symbols D_x and N_x are introduced as above, this standard formula reduces to

$$PVRB = (1 - t_1)\left(\frac{D_{65}}{D_x}\right) + (1 - t_2)\left(\frac{D_{66}}{D_x}\right)$$
$$+ (1 - t_3)\left(\frac{D_{67}}{D_x}\right) + (1 - t_4)\left(\frac{N_{68}}{D_x}\right),$$

or, for a life-expectancy rule situation,

$$PVRB = (1 - t)\left(\frac{N_{65}}{D_x}\right)$$

which, except for the value for t which will pertain, is the same result as for a noncontributory pension.

POSTRETIREMENT DEATH BENEFITS

If the annual contributions to the pension plan by the employee per dollar of before-tax retirement benefit are K, and they accumulate interest at a rate i under the terms of the plan, a man now age x will have amassed, at age 65, a sum equal to

$$K(1 + i)^{65-x} + K(1 + i)^{65-(x+1)} + K(1 + i)^{65-(x+2)}$$
$$+ \cdots + K(1 + i) = MDB.$$

As indicated in the preceding section, this figure represents the maximum death benefit payable to the employee's estate if he should die after retiring.

Using

$$S_n = \sum_{a=1}^{n} (1 + i)^a$$

to denote the accumulated value of a series of n payments as of the end of the nth period, we have: $MDB = KS_{65-x}$.[5] Every dollar of pension benefit received in retirement then reduces the amount of the prospective payment to the estate until the entire sum is recouped, at which time the death settlement provision ceases. Thus, if the employee should die after attaining age 65 and receiving the first annual installment of his pension ($1 in the situation chosen as standard here) but before attaining age 66, his estate will be paid the amount: $(KS_{65-x}) - 1$. If he dies the following year, the payment will be $(KS_{65-x}) - 2$, and so on. A portion of any such payments—that amount deemed by the IRS to consist simply of a return of the employee's contributions—is taxed at whatever estate tax rates apply and the remainder—the interest earnings imputed to those contributions—is taxed as a long-term capital gain. On the assumption suggested in Chapter 2, that 25 per cent is a reasonable approximation of over-all effective estate tax rates for executives, the division of these death benefits into the two components is a matter of indifference to the present calculations. A 25 per cent rate is taken to apply to both portions and therefore to the total, whatever its breakdown.

Since the probability that an employee, now age x, will die during the first year of his retirement is denoted by the ratio d_{65}/l_x,[6] the after-tax present value of that first possible postretirement death benefit is

$$PVDB(65) = (KS_{65-x} - 1)(.75)\left(\frac{d_{65}}{l_x}\right)v^{66-x}.$$

This benefit is discounted back $66 - x$ years on the conventional actuarial assumption that such payments are made at the *end* of the year in which death occurs. The present value of the following year's benefit is

$$PVDB(65) = (KS_{65-x} - 2)(.75)\left(\frac{d_{66}}{l_x}\right)v^{67-x}.$$

[5] Which was equal to $90,000 in the illustration cited above.
[6] See Appendix B.

The aggregate present value of the entire series of these potential receipts may therefore be represented as

$$PVDB = \sum_{n=65}^{m} PVDB(n)$$

where m refers to the age at which the sum (KS_{65-x}) is finally drawn down to zero.

PRERETIREMENT DEATH BENEFITS

If the executive should die *before* reaching age 65, his estate stands to receive the interest-accumulated value of the contributions he has made up to that time. Thus, if our man, age x, should die within the coming year, he will have contributed an amount K and his estate will receive $K(1 + i)$ in return—again assuming payment at the end of the year. Of this amount, K is taxed at estate tax rates and iK at capital gains rates. Continuing the assumption that the two percentages are equal, a flat rate of 25 per cent applies to the entire benefit in the calculations here. After taxes, then, the benefit payable upon death at age x is

$$DB(x) = (.75)(K)(1 + i)$$

and its present value is

$$DBPV(x) = (.75)(K)(1 + i)(v)\left(\frac{d_x}{l_x}\right).$$

If the employee dies the following year, he will have made two contributions to the plan, and the resulting after-tax death benefit will be

$$DB(x + 1) = (.75)(K)[(1 + i) + (1 + i)^2] = (.75K)(S_2).$$

This has a present value equal to

$$DBPV(x + 1) = (.75K)(S_2)(v^2)\left(\frac{d_{x+1}}{l_x}\right).$$

In general, therefore,

$$DBPV(x + n) = (.75K)(S_{n+1})(v^{n+1})\left(\frac{d_{x+n}}{l_x}\right)$$

and, for the complete set of such payments,

$$DBPV = \sum_{n=0}^{64-x} DBPV(x+n).$$

This last is the total present value of the preretirement death benefit feature.

THE CONTRIBUTIONS

The employee's obligation to contribute to the financing of the pension plan, of course, represents to him a negative present value that must be subtracted from the aggregate value of the indicated benefits in order to obtain the appropriate net figure for the whole package. For a man now age x, that negative present value can be expressed as

$$NKPV = K\left(\frac{l_x}{l_x}\right) + Kv\left(\frac{l_{x+1}}{l_x}\right) + Kv^2\left(\frac{l_{x+2}}{l_x}\right) + \cdots + Kv^{64-x}\left(\frac{l_{64}}{l_x}\right).$$

Each term is the product of the probability that he will live to make the required contribution and the discounted amount of that contribution. This expression ultimately reduces to

$$NKPV = \left(\frac{N_x - N_{65}}{D_x}\right)(K)$$

following the notation introduced above.

THE TOTAL

The combined present value of the various benefit provisions of the contributory pension. therefore, is simply: $PV = PVRB + PVDB + DBPV - NKPV$. The necessary computations can be programmed with little difficulty, given the appropriate mortality data and discount rates.

The Individual Retirement Annuity

The form of individual annuity chosen as the executive's market alternative to both types of pension arrangements has two component benefit provisions: the retirement benefit itself; and a preretirement death benefit. Their tax treatment generally resembles that of the contributory pension.

THE RETIREMENT BENEFIT

The annual retirement benefit is to begin at age 65 and continue for the life of the employee. According to the IRS, that portion of each receipt represented by the ratio of total premiums paid to total benefits anticipated is exempt from the personal income tax. Thus, if the annual premium quoted to a man, age x, for the purchase of a $1 per year retirement annuity is denoted by P_x, he will have to pay a total of $(P_x)(65 - x)$ dollars in premiums through age 64. Given a fifteen-year life expectancy at age 65—the IRS' figure—he is assumed to have fifteen $1 annuity benefits in store. Therefore, the tax-free portion of each such benefit will be

$$f = \frac{(P_x)(65 - x)}{15}$$

and the after-tax present value of that benefit stream will be

$$PVB = (1 - t)\left(\frac{l_{65}}{l_x}\right)(v^{65-x}) + (1 - t)\left(\frac{l_{66}}{l_x}\right)(v^{66-x}) + \cdots + (1 - t)\left(\frac{l_{110}}{l_x}\right)(v^{110-x})$$

or, ultimately,

$$PVB = (1 - t)\left(\frac{N_{65}}{D_x}\right)$$

where the effective tax rate, t, depends on the value of f.

THE PRERETIREMENT DEATH BENEFIT

If the prospective annuitant should die before reaching age 65, his estate receives as a settlement the "cash surrender value" of the contract as of the time of death. The applicable schedule of these cash values is specified in the annuity agreement, and it is necessary to have that schedule in order to perform the present value computations.[7] When and if payment is made, the entire amount is taxed to the man's estate at the normal rates—25 per cent by assumption here—and, in addition, any excess over the aggregate premiums paid up to that time is

[7] See Appendix K for the schedule used in the empirical portion of the current study.

taxed as a long-term capital gain. In determining the latter assessment, however, the estate tax on the relevant portion is deducted in defining the tax base.

To illustrate: If a man who has paid ten \$500 annual premiums toward the purchase of a retirement annuity dies, and his estate receives a \$6,000 death benefit, the tax thereon is: (a) 25 per cent of \$6,000, or \$1,500 in estate taxes and (b) 25 per cent of (\$6,000 — \$5,000)(.75), or \$187.50 in capital gains taxes. This comes to \$1,687.50 in all. The \$250 in estate tax payable on the \$1,000 difference is excluded from additional taxation.

In general, then, if P_x is the annual premium required and CV_{x+n} the cash value/death benefit payable at age $x + n$, the after-tax amount of that benefit is

$$DB(x + n) = (.75)(CV_{x+n}) - (.25)(.75)[(CV_{x+n}) - (n + 1)(P_x)].$$

Its present value is:

$$DBPV(x + n) = [DB(x + n)]\left[\frac{d_{x+n}}{l_x}\right](v^{n+1}).$$

And the present value of the complete set of such payments is:

$$DBPV = \sum_{n=0}^{64-x} DBPV(x + n).$$

THE ANNUITY AS A WHOLE

The total present value of a \$1 per year individual retirement annuity arrangement to a man, age x, is therefore: $PV = PVB + DBPV$, since no postretirement death benefits are included in the package specified here.

APPENDIX E

ELIGIBILITY REQUIREMENTS FOR "QUALIFIED" CORPORATE RETIREMENT PLANS

The annual payments a corporation makes either to its own trust fund or to an insurance company in order to meet the anticipated cost of its employee pension plan are tax deductible if that plan satisfies the following requirements:

1. The plan is permanent.
2. The plan is for the exclusive benefit of employees and their beneficiaries.
3. The distribution of benefits under the plan is on the basis of an explicit and predetermined formula.
4. Contributions by the corporation and benefit payments do not discriminate in favor of the firm's officers, shareholders, supervisory employees, or highly paid employees.
5. The plan benefits either (a) 70 per cent of all employees, (b) 80 per cent of all eligible employees, provided at least 70 per cent of all employees are eligible, or (c) all employees within a classification which does not discriminate in favor of highly paid employees.

Deductions for such plans are limited to 15 per cent of the direct annual payroll cost of the employees covered by the plan, except where a larger amount is required to provide for the funding of past service credits.

If the plan does not meet the indicated requirements, the employer company may deduct contributions to it only if the covered employees' rights to the benefits promised are nonforfeitable. Otherwise, no tax deduction at all is allowed, either at the time contributions to the fund are made or when retirement benefits to the employees are ultimately paid. See Internal Revenue Code, Sections 401 and 404 as summarized in Joint Economic Committee, Congress of the United States, *The Federal Tax System: Facts and Problems* (Washington: 1964), pp. 120–121.

APPENDIX F

PRESENT VALUE AND CURRENT EQUIVALENT OF A DEFERRED COMPENSATION CONTRACT

As was indicated in the text, the type of contract adopted here as a standard for computational purposes is probably the most common deferred compensation instrument in use today. It consists, as does a contributory pension, of three benefit provisions: postretirement deferred payments to the executive, a preretirement death benefit, and a postretirement death benefit. It was possible to fit just about every arrangement actually confronted into the analytical mold developed for this benefit package, even if the deferred payments were to be made in shares of the corporation's stock rather than in cash. The methodology for doing so is discussed in Chapter 5 and in Appendix H below. Both discussions build on the basic framework to be outlined here.

The Deferred Payments to the Executive

The central feature of deferred compensation contracts is, of course, the promise by the corporation to pay a specified sum to the executive each year for a given number of years following his retirement. Unlike the benefits under a pension plan, these payments are to cease after that given period, even though the executive may continue to live. Since the executive himself is not required to contribute any of his own funds to the arrangement, the full amounts of any payments he eventually receives are taxable to him at regular personal income tax rates.

The after-tax present value to a man, now age x, of the deferred payments he stands to receive may therefore be expressed as

$$PVDP = (A)(1 - t)\left(\frac{l_{65}}{l_x}\right)(v^{65-x}) + (A)(1 - t)\left(\frac{l_{66}}{l_x}\right)(v^{66-x})$$
$$+ \cdots + (A)(1 - t)\left(\frac{l_{65+R-1}}{l_x}\right)(v^{65+R-1})$$

or:

$$PVDP = (A)(1 - t)\left(\frac{N_{65} - N_{65+R}}{D_x}\right)$$

where A denotes the annual before-tax payment in prospect, t the effective personal tax rate thereon. and R the number of years for which payments are to be made.

The Preretirement Death Benefit

If the executive dies before age 65, a lump-sum settlement with his estate in the amount of the aggregate payments due if he had lived is typically made. Thus his heirs would receive $(A)(R)$ dollars in the situation just depicted, all of which is taxable at whatever estate tax rates apply. By assumption here, 25 per cent is taken to be a reasonable estimate of the latter. Thus the after-tax present value of the preretirement death benefits under the contract for a man now age x comes to

$$PVDB1 = (.75AR)\left[\left(\frac{d_x}{l_x}\right)(v) + \left(\frac{d_{x+1}}{l_x}\right)(v^2) + \cdots + \left(\frac{d_{64}}{l_x}\right)(v^{65-x})\right].$$

The Postretirement Death Benefit

A similar settlement is made after retirement as well, if the executive does not survive to claim all R payments promised him. The only difference is that the amount of those installments already received is deducted from the total contracted for in determining the size of the death benefit—which again is taxed in full at estate tax rates. If he should die after attaining age 65 and receiving the first annual payment, but before reaching age 66, for example, his estate would be awarded $(A)(R - 1)$ dollars and would net, in the view here, 75 per cent of that amount after taxes. If he died in the following year, the payment would be $(A)(R-2)$ dollars, and so on. The after-tax present value of all such receipts as of age x is, then,

$$PVDB2 = (A)(R-1)(.75)\left(\frac{d_{65}}{l_x}\right)(v^{66-x}) + (A)(R-2)(.75)\left(\frac{d_{66}}{l_x}\right)(v^{67-x})$$

$$+ \cdots + (A)(.75)\left(\frac{d_{65+R-2}}{l_x}\right)(v^{65+R-1}).$$

By convention, the executive if he lives receives his deferred pay at the *beginning* of each year but any death benefits are remitted at the *end* of the year.

The present value of the whole deferred compensation package is, of course, simply the total of the three expressions developed above: $DCPV = PVDP + PVDB1 + PVDB2$.

The Current Income Equivalent

Given this present value, the stream of salary payments which are defined here as the "after-tax current income equivalent" of the arrangement in question can be computed. Those payments are specified to begin at age x and continue through age 64, being payable only to the executive and therefore of sufficient size that they connote the requisite present value when discounted for mortality as well as for time deferral. In the case at hand, therefore, the relevant condition is that

$$(ATCEQ)\left[\left(\frac{l_x}{l_x}\right) + \left(\frac{l_{x+1}}{l_x}\right)(v) + \cdots + \left(\frac{l_{64}}{l_x}\right)(v^{64-x})\right] = DCPV$$

where $ATCEQ$ denotes the necessary annual salary payment. Rearranging and substituting the shorthand actuarial symbols used previously, we find that

$$ATCEQ = \frac{(D_x)(DCPV)}{(N_x - N_{64})}.$$

Were the executive's annual after-tax salary raised by this amount, he would be as well off, looking ahead at age x, as he is in fact with the deferred compensation arrangement described.

APPENDIX G

EXECUTIVE STOCK OPTIONS

Section 218 of the Revenue Act of 1950 added "Section 130A: Employee Stock Options" to the Internal Revenue Code. It established rules for the favorable tax treatment of what were termed "Restricted Stock Options" granted to employees of corporations. In order to qualify for that designation, the option was required to satisfy the following conditions:

1. It must have been granted after February 26, 1945, to an individual for a reason connected with his employment.
2. It must have been granted by the employer corporation or its parent or subsidiary to purchase stock of such corporations.
3. The option price must have been at least 85 per cent of the fair market value of the optioned stock at the time the option was granted.
4. The option must be nontransferable except by will or by the laws of descent and distribution.
5. It could be exercisable, during the lifetime of the optionee, only by him.
6. The optionee, at the time the option was granted, could not have owned stock possessing more than 10 per cent of the combined voting power of all classes of stock of the employer corporation.

If the option met those requirements, and if the optionee: (1) was an employee of the corporation granting the option or of its parent or subsidiary at the time he exercised the option—or had been one within three months beforehand—and (2) did not dispose of the stock acquired under the option until at least two years after the date the option was granted or until at least six months after the date the option was exercised, he was eligible for the following special tax treatment:

1. If the option price was 95 per cent or more of the market value of the stock at the time the option was granted, any gain from the subsequent sale

of the optioned stock was considered a capital gain and taxed accordingly.

2. If instead the option price was between 85 and 95 per cent of the market value of the stock at the time the option was granted, any profit realized upon subsequent resale was taxed as follows: (a) if, at the time of the sale, the market price of the stock was less than the market price when the option was granted, the difference between the option price and the sale price was treated as ordinary income at the time of the sale; (b) if, at the time of the sale, the market price of the stock was greater than the market price when the option was granted, the difference between the option price and the market price at the date of granting was treated as ordinary income; the excess of sale price over that market price was considered a capital gain.

The law also provided that, in the event of a stock split or a stock dividend payable to the employer corporation's shareholders, the number of shares under option to the executive, and the option price, could be adjusted to reflect that change. No deduction from taxable income pursuant to either the granting or the eventual exercise of the option was allowed the corporation itself.

The revision of the Internal Revenue Code undertaken by Congress in 1954 made several modifications in these rules. Chief among them were:

1. The restriction as to those individuals who owned more than 10 per cent of the employer corporation's stock was removed. It was specified, however, that any options granted to such persons had to be issued at a price not less than 110 per cent of the market price on the date of granting if they were to qualify as "Restricted" stock options.

2. Variable-price options were sanctioned. According to this provision, it became possible to reduce the price of an option previously granted under certain conditions if it turned out that the market price of the optioned stock declined subsequent to the granting of the option and the new, lower price persisted for a significant period of time.

3. A limit of ten years was placed on the term of a single option.

The rest of the 1950 legislation was retained substantially intact, and the entire set of regulations became Section 421 rather than Section 130A of the Revenue Code.

In 1964, however, a major change in the relevant statutes occurred.

A much less favorable view of the privileges that should be associated with the option was adopted by Congress, and the attractiveness of that device diminished noticeably. The revised legislation (now Sections 421–425 of the Revenue Code) specified that, in order for an option to be awarded special tax treatment under the new designation "Qualified Stock Option":

1. The option price must equal or exceed the market value of the stock involved at the time the option is granted.
2. The option must be exercised within five years of the date of its granting.
3. The shares of stock acquired under the option must not be resold within three years of the date it is exercised.
4. The option must be granted pursuant to a plan which specifies the number of shares of stock to be issued and the employees or class of employees who are to receive the options. This plan must be approved by the shareholders of the corporation within twelve months of its adoption and cannot extend for more than ten years.
5. The option price cannot be reduced in the face of declining stock market conditions nor can the option, by its terms, be exercisable while there is outstanding an option which was granted to the same employee at an earlier time.
6. The optionee, immediately before the option is granted, must not own stock representing more than 5 per cent of the voting power or value of all classes of stock of the issuing corporation (up to 10 per cent in the case of certain specified small businesses).

If these conditions are met, the difference between the market price of the stock acquired under option at the time it is eventually resold and the original option price is considered to be a long-term capital gain and is taxed accordingly.

If instead the optionee disposes of the stock less than three years but more than six months after exercise, the spread between the option price and the market price on the date of *exercise* is taxed as ordinary income at the time the stock is sold. The difference between the market price at the time of the sale and that at the time of exercise is taxed as a capital gain.

Finally, if the stock acquired is resold within six months of exercise, any profits are taxable in full as ordinary income.

Valuation Under the New Tax Law

Despite these rather substantial changes in the tax treatment of options, the procedures described in Chapter 4 of the text for measuring the compensatory value of—and constructing "current income equivalents" for—options granted before 1964 can be applied directly to those issued under the new legislation as well. It is true that, as a result of that legislation, executives are likely to enjoy somewhat more modest option profits in the future than they have in the past, but the basic character of the instrument has not been altered, and our approach to its valuation should require no important adjustments.

For example, the fact that the maximum term of the option has been shortened to five years and the minimum option price raised to 100 per cent of market on the date of granting merely implies that these parameters will now determine the duration and magnitude of the executive's stock option current equivalent instead of the ten-year, 95 per cent combination most frequently encountered prior to 1964. Similarly, the restriction that employees who own stock representing more than 5 per cent of the voting power or value of all classes of stock of the employer corporation cannot now qualify for favorable tax treatment on any options they are granted simply means that a slightly smaller number of executives may end up receiving such options in the years to come than might otherwise have been the case. There is, however, no reason to view those who do still qualify and differently than we have in the past.

The one provision of the new tax law which might suggest a revision of our valuation procedures is that which specifies a holding period of three years from the date of exercise of an option as a requirement for capital gains tax treatment of any profits realized upon resale of the shares thus acquired. It was argued in Chapter 4 that under the original stock option legislation the compensation implicit in the optionee's opportunity to purchase shares of stock at a discount from the prevailing market price could be measured very precisely by the size of that discount at the time it was claimed, i.e., on the date of the option's exercise. From that point on the optionee stood in the same position as any investor who might have purchased a like number of shares on the open market; the only difference between his opportunities and everyone else's was the initial purchase discount itself. Under those conditions, the gap between option price and market price at exercise completely defined the optionee's net market advantage and supplied us with an accurate index of the compensation he obtained from his option.

According to the rules currently in effect, however, the executive who exercises an option is subject to a constraint which is not imposed on other investors: he must wait a full three years before reselling the shares he has purchased in order to avoid having his profits taxed as ordinary income. The question therefore arises as to whether there should be some downward adjustment in our appraisal of the value of that option to reflect this requirement. The position taken here is that the indicated constraint is more apparent than real and that no such adjustment is necessary, since the optionee's market activities are not in practice limited by the additional holding period per se and he is not put at any meaningful disadvantage by it.

For one thing, most executives retain the shares acquired pursuant to the exercise of stock options in their portfolios for a substantial period of time, even in the absence of formal sanctions for not doing so.[1] They seem to consider an option a convenient vehicle for obtaining on favorable terms a long-run ownership interest in their firms rather than a speculative opportunity to realize quick profits. Few of them are therefore likely in practice to feel themselves differentially "locked in" to the shares thus purchased even in the face of a three-year waiting period. It may well be, of course, that those shares simply take the place of some the optionee would otherwise have acquired in the normal course of affairs, and that on balance his aggregate holdings of the stock of his employer are not increased over time. That is quite a different issue, however, and one which deserves to be treated on its own merits. The fact remains that executives have not in the past typically resold optioned stock for several years, even though they could have done so without a tax penalty.[2]

[1] For evidence on this point, see: George E. Lent and John A. Menge, "The Importance of Restricted Stock Options in Executive Compensation," *Management Record*, June 1962.

[2] Clearly, other types of implicit or informal sanctions threatened by the organizations to which such executives belong may, in part at least, account for

There is also evidence that, in general, top corporate executives maintain a fairly sizeable ownership interest in their respective firms apart from any shares acquired through the exercise of stock options. Thus, if an optionee should decide to liquidate a portion of his holdings in order to free funds for consumption or other investments, he can almost certainly do so by selling off shares which were purchased in the normal manner and which have been held long enough to qualify for capital gains tax treatment. In this manner, optioned stock is effectively insulated from the tax penalties of short-term trading.

Both of these arguments are, of course, empirical.[3] The contention is that a long holding period requirement is not a real constraint for the great majority of executives who are granted options because they can and will ordinarily hold for several years anyway. Nonetheless, for certain individuals this will not—or would not by preference—be true, and in their case the worth of the option will be somewhat overstated by utilizing the pre-1964 valuation procedures and current income equivalent format for options granted thereafter. Even for some of these individuals, however, there is a way out which still preserves the validity of the position taken here. If the optionee's problem is only one of liquidity, he need not accept a tax penalty in order to raise funds. He can simply borrow against the value of his stock and repay the loan later by liquidating his holdings after the three-year period expires. It is only in situations where the optionee would, but for tax considerations, dispose of the shares he has acquired within three years because he anticipates a decline in price or perceives a more favorable alternative investment opportunity that he does in fact find himself at a disadvantage vis-à-vis the market.[4] As was suggested above, this problem should not

this phenomenon. Thus, the executive might hesitate to dispose of shares he has acquired under option for fear of having that action interpreted by his superiors or by the firm's shareholders as an expression of his lack of confidence in its future prospects.

[3] And, as such, clearly require more documentation than they have been given here, if they are actually to be used as a basis for valuation.

[4] It is worth noting that, were it possible for top corporate executives to *sell short* shares of their firms' stock, the adverse tax consequences associated even with these situations could be circumvented. Thus the optionee would, instead of selling off stock acquired under option, go short in an equal number of shares at what seemed to him the opportune time. He would then cover that short sale with the proceeds of the sale of the optioned shares as soon as they were eligible for capital gains tax treatment. Unfortunately—for us, that is—

arise frequently. When applied to executive stock options issued under the new tax law, therefore, the techniques developed in Chapter 4 will no more than slightly overstate their "true" value.

the senior officers and directors of large publicly held corporations are prohibited by the SEC from engaging in such activities (Securities and Exchange Act, Section 9).

APPENDIX H

PRESENT VALUE AND CURRENT EQUIVALENTS OF OTHER COMPENSATION ARRANGEMENTS

Deferred Stock Bonuses

The analytical framework for measuring the compensatory value of a postretirement deferred stock bonus arrangement is essentially the same as that developed for cash deferred pay contracts. The benefit structures and tax treatment of the two instruments are virtually identical, the only difference being the form in which benefits are ultimately transmitted. Thus a deferred stock bonus provides for: (1) a series of annual payments to the employee in retirement, each consisting of a specified number of shares of the employer corporation's common stock; (2) The immediate transferral of all the shares set aside under that arrangement to the employee's estate if he dies prior to retirement; and (3) an immediate settlement with the estate in the amount of the remaining installments due if the employee dies after retiring but before enjoying the full series of annual payments designated.

The shares received are taxed to the employee at regular personal income tax rates or to his estate at the applicable estate tax rates—in both cases according to the market value of those shares at the time of *receipt*. The one peculiarity of the valuation procedure required for such an arrangement is the necessity to make a new appraisal of the worth of the benefit package periodically as stock prices change, even if no additional shares are allotted to it.

THE ANNUAL RETIREMENT PAYMENTS

If an executive, age x, is promised a deferred stock bonus consisting of a series of R annual payments of K shares each, to begin upon his retirement at age 65, and if the current market price of those shares is

P_x dollars each, the after-tax present value of the prospective payments may be written as

$$PVRP(x) = (K)(P_x)(1 - t)\left[\left(\frac{l_{65}}{l_x}\right)(v^{65-x}) + \left(\frac{l_{66}}{l_x}\right)(v^{66-x}) + \cdots + \left(\frac{l_{65+R-1}}{l_x}\right)(v^{65+R-1})\right];$$

or, more conveniently,

$$PVRP(x) = (K)(P_x)(1 - t)\left(\frac{N_{65} - N_{65+R}}{D_x}\right)$$

where t denotes the over-all effective personal tax rate associated with an annual income of size $(K)(P_x)$.[1]

If, by the time the executive reaches age $x + 1$, the market price of the shares involved has changed, it is necessary to adjust our estimate of the value of his deferred bonus to reflect this change in his circumstances. Thus we have

$$\Delta PVRP(x + 1) = (K)(P_{x+1} - P_x)(1 - \Delta t)\left(\frac{N_{65} - N_{65+R}}{D_{x+1}}\right).$$

This represents the after-tax present value as of age $x + 1$ of the increase (or decrease) in the worth of the bonus agreement occasioned by the stock price rise (or fall) experienced during the preceding year. The notation Δt refers to the effective personal tax rate on the *increment*. This procedure is then repeated every year until the man retires, the result being a *series* of present value computations for each deferred bonus observed.[2]

PRERETIREMENT DEATH BENEFITS

Assuming 25 per cent to be a fair approximation of the relevant estate tax levy for executives, the present value as of age x of the pre-

[1] As indicated in the discussion of these instruments in Chapter 5, footnote 11, 5 per cent per annum is deemed the appropriate discount rate for purposes of calculating present values. Therefore, the symbol v in the equations above is defined as $(1/1.05)$ rather than the $(1/1.025)$ figure used for pension and cash deferred compensation arrangements.

[2] As noted in the text in connection with stock option valuation, the change in stock price could be recorded every month or every quarter if a more frequent appraisal and revision of the worth of the particular arrangement were considered desirable. Since the analysis throughout the present study has been in terms of annual data, however, that orientation will be maintained here.

retirement death benefits payable under the arrangement described above is

$$PVDB1(x) = (.75)(K)(P_x)(R)\left[\left(\frac{d_x}{l_x}\right)(v) + \left(\frac{d_{x+1}}{l_x}\right)(v^2) + \cdots + \left(\frac{d_{64}}{l_x}\right)(v^{65-x})\right].$$

Except for the substitution of the product $(K)(P_x)$ for the annual cash payment A. this is a duplicate of the expression derived in Appendix F for a regular deferred compensation contract.

Every year in which the market price of the stock changes, then, the incremental death benefit present value *as of that year* is computed. Thus,

$$\Delta PVDB1(x+1) = (.75)(K)(P_{x+1} - P_x)(R)\left[\left(\frac{d_{x+1}}{l_{x+1}}\right)(v) + \left(\frac{d_{x+2}}{l_{x+1}}\right)(v^2) + \cdots + \left(\frac{d_{64}}{l_{x+1}}\right)(v^{65-x-1})\right]$$

and, in general,

$$\Delta PVDB1(x+n) = (.75)(K)(P_{x+n} - P_{x+n-1})(R)\sum_{m=n}^{64-x}\left(\frac{d_{x+m}}{l_{x+n}}\right)(v^{m-n+1})$$

for $1 \leq n \leq (64 - x)$.

POSTRETIREMENT DEATH BENEFITS

A similar analysis applies to the postretirement death benefits. If the executive. now age x, should die during the first year of his retirement, his estate stands to receive the $(K)(R-1)$ shares of stock that will not yet have been distributed to him by the corporation in annual deferred bonus payments. Given a current per-share stock price of P_x, that death benefit is estimated to have a before-tax value equal to $(P_x)(K)(R-1)$ dollars and therefore implies an after-tax present value as of age x of

$$(.75)(P_x)(K)(R-1)\left(\frac{d_{65}}{l_x}\right)(v^{66-x}).$$

If he dies the following year, the resulting death settlement will consist of $(K)(R-2)$ shares having a present value now of

$$(.75)(P_x)(K)(R-2)\left(\frac{d_{66}}{l_x}\right)(v^{67-x}).$$

And, for the whole series of such prospective payments, we have

$$PVDB2(x) = (.75)(P_x)(K)\sum_{n=1}^{R-1}(R-n)\left(\frac{d_{64+n}}{l_x}\right)(v^{65-x+n}).$$

Each time stock prices rise or fall, the change in this present value is determined as before. Thus,

$$\Delta PVDB2(x+1) = (.75)(P_{x+1}-P_x)(K)\sum_{n=1}^{R-1}(R-n)\left(\frac{d_{64+n}}{l_{x+1}}\right)(v^{65-x+n-1})$$

and

$$\Delta PVDB2(x+m) = (.75)(P_{x+m}-P_{x+m-1})(K) \text{ multiplied by}$$

$$\sum_{n=1}^{R-1}(R-n)\left(\frac{d_{64+n}}{l_{x+m}}\right)(v^{65-x+n-m})$$

for each $1 \leq m \leq (64-x)$. The increment is evaluated in every instance as of the year it occurs.

THE TOTAL PACKAGE

The aggregate after-tax present value of the deferred stock bonus at the time it is established is, then,

$$PVDSB(x) = PVRP(x) + PVDB1(x) + PVDB2(x).$$

The total change therein in each subsequent year is

$$\Delta PVDSB(x+n) = \Delta PVRP(x+n) + \Delta PVDB1(x+n) + \Delta PVDB2(x+n),$$

which must be computed through age 64 for the executive in question.

THE CURRENT EQUIVALENT

The stream of annual after-tax salary payments beginning at age x, continuing up to and including age 64, and having a present value as of age x equal to $PVDSB(x)$ is the first element in the "current income equivalent" of the deferred bonus. Thus, where $ATCEQ(x)$ is the necessary annual payment,

$$PVDSB(x) = [ATCEQ(x)]\left[\left(\frac{l_x}{l_x}\right) + \left(\frac{l_{x+1}}{l_x}\right)(v) + \cdots + \left(\frac{l_{64}}{l_x}\right)(v^{64-x})\right]$$

defines the relevant equality. Rearranging:

$$ATCEQ(x) = \frac{[PVDSB(x)](D_x)}{(N_x - N_{65})}.$$

And, in each subsequent year, the appropriate increment to that stream of payments is

$$\Delta ATCEQ(x+n) = \frac{[\Delta PVDSB(x+n)](D_{x+n})}{(N_{x+n} - N_{65})}.$$

As a result, the total in any given year for the deferred stock bonus which was initially established at age x comes to

$$ATCEQ(x+n) = ATCEQ(x) + \sum_{m=1}^{n} [\Delta ATCEQ(x+m)].$$

The current equivalents for additional bonuses of this type can then simply be added to this figure to arrive at an aggregate which reflects not only the initial value of each but any later changes in that value.

Profit-Sharing Plans

A corporate profit-sharing plan which provides that the funds allocated to it be invested in shares of the firm's common stock and those shares distributed to the employee immediately upon his retirement is simply a special case of a deferred stock bonus and may be analyzed in a similar manner. The only benefits payable under such an arrangement are the indicated retirement distribution and a preretirement death benefit which specifies that the shares credited to the employee's account be awarded to his estate if he should die before attaining age 65. Both are taxable on the basis of the market value of the shares involved on the date they are distributed, the retirement payment at the capital gains tax rate and the death benefit at estate tax rates. As with a deferred stock bonus, it is necessary to keep track of changes over time in stock prices in order to update the value of the arrangement and ensure that its current income equivalent adequately reflects that value.

THE RETIREMENT BENEFIT

An employee now age x who has credited to his profit-sharing account in the current year M shares of the employer corporation's common stock having a market price equal to P_x dollars per share has in prospect a lump-sum retirement benefit of $(M)(P_x)$ dollars. The after-tax present value of that benefit is therefore

$$PVRB(x) = (.75)(M)(P_x)\left(\frac{l_{65}}{l_x}\right)(v^{65-x})$$

where again in this case, $v = (1/1.05)$. If, over the following year, the market price of the shares changes, the employee will have experienced a change in the prospective value of his remuneration amounting to

$$\Delta PVRB(x+1) = (.75)(M)(P_{x+1} - P_x)\left(\frac{l_{65}}{l_{x+1}}\right)(v^{65-x-1})$$

and, in general

$$\Delta PVRB(x+n) = (.75)(M)(P_{x+n} - P_{x+n-1})\left(\frac{l_{65}}{l_{x+n}}\right)(v^{65-x-n})$$

for all $1 \leq n \leq (64 - x)$.

PRERETIREMENT DEATH BENEFITS

The benefit format and present value of these payments are simply duplicates of those applicable to deferred stock bonuses. Thus

$$PVDB(x) = (.75)(M)(P_x)\left[\left(\frac{d_x}{l_x}\right)(v) + \left(\frac{d_{x+1}}{l_x}\right)(v^2) + \cdots + \left(\frac{d_{64}}{l_x}\right)(v^{65-x})\right]$$

and

$$\Delta PVDB(x+n) = (.75)(M)(P_{x+n} - P_{x+n-1})\sum_{m=n}^{64-x}\left(\frac{d_{x+m}}{l_{x+n}}\right)(v^{m-n+1})$$

for the yearly present value increments.

THE PACKAGE AND ITS CURRENT EQUIVALENT

The combined present value of the two benefits is $PV(x) = PVRB(x) + PVDB(x)$ and the annual change in that value $\Delta PV(x+n) = \Delta PVRB(x+n) + \Delta PVDB(x+n)$. Following our previous notation, the after-tax current income equivalent of the arrangement is

$$ATCEQ(x) = \frac{[PV(x)](D_x)}{(N_x - N_{65})}$$

$$ATCEQ(x+n) = ATCEQ(x) + \sum_{j=1}^{n} [\Delta ATCEQ(x+j)]$$

where

$$\Delta ATCEQ(x+j) = \frac{[\Delta PV(x+j)](D_{x+j})}{(N_{x+j} - N_{65})}.$$

A profit-sharing plan under which benefits were payable in cash instead would be analyzed in the same way, the only difference being that adjustments for changes in stock prices would, of course, be unnecessary.

Savings Plans

Since the typical corporate "savings plan" or "thrift plan" closely resembles a profit-sharing arrangement, the framework for its valuation is almost identical. The only new element is the presence of contributions to the plan by the employee, whose value must be deducted in arriving at the relevant *net* present value.

THE RETIREMENT BENEFIT

A savings plan commonly specifies that the total of the employee's and the corporation's contributions, along with the accumulated investment income earned on them, be distributed to the employee in a lump sum upon his retirement. The capital gains tax applies to the excess of such distributions over the aggregate contributions by the employee. Therefore, if the firm adds a dollars to the man's savings plan account for every dollar he contributes each year, the total prospective retirement benefit which results from a contribution of size K out of current salary by an employee now age x is $(K)(1 + a)$. After taxes, this implies a future receipt of

$$K(1 + a) - (.25)(aK) = K(1 + .75a)$$

having a present value, as of age x, equal to

$$PVRB(x) = (K)(1 + .75a)\left(\frac{l_{65}}{l_x}\right)(v^{65-x})$$

adopting the usual notation.

If, then, each dollar placed in the savings plan in that year is invested so as to have a capital value—including the reinvestment of any dividend or interest income—equal to I_{x+1} dollars at the end of the year, the present value of the anticipated retirement benefit must be revised to reflect this change. Accordingly, the employee would, as of age $x + 1$, expect to receive upon retirement $(I_{x+1})(K)(1 + a)$ dollars before taxes as a result of his participation in the plan during the previous year. Of this amount, K dollars will be tax-free, and the new prospective after-tax benefit comes to

$$(I_{x+1})(K)(1 + a) - (.25)[(I_{x+1})(K)(1 + a) - K]$$
$$= K[1 + (.75)(I_{x+1})(1 + a)].$$

This represents an increase of

$$K[1 + (.75)(I_{x+1})(1 + a)] - K[1 + (.75)(a)]$$
$$= (.75)(K)[(I_{x+1})(K)(1 + a) - a]$$

pursuant to the year's investment experience. The after-tax present value of that increment is

$$\Delta PVRB(x + 1) = (.75)(K)[(I_{x+1})(1 + a) - a]\left(\frac{l_{65}}{l_{x+1}}\right)(v^{65-x-1})$$

If, in the following year, each dollar of capital value at the beginning of the year becomes I_{x+2} dollars at the end, the before-tax retirement benefit rises to $(I_{x+2})(I_{x+1})(K)(1 + a)$. After taxes it is

$$(I_{x+2})(I_{x+1})(K)(1 + a) - (.25)[(I_{x+2})(I_{x+1})(K)(1 + a) - K]$$
$$= K[1 + (.75)(I_{x+2})(I_{x+1})(1 + a)]$$

and the increment is

$$K[1 + (.75)(I_{x+2})(I_{x+1})(1 + a)] - K[1 + (.75)(I_{x+1})(1 + a)]$$
$$= (.75)(K)(I_{x+1})(1 + a)(I_{x+2} - 1)$$

with an after-tax present value of

$$\Delta PVRB(x + 2) = (.75)(K)(I_{x+1})(1 + a)(I_{x+2} - 1)\left(\frac{l_{65}}{l_{x+2}}\right)(v^{65-x-2}).$$

In general, then,

$$\Delta PVRB(x + n) = (.75)(K)(1 + a)(I_{x+n} - 1)\left(\frac{l_{65}}{l_{x+n}}\right)(v^{65-x-n})\prod_{i=1}^{n-1}(I_{x+n})$$

for all $2 \leq n \leq (64 - x)$.

PRERETIREMENT DEATH BENEFITS

Should the employee die before attaining age 65, the usual arrangement provides that his estate receives the then-accumulated value of both his and the firm's contributions to the plan. As in the case of a contributory pension,[3] the portion of that receipt which consists of a return of the man's own contributions is taxed to the estate at the regular estate tax rates and the rest as a long-term capital gain. By convention here, of course, this implies a 25 per cent rate for both portions and therefore for the total.

Thus, the amount of the prospective death benefit, as perceived at age x, is $K(1 + a)$ dollars and its after-tax present value is

$$PVDB(x) = (.75)(K)(1 + a)\left[\left(\frac{d_x}{l_x}\right)(v) + \left(\frac{d_{x+1}}{l_x}\right)(v^2) + \cdots + \left(\frac{d_{64}}{l_x}\right)(v^{65-x})\right].$$

As a result of the investment income credited to the account during the first year, the potential benefit increases to $(I_{x+1})(K)(1 + a)$ dollars, a gain of $(I_{x+1} - 1)(K)(1 + a)$ over the initial figure and an additional after-tax present value of

$$\Delta PVDB(x + 1) = (.75)(I_{x+1} - 1)(K)(1 + a)\sum_{j=1}^{64-x}\left(\frac{d_{x+j}}{l_{x+1}}\right)(v^j).$$

[3] See Appendix D.

In general

$$\Delta PVDB(x + n) = (.75)(I_{x+n} - 1)(K)(1 + a) \text{ multiplied by}$$

$$\left[\prod_{i=1}^{n-1} (I_{x+i})\right] \sum_{j=n}^{64-x} \left(\frac{d_{x+j}}{l_{x+n}}\right)(v^{j-n+1})$$

again for $2 \leq n \leq (64 - x)$.

THE PACKAGE AND THE CURRENT EQUIVALENT

The rest of the story, then, follows exactly the pattern above. Thus, $PV(x) = PVRB(x) + PVDB(x) - K$ and $\Delta PV(x + n) = \Delta PVRB(x + n) + \Delta PVDB(x + n)$ for the present values, the employee's initial contribution, K, being subtracted in order to obtain the appropriate *net* value to him of the indicated benefits. For their current income equivalent

$$ATCEQ(x) = \frac{[PV(x)](D_x)}{(N_x - N_{65})}$$

$$ATCEQ(x + n) = ATCEQ(x) + \sum_{j=1}^{n} [\Delta ATCEQ(x + j)]$$

where

$$\Delta ATCEQ(x + j) = \frac{[\Delta PV(x + j)]\,[D_{x+j}]}{(N_{x+j} - N_{65})}.$$

The current equivalents of the benefits from the plan resulting from subsequent years' participation by the employee can then simply be added to these figures.

APPENDIX I

COMPANIES IN THE SAMPLE

Allied Chemical Corporation
American Can Company
American Cyanamid Company
American Metal Climax, Incorporated
American Tobacco Company
Anaconda Company
Bendix Corporation
Bethlehem Steel Corporation
Boeing Company
Borden Company
Caterpillar Tractor Company
Cities Service Company
Continental Can Company
Continental Oil Company
Douglas Aircraft Company
Dow Chemical Company
E. I. DuPont de Nemours and Company
Eastman Kodak Company
Firestone Tire and Rubber Company
General Electric Company
General Foods Corporation
General Motors Corporation
General Tire and Rubber Company
B. F. Goodrich Company
Goodyear Tire and Rubber Company
Gulf Oil Corporation
Inland Steel Company
International Business Machines Corporation
International Harvester Company
International Paper Company
International Telephone and Telegraph Corporation
Jones and Laughlin Steel Corporation
Lockheed Aircraft Corporation
National Dairy Products Corporation
North American Aviation, Incorporated
Phillips Petroleum Company
Procter and Gamble Company
Radio Corporation of America
Republic Steel Corporation
R. J. Reynolds Tobacco Company
Shell Oil Company
Sinclair Oil Corporation
Standard Oil Company (Indiana)
Swift and Company
Texaco, Incorporated
Tidewater Oil Company
United Aircraft Corporation
United States Rubber Company
United States Steel Corporation
Westinghouse Electric Corporation

APPENDIX J

SAMPLE SIZE EACH YEAR

	Executive Rank, by Total After-Tax Compensation				
Year	Highest-Paid	Second Highest-Paid	Third Highest-Paid	Fourth Highest-Paid	Fifth Highest-Paid
1940	49	48	44	45	44
1941	49	48	47	46	45
1942	49	49	47	45	46
1943	49	49	47	47	45
1944	50	50	48	47	46
1945	50	50	48	46	45
1946	50	49	49	47	44
1947	50	49	49	47	46
1948	50	50	50	48	43
1949	50	50	50	48	43
1950	50	50	49	49	46
1951	50	50	49	46	47
1952	50	50	47	47	46
1953	50	50	46	47	40
1954	50	50	47	45	41
1955	50	50	46	43	38
1956	50	48	46	42	31
1957	50	48	45	40	29
1958	50	49	40	38	29
1959	50	48	38	32	29
1960	50	46	33	32	24
1961	49	44	32	27	23
1962	48	40	30	24	19
1963	47	37	30	21	13

NOTE: A complete sample in each case would be 50.

APPENDIX K

DERIVATION OF THE INDIVIDUAL RETIREMENT ANNUITY PREMIUM RATE SCHEDULE

Historical premium rate quotations were obtained from two leading insurance companies: Connecticut General Life Insurance Company and The Travelers Insurance Company. The quotations represented the annual premiums required for the purchase of a nonparticipating straight life annuity to begin at age 65 and providing for a full cash refund (of the interest-accumulated net premiums) in the event of the death of the prospective annuitant prior to that time. This is the individual annuity form specified in Chapter 2 as the executive's relevant market alternative to his employer's pension plan.

Even though the compensation data presented throughout the study cover the period 1940 through 1963, it was necessary to secure premium rate information back to 1938 in order to handle properly those cases in which executives came under pension plans as early as that year. Both insurance companies have had several premium schedules in effect since then, indicating that for completeness separate tabulations for each of the various subperiods should be compiled here. In the interest of efficiency, however, the number of such subperiods was arbitrarily restricted to three: 1938 through 1948, 1949 through 1958, and 1959 through 1963. These intervals roughly coincide with those covered by the schedules offered by the two firms, which were not entirely congruent, and give expression to the more significant changes in premium rates which have occurred since 1938. They should, therefore, provide both a manageable and an acceptable representation of the recent history of individual annuity costs.

Each of the various premium rate quotations was supplied in the form of a schedule of end-of-year "cash values" and an accompanying annuity conversion factor for age 65. For example, the following schedule applied to annuity contracts sold from 1938 through 1948 by one of the two insurance companies:

Number of Years Premiums Paid	Cash Value at End of Year Per $100 Annual Premium
1	$ 52
2	142
3	244
4	352
5	464
6	581
7	704
8	832
.	.
.	.
.	.
28	4,723
29	5,009
30	5,307

Annuity payable at age 65 per $1,000 of cash value = $6.68 per month.

According to these quotations, then, a man who, at age 57, contracted to purchase a retirement annuity and paid eight annual premiums of $100 each would, at age 65, stand to receive

$$\left(\frac{832}{1000}\right)(6.68) = \$5.558$$

per month, or a total of $66.69 in annuity benefits per year, since he would have accumulated $832 in cash value by that time. Similarly, had he begun to pay premiums when he was 35 years old, his annual benefit at age 65 would have been

$$\left(\frac{5307}{1000}\right)(6.68)(12) = \$425.41$$

as a result of paying thirty annual premiums of $100.

It is, of course, a simple matter to transform this schedule of cash values into a schedule of premium rates per dollar of annuity benefit as a function of age at the time premium payments begin. Thus, if a \$100 annual premium starting at age 35 and continuing through age 64 will purchase \$425.41 in annuity benefits, a \$1 annuity benefit would require

$$\frac{100}{425.41} = \$0.235$$

in premiums per year. In general, the cash-value-to-premium rate conversion formula is

$$P(x) = \frac{(100)(1000)}{(12)(6.68)[C(65 - x)]}$$

where $P(x)$ denotes the annual premium payable beginning at age x for the purchase of a \$1 per year annuity which is to start at age 65, and $C(65 - x)$ is the cash value tabulated above for $(65 - x)$ years' worth of premium payments. In the example just cited, an age of 35 at the time of the initial premium payment implied a total of (65 − 35), or thirty years of premiums. Therefore,

$$P(35) = \frac{(100)(1000)}{(12)(6.68)(5307)} = \$0.235.$$

Because the computations involved in arriving at the "current income equivalent" of a pension make it convenient to have the premium quotations stated in this form, each of the schedules provided by the insurance companies was transformed accordingly. In the case of the schedule above, the result was:

Age at Time of Purchase	Annual Premium Per Dollar of Annuity at Age 65
64	23.9044
63	8.7852
62	5.1127
61	3.5440
60	2.6885
59	2.1471

(Continued)

Age at Time of Purchase	Annual Premium Per Dollar of Annuity at Age 65
58	1.7720
57	1.4994
.	.
.	.
.	.
37	0.2641
36	0.2490
35	0.2350

These are, therefore, the relevant figures for the years 1938 through 1948 for this particular firm. A similar schedule was derived for the other insurance company and the average of the two taken to be the "typical" premium rate per dollar of retirement annuity confronted by executives during that period.

The procedure was then repeated for the intervals 1949–58 and 1959–63. The complete set of averaged premium rates which was obtained is the following:

Age at Time of Purchase	Annual Premium Per Dollar of Annuity		
	1938–48	1949–58	1959–63
64	$20.9453	$18.8166	$16.1630
63	8.0126	7.8305	7.2040
62	4.7947	4.8864	4.6011
61	3.3821	3.5314	3.3708
60	2.5841	2.7526	2.6541
59	2.2784	2.2392	2.1550
58	1.7252	1.8844	1.8113
57	1.4666	1.6183	1.5545
56	1.2687	1.4149	1.3570
55	1.1157	1.2544	1.2006
54	0.9899	1.1206	1.0720
53	0.8856	1.0109	0.9668
52	0.7985	0.9182	0.8779
51	0.7248	0.8399	0.8019
50	0.6614	0.7720	0.7363

(Continued)

Age at Time of Purchase	Annual Premium Per Dollar of Annuity 1938–48	1949–58	1959–63
49	0.6063	0.7130	0.6796
48	0.5578	0.6614	0.6297
47	0.5154	0.6155	0.5852
46	0.4777	0.5748	0.5460
45	0.4438	0.5380	0.5106
44	0.4135	0.5052	0.4795
43	0.3861	0.4753	0.4515
42	0.3613	0.4481	0.4259
41	0.3386	0.4234	0.4025
40	0.3180	0.4007	0.3811
39	0.2991	0.3799	0.3609
38	0.2817	0.3606	0.3423
37	0.2657	0.3428	0.3250
36	0.2508	0.3263	0.3091
35	0.2371	0.3109	0.2943

A schedule for ages 35 through 64 was sufficient to encompass all the executives there was occasion to treat empirically, since most of them were already quite high up in their firms' hierarchy by the time pension plans came into common use.[1]

The second feature of individual annuity contracts which is pertinent to the calculations is their provision for a refund of the potential annuitant's premiums if he should die before attaining the age at which his annuity is to begin.[2] That provision specifies that his estate shall receive the amount of the *gross* premiums paid up to the time of his death *or* the cash value listed for that year, whichever is greater.[3] If an individual who contracted to purchase an annuity under the terms of the first schedule tabulated in this appendix died after making, say, three $100 annual premium payments, his estate would have received $300, since the cash value indicated for year 3 is only $244. If he had died after making eight payments, his estate would have received $832, which exceeds the $800 in total gross premiums paid to that point. In effect, the listed cash values represent the sum to which the individual's *net*

[1] See Chapter 7.

[2] No death benefits are payable after the annuity begins according to the form of that instrument chosen here as a standard of comparison for the pension. See Chapter 2.

[3] See also Appendix D.

premiums—net of sales commissions and administrative expenses—accumulate at the rate of interest guaranteed by the contract as of the end of each successive year of premium payments. Thus, the insurance company agrees to refund at least the absolute amount of the policyholder's gross premiums in the event of his premature death, and will pay the accumulated amount of his net premiums if that figure is greater.

This feature, of course, has a significant value to an individual who might contemplate the purchase of an annuity and is, as was outlined in Appendix D, an important element in the determination of that particular contract which is as valuable as his pension. It is desirable to tabulate the present value of the possible death benefits per dollar of prospective annuity along with the applicable premium rates in order to eliminate the need to recompute those present values each time a measurement of the annuity's *total* present value is required. This can be accomplished by first converting the original schedule of cash values per $100 annual premium into one expressed in terms of cash value per dollar of anticipated annuity receipt, and then using those figures as the inputs to the death benefit present value formula developed in Appendix D.

To illustrate: A man, age 57, who contracted to pay eight $100 annual premiums to the insurance company whose cash value schedule is listed above would, as part of the bargain, be assured that his estate would receive the following schedule of death benefits depending on the time of his death:

If Death Should Occur at Age: [a]	The Estate Will Receive: [a]
57	$100
58	200
59	300
60	400
61	500
62	600
63	704
64	832

[a] Assumes premiums are paid at the beginning of each year and that, if death occurs, it is at some point subsequent to that payment.

If he paid instead the $1.4994 annual premium required for a $1 annuity, the associated schedule of death benefits would look like:

Age at Time of Death	Death Benefit
57	$ 1.4994
58	2.9988
59	4.4982
60	5.9976
61	7.4970
62	8.9964
63	10.5559
64	12.4750

Each of these values is simply (1.4994 100) of the corresponding figures above. This, then, is the relevant tabulation for age 57 for a schedule of per-dollar annuity present values for this particular insurance company. As indicated in Appendix D, death benefits are tax-free to the policyholder's estate if they represent merely a return of his gross premiums—as would be the case if he should die at any time prior to attaining age 63 in the example here—but a capital gains tax is assessed on any excess above the gross premiums. Thus, if our $1 annuity purchaser should die when he is age 63, his estate would receive, after taxes, (10.5559) – (0.25)(10.5559 – 10.4958) = $10.5409, since $10.4958 represents the total amount of seven $1.4994 annual premiums. Similarly, if he should die the following year, his estate would receive (12.4750) – (0.25)(12.4750 – 11.9952) = $12.3630 net of taxes.

When this series of potential after-tax death benefits is discounted for mortality and time deferral back to age 57 (as discussed in Appendix D), the result is the aggregate present value of those payments per dollar of retirement annuity purchased—the form in which it is most convenient to express the relationship for purposes of "current equivalent" calculations. Similar values can be obtained for each of the ages 35 through 64 at which executives might begin the purchase of an annuity, and the outcome for the insurance company whose cash value schedule has been used as an illustration here is:

Age at Time of Initial Premium Payment	Present Value of Death Benefit Per Dollar of Annuity
64	$0.3873
63	0.4002
62	0.4392
61	0.4794
60	0.5165
59	0.5476
58	0.5729
57	0.5968
.	.
.	.
.	.
37	0.6457
36	0.6360
35	0.6258

When these figures and the corresponding ones for the years 1938–48 for the other insurance company are averaged, a composite schedule of death benefit present values for that period similar to the composite premium rates derived earlier is obtained. When the process is repeated for the other two time periods of interest, the following tabulation results:

Age at Time of Initial Premium Payment	Present Value of Death Benefits Per Dollar of Annuity		
	1938–48	1949–58	1959–63
64	$0.3381	$0.3038	$0.2609
63	0.3650	0.3567	0.3281
62	0.4118	0.4197	0.3952
61	0.4575	0.4777	0.4560
60	0.4964	0.5288	0.5098
59	0.5310	0.5711	0.5496
58	0.5571	0.6085	0.5849
57	0.5808	0.6388	0.6152
56	0.6020	0.6646	0.6421
55	0.6218	0.6866	0.6656
54	0.6376	0.7041	0.6849
53	0.6503	0.7196	0.7020

(Continued)

Age at Time of Initial Premium Payment	Present Value of Death Benefits Per Dollar of Annuity		
	1938–48	1949–58	1959–63
52	0.6608	0.7321	0.7158
51	0.6692	0.7428	0.7269
50	0.6753	0.7509	0.7355
49	0.6795	0.7571	0.7422
48	0.6816	0.7614	0.7468
47	0.6825	0.7638	0.7492
46	0.6818	0.7647	0.7502
45	0.6795	0.7637	0.7495
44	0.6762	0.7619	0.7486
43	0.6718	0.7584	0.7464
42	0.6665	0.7538	0.7428
41	0.6601	0.7485	0.7381
40	0.6530	0.7420	0.7324
39	0.6453	0.7349	0.7250
38	0.6369	0.7268	0.7168
37	0.6281	0.7184	0.7081
36	0.6188	0.7093	0.6989
35	0.6092	0.6997	0.6893

This schedule and the one listed above, therefore, summarize the historical data on individual annuities which are relevant to the pension current equivalent computations.

APPENDIX L

PROFESSIONAL INCOMES ANALYSIS

In Chapter 9. a comparison was made of the rate of growth since 1940 of the total after-tax compensation of top executives and the after-tax earnings of "successful" physicians, lawyers, and dentists. As a means of estimating the likely impact of progressive personal income taxes on the last three groups, the assumption was that their earnings in 1962—the most recent year for which data are available—were of the same order of magnitude as the before-tax salaries and bonuses received by the executives in the sample studied. An assumption of this sort was necessary because published information on professional incomes exists only in the form of averages for the various occupational categories, and it is therefore impossible to identify the earnings of just that upper end of each which would seem to be the most logical focus for a comparison with senior executives. The objective here is to test the effects on such a comparison of some alternative income level choices.

The assumption made in Chapter 9 was that the before-tax earnings of the most successful men in the highest-paid of the three professions in 1962, i.e., medicine, were equal to the average before-tax direct current remuneration received during recent years by top executives. This implied a figure of $143,548 for physicians. The before-tax earnings of lawyers and dentists were then set equal to $97,439 and $99,984, respectively, these figures being in the same proportion to $143,548 as the reported averages for all lawyers and dentists were in 1962 to the average for all physicians. From the historical record of growth rates in before-tax earnings for the three groups, their incomes were projected back to 1940 and the relevant after-tax figures obtained.

As alternatives, the following assumptions will be tested here:

1. The before-tax earnings of the upper end of *all three* professions in 1962 equal to $143,548.

2. The before-tax earnings of the *lowest*-paid of the three—lawyers—set equal to $143,548 in 1962 and those of physicians and dentists raised proportionately to $211,450 and $147,295.

Developments back to 1940 may then be reproduced on these assumptions and new after-tax time series created. The results are summarized in the attached table and compared with executives' after-tax histories.

TABLE L-1

After-Tax Earnings Histories
(1940 = 1.00)

Year	Under Assumption 1 Above: Physicians	Lawyers	Dentists	Under Assumption 2 Above: Physicians	Lawyers	Dentists	Top Executives
1940	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1941	0.94	0.86	0.94	0.91	0.86	0.93	0.95
1942	1.03	0.85	0.97	0.98	0.85	0.97	0.74
1943	1.09	0.80	1.02	1.00	0.80	1.01	0.65
1944	1.20	0.85	1.12	1.09	0.85	1.11	0.70
1945	1.29	0.88	1.14	1.15	0.88	1.14	0.69
1946	1.38	0.99	1.21	1.28	0.99	1.21	0.80
1947	1.42	1.03	1.24	1.32	1.03	1.23	0.84
1948	1.92	1.42	1.66	1.85	1.42	1.66	1.13
1949	1.97	1.41	1.68	1.90	1.41	1.68	1.19
1950	2.05	1.46	1.73	1.97	1.46	1.73	1.32
1951	2.11	1.48	1.75	2.00	1.48	1.74	1.29
1952	–	1.40	–	–	1.40	–	1.33
1953	–	1.44	–	–	1.44	–	1.44
1954	–	1.64	–	–	1.64	–	1.56
1955	–	–	–	–	–	–	2.15
1956	–	–	–	–	–	–	2.17
1957	–	–	–	–	–	–	2.20
1958	–	–	–	–	–	–	2.10
1959	2.90	2.06	2.60	2.70	2.06	2.60	2.16
1960	2.94	2.08	2.68	2.73	2.08	2.67	2.14
1961	3.01	2.21	2.79	2.79	2.21	2.78	2.16
1962	3.13	2.24	2.95	2.88	2.24	2.94	2.18
1963	–	–	–	–	–	–	2.16

As is evident, the conclusion reached in Chapter 9 that top executives have not fared as well as the professions in terms of rates of after-tax earnings growth still holds. The gap narrows the higher the pretax figures assumed for other occupations, but the range of estimates specified encompasses a fairly broad range of possibilities and should suffice for our purposes here.

APPENDIX M

COMPENSATION COST ANALYSIS

The question as to the relationship between the cost to the employer corporation of the various rewards in its executive pay package and the cost of the "current income equivalents" proposed for those rewards was raised at several points in the study. The answer to that question for each of the major components of the package is, given the appropriate framework by which to view the compensation transaction, quite clear-cut. The objective of this appendix is to spell out such a framework.

Pension Plans

Consider the case of an executive, now age x, who is promised K dollars per year in retirement under his firm's pension plan.[1] If we assume initially that there are no corporate or personal income taxes —which assumption will very shortly be relaxed—we may express the present value to him of that promise as

$$PV_P = (K)\left(\frac{N_{65}}{D_x}\right)$$

where N_{65} and D_x are the actuarial symbols defined in Appendix D and employed in developing the present value formulas in most subsequent appendixes. The annual cost to the corporation of providing the indicated pension is simply the annual premium it must pay for this

[1] For convenience, the discussion will be cast in terms of a *non*contributory pension and its current income equivalent. Nothing essential to the analysis is sacrificed by doing so, and the present value expressions necessary for the cost comparisons are much less complicated than would be the case for a contributory arrangement. The arguments developed and the conclusions reached will, however, apply equally to the latter.

executive to the insurance company from which it has purchased its group annuity contract.[2] If that premium is of size P_P per dollar of pension, the total annual cost to the firm for the executive in question is

$$C_P = (K)(P_P),$$

which cost it will incur each year until the man retires.

Now, according to the reasoning suggested in Chapter 2, the "current income equivalent" of an employee's pension is the increment to his annual after-tax salary which would permit him to purchase an individual retirement annuity having the same present value. In the absence of taxes, of course, a straight life annuity of precisely K dollars to begin at age 65 would be as valuable to our hypothetical executive as his pension, since its present value would also be

$$PV_A = (K)\left(\frac{N_{65}}{D_x}\right)$$

as of age x.[3] If we then let P_A denote the annual premium charged by an insurance company for a $1 annuity of this type, the total annual premium that would be required of the executive beginning at age x and continuing through age 64 is

$$C_A = (K)(P_A)$$

and a salary increase of the same amount would be an appropriate substitute for his pension; he could acquire the annuity with that increase and be as well off in terms of present value.

The issue for our attention, therefore, is whether, given indifference from the executive's standpoint, the salary increase or the pension

[2] Or, alternatively, the amount the firm must set aside on the executive's behalf in its own pension fund if it has chosen to manage that fund itself.

[3] Again, for convenience and ease of comparison, the preretirement death benefits payable under such an arrangement will be ignored. The analysis should be affected very little by this simplification, however, since the present value of those prospective payments is in all cases quite small in relation to that of the retirement benefits themselves. For example, according to the mortality table used in the empirical portion of the current study, and assuming a 2½ per cent discount rate, the present value to an executive, age 40, of a $1 per year retirement benefit to begin at age 65 is $5.113. The present value of the preretirement death benefits associated with an individual annuity contract of that size is only about $0.732. For a man, age 50, the corresponding figures are $6.784 and $0.735.

promise is more costly to the company. Since both costs have been put in the form of an annual outlay extending over the same future period, the relevant comparison is simply

$$C_P = (K)(P_P) \lesseqgtr (K)(P_A) = C_A.$$

Clearly, if $P_P = P_A$, i.e., if the premiums charged per dollar of prospective retirement benefit are the same for group annuity contracts as for individual annuities, the cost to the corporation of the current income equivalent of each of its employees' pensions will be equal to that of the pension itself.

It is worth noting that this assertion is completely independent of not only the executive's but the firm's opportunity costs. Whatever discount rate is chosen for the individual, the present value of the payments due under both his pension and its individual annuity counterpart are calculated using the same rate, which is built into the actuarial symbols N_r and D_r in the formulation above and thus is neutral in its impact on the comparisons. Similarly, if the costs to the firm of the two alternatives were expressed more fully as the *present values* of the indicated *series* of required annual outlays, the relationship between those present values would obviously be nothing more than a restatement of that between the annual figures themselves. This conclusion will be seen to apply to subsequent comparisons as well, since the analytical framework will be the same in each case.

Now, because group annuity premium rates are typically lower than those quoted for individual annuities, it would almost certainly turn out in practice that even if—as in the situation depicted—there were no corporate or personal income taxes, it would be less expensive for the business firm to provide pensions for its employees than to award them salary increases of equivalent value. In other words, we would expect to find that

$$P_P = (1 - a)(P_A)$$

where $0 < a < 1$. If so, then,

$$C_P < C_A,$$

since

$$(K)(P_P) = (K)(1 - a)(P_A) < (K)(P_A).$$

Thus, our first move toward a more realistic description of the relevant environment suggests that, for the corporation, the pension is the more "efficient" of the two alternatives proposed.

Introduction of the corporate income tax to the comparison leaves this relationship unchanged. Both the firm's contributions to its pension fund and any salary payments to its executives are tax-deductible. Hence the annual after-tax cost of the pension becomes

$$(K)(1 - a)(P_A)(1 - t_c)$$

where t_c denotes the corporate tax rate. Similarly, the annual cost of the salary equivalent is now

$$(K)(P_A)(1 - t_c).$$

Therefore, the conclusion remains that $C_P < C_A$ as long as group annuity premium rates—or funding obligations—are less per dollar of prospective benefit than those for individual annuity policies.

Consider next the impact of the personal income tax, assuming for the moment that the effective rate for the employee in question is expected to be the same after retirement as before and that both individual annuity benefits and any pension receipts are taxable in full at that rate. Under those conditions the present value to the employee of his pension now falls to

$$PV_P = (K)\left(\frac{N_{65}}{D_x}\right)(1 - t_p)$$

where t_p is the applicable personal tax rate. On the other hand, a matching decline in value is also associated with the K-dollar individual annuity which was, in the absence of taxes, as valuable to him as the indicated pension. Thus,

$$PV_A = (K)\left(\frac{N_{65}}{D_x}\right)(1 - t_p) = PV_P.$$

Accordingly, an annual premium of $(P_A)(K)$ dollars will *still* permit the purchase from an insurance company of an annuity of the proper size, and therefore $(K)(P_A)$ continues to define the amount of the "after-tax current income equivalent" at issue. In order to provide the executive with that much additional take-home pay each year, however, the corporation would have to raise his *before-tax* salary by $(K)(P_A)/(1 - t_p)$ dollars, thereby incurring a net annual cost of

$$C_A = \frac{(K)(P_A)(1 - t_c)}{(1 - t_p)}.$$

This obviously would be rather substantially in excess of the cost of the pension itself, since

$$C_P = (K)(1 - a)(P_A)(1 - t_c) < \frac{(K)(P_A)(1 - t_c)}{(1 - t_p)} = C_A.$$

The factor $1/(1 - t_p)$ represents, in effect, the tax advantage which results from the fact that employees need not, under present law, include in their taxable income the contributions made on their behalf to qualified corporate retirement plans by their employers. If such contributions *were* taxable—or if it were possible for the employee to opt instead for a salary increase which would be considered tax-free by the IRS as long as it were used for the purchase of an individual retirement annuity to replace his pension—the relationship between the cost to the firm of the two alternatives would revert to that wherein the only difference was attributable to a difference in group annuity and individual annuity premium rates.

The conclusion that the pension is less expensive than its current equivalent holds, therefore, even under the assumption that the employee's tax rate in retirement is as high as that which he confronts while still working. A more likely circumstance, of course, would be a lower over-all effective rate past age 65, since the man's income is almost certain to diminish when he retires. Nonetheless, if we let t_r denote the anticipated postretirement personal tax rate, where $t_r < t_p$, we simply substitute the term $(1 - t_r)$ for $(1 - t_p)$ in the expressions above for the present values of both the pension and the individual annuity, and we establish once again that

$$PV_P = PV_A,$$

since both are equal to

$$(K)\left(\frac{N_{65}}{D_x}\right)(1 - t_r).$$

Therefore, P_A and P_P are still the relevant annual pension and annuity premiums, and the resulting cost comparison from the standpoint of the firm remains

$$C_P = (K)(P_P)(1 - t_c) < \frac{(K)(P_A)(1 - t_c)}{(1 - t_p)} = C_A$$

where, as before, $P_P = (1 - a)(P_A)$.

Let us then remove the final constraint imposed on the analysis and recognize that in fact the retirement benefits received under an individual annuity policy are taxed less heavily than those received under a corporate pension plan. As indicated in Chapter 2, a portion of the annuity benefits are considered by the IRS to constitute a return of the policyholder's premiums and, as such, are exempt from tax. In particular, the fraction

$$F = \frac{(P_A)(65 - x)}{15}$$

of each payment received by the annuitant in retirement will be tax-free.[4] Accordingly, the present value, as of age x, of a K-dollar individual annuity is in reality

$$PV_A = (K)\left(\frac{N_{65}}{D_x}\right)[1 - t_r(1 - F)],$$

which is necessarily a somewhat larger present value than that implied by the prospect of a K-dollar pension benefit. As a result, the corporation, in order to permit the employee concerned to obtain an adequate replacement for that pension, need only raise his annual take-home pay by an amount equal to the premiums on an individual annuity of size $(K)(1 - b)$, where

$$PV_P = (K)\left(\frac{N_{65}}{D_x}\right)(1 - t_r) = (K)\left(\frac{N_{65}}{D_x}\right)[1 - t_r(1 - F)](1 - b) = PV'_A$$

and, of course, $0 < b < 1$. In short, a smaller annuity than that sug-

[4] Thus, $(P_A)(65 - x)$ represents the aggregate premiums per dollar of prospective annuity which will be paid between age x and age 65 by the policyholder, and fifteen years is specified by the IRS as his life expectancy at age 65, i.e., the aggregate annuity payments he is expected to receive under the contract.

gested by the simpler comparisons above will suffice to define the pension's current equivalent. Solving for $(1 - b)$, we find that

$$(1 - b) = \frac{1 - t_r}{1 - t_r(1 - F)}$$

and the annual individual annuity premium the employee would have to be able to meet out of any salary increase is just $(K)(P_A)(1 - b)$.

The cost to the firm of providing that increase would be

$$C_A = \frac{(K)(P_A)(1 - b)(1 - t_c)}{(1 - t_p)}$$

as compared with a pension cost of

$$C_P = (K)(P_A)(1 - a)(1 - t_c).$$

Therefore, if

$$(K)(P_A)(1 - a)(1 - t_c) < \frac{(K)(P_A)(1 - b)(1 - t_c)}{(1 - t_p)}$$

the pension will, after all, be less expensive than its current equivalent.

Assuming temporarily that $a = 0$, i.e., that there is no difference between group annuity and individual annuity premium rates, we may state the necessary condition as

$$1 < \frac{1 - b}{1 - t_p}$$

or

$$1 - t_p < 1 - b.$$

Substituting for $(1 - b)$

$$1 - t_p < \frac{(1 - t_r)}{1 - t_r(1 - F)}.$$

Clearly, even if F were equal to its maximum possible value of unity (the annuity benefits being completely tax-free), the inequality would hold, since we have established that $t_r < t_p$.[5] Any smaller F would then

[5] This result may be interpreted as follows: The tax saving in retirement occasioned by the employee's not having to pay taxes on his annuity benefits is necessarily less than the tax disadvantage involved in raising his salary during his active working life by enough to enable him to pay the taxes thereon and still end up with sufficient funds to purchase that annuity.

imply a larger value for the quotient on the right-hand side of the inequality and reinforce that relationship.

Finally, if we permit a to take on a positive value, the question becomes whether

$$(1 - a)(1 - t_p) < 1 - b,$$

the answer to which is obvious, given that $(1 - t_p) < (1 - b)$.

Our conclusion, therefore, is that under almost any conceivable set of circumstances, the cost of the pension to the employer corporation will be smaller than the cost of the salary increase which would provide the executive with the same level of after-tax remuneration. Only if the executive were expecting a higher total annual income after retirement than before, or if group annuity premium rates exceeded those quoted for individual annuities, could this conclusion be reversed. Both situations, of course, are extremely unlikely to occur in practice.[6]

Deferred Compensation

A similar story emerges from an examination of the costs of deferred compensation arrangements and their current equivalents. Consider an executive, now age x, who is promised K dollars per year for a total of m years upon his retirement at age 65. If we start out once again assuming that neither personal nor corporate income taxes are imposed, the present value to him of that promise as of age x may be written as

$$PVDC = (K)\left(\frac{N_{65} - N_{65+m}}{D_x}\right)$$

and the present value of the cost of those payments to the firm as

$$C_{dc} = (K)\left(\frac{N'_{65} - N'_{65+m}}{D'_x}\right).$$

[6] The preretirement vs. postretirement income issue does, however, illustrate why it would be inappropriate for a firm to attempt to minimize its compensation costs by paying only nominal salaries and utilizing pension benefits as the major component of the pay package. Even if its employees would accept such a strategy and the government would sanction it (corporate tax deductions for pension fund contributions are limited by law to 15 per cent of employee wage costs), at some point it would turn out that prospective pension receipts exceeded current salary payments and the tax advantage would disappear (in the formulation above, this would imply $t_r > t_p$).

The notation N_i' and D_i' indicates that the discount rates built into the actuarial symbols may not be the same for the executive and the corporation and therefore that the present value of exactly the same series of payments may differ depending on which one is doing the evaluating. Thus the relevant definitions are

$$D_x = l_x v^x = l_x \left(\frac{1}{1 + r_e}\right)^x$$

$$N_{65} - N_{65+m} = D_{65} + D_{66} + \cdots + D_{65+m-1}$$

$$D_x' = l_x (v')^x = l_x \left(\frac{1}{1 + r_c}\right)^x$$

$$N_{65}' - N_{65+m}' = D_{65}' + D_{66}' + \cdots + D_{65+m-1}'$$

where r_e represents the executive's opportunity cost and r_c the corporation's.[7] Clearly, if $r_c > r_e$, then $D_x' < D_x$ and $(N_{65}' - N_{65+m}') <$ $(N_{65} - N_{65+m})$; i.e., the present value of the cost of the arrangement to the corporation is less than the present value of the reward it implies for the executive.

Now, the "current income equivalent" of such a series of payments is taken to be that increase in the executive's salary which, if maintained from age x through age 64, would have the same present value to him. Denoting this increase by S, we have

$$(S)\left(\frac{N_x - N_{65}}{D_x}\right) = PVDC,$$

since, of course, the executive must remain alive up to retirement in order to claim all those additional payments. Substituting and solving for S

$$S = \frac{(PVDC)(D_x)}{(N_x - N_{65})}$$

$$S = (K)\frac{(N_{65} - N_{65+m})}{(N_x - N_{65})}.$$

[7] As in the case of pension plans, any death benefits payable under the deferred compensation contract will be ignored in order to simplify the analysis. Such a step will not affect our conclusions, however, since the present value of those benefits would appear in both the executive's and the firm's appraisal of the contract in question and—except for the same sort of effect of possible differences in discount rates which will be pinpointed in the discussion that follows—would thereby raise both to the same extent.

The question, then, is whether the cost to the firm of a salary increase of this magnitude differs from the cost of the deferred pay contract itself. That is, whether

$$C_s = (S)\left(\frac{N'_x - N'_{65}}{D'_x}\right) \lesseqgtr (K)\left(\frac{N'_{65} - N'_{65+m}}{D'_x}\right) = C_{dc}.$$

Substituting now for S and rearranging, the issue reduces to

$$\frac{(N'_x - N'_{65})}{(N_x - N_{65})} \lesseqgtr \frac{(N'_{65} - N'_{65+m})}{(N_{65} - N_{65+m})}.$$

If the same discount rate applies to both the executive and the corporation ($r_e = r_c$), it will be true for all i that $N_i = N'_i$. In that case, the quotients on either side of this expression will be equal to one, and we may conclude that $C_s = C_{dc}$.

If, on the other hand, the corporation's opportunity cost exceeds that of the executive, it turns out that [8]

$$\frac{(N'_x - N'_{65})}{(N_x - N_{65})} > \frac{(N'_{65} - N'_{65+m})}{(N_{65} - N_{65+m})}$$

and therefore:

$$C_s > C_{dc}$$

which is, of course, what our intuition would lead us to expect. Thus, if a firm has available to it better investment opportunities than do its employees, it is not surprising to discover that, in effect, the advantage to it of being able to defer a portion of their wages is greater than the accompanying disadvantage that deferment entails for them. If, however, the firm can do no better with the funds than can the employees involved, neither party stands to gain through a deferred pay arrangement, and the current equivalent of such a contract would, at least in the absence of taxes, be precisely as expensive as the contract itself. If the firm cannot do as well, the current equivalent is cheaper. The consensus would probably be that, in practice, the first of the three situations is the most likely.[9]

[8] The difference in discount rates makes itself felt more strongly the farther in the future are the payments being considered. Thus, the ratio of any N'_i to the corresponding N_i or D'_i to D_i becomes smaller as i increases.

[9] It is important to recognize in this connection that, in speaking of potential investment returns, care must be taken to compare alternatives in which the

The presence of a corporate income tax does not alter these conclusions, since both immediate salary payments and any eventual outlays for deferred compensation awards are tax-deductible at the time they are made. Thus the present value, as of age x, of the net cost to the firm of the deferred payments described above is

$$C_{dc} = (K)(1 - t_c)\left(\frac{N'_{65} - N'_{65+m}}{D'_x}\right)$$

where t_c denotes the corporate tax rate. The cost of the current equivalent thereof is

$$C_s = (S)(1 - t_c)\left(\frac{N'_x - N'_{65}}{D'_x}\right)$$

and a comparison of the two produces exactly the same result as in the no tax case; i.e., if

$$\frac{(N'_x - N'_{65})}{(N_x - N_{65})} > \frac{(N'_{65} - N'_{65+m})}{(N_{65} - N_{65+m})}$$

then $C_s > C_{dc}$, the particular corporate tax rate levied being quite irrelevant.

The personal income tax is similarly neutral in its impact on the analysis as long as the executive in question is subject to the same overall effective rate after retirement as before. Under those conditions the present value to him, as of age x, of a series of m payments of K dollars each beginning at age 65 is

$$PVDC = (K)(1 - t_p)\left(\frac{N_{65} - N_{65+m}}{D_x}\right)$$

where t_p represents the applicable personal tax rate. It would therefore require an increase in his annual after-tax salary of only

$$S' = \frac{(PVDC)(D_x)}{(N_x - N_{65})}$$

$$S' = (K)(1 - t_p)\left(\frac{N_{65} - N_{65+m}}{(N_x - N_{65})}\right)$$

risks incurred are similar. Thus a corporation may indeed have available opportunities for employing its funds which hold out the promise of a rather higher rate of return than those effectively open to its executives as individuals, but such opportunities may also subject the firm to the possibility of more substantial losses if they do not work out as planned. Only if the corporation has differentially better investment prospects within given "risk classes" can we legitimately credit it with an advantage over its employees.

dollars in order to provide him with an equivalent reward. Before taxes, of course, this would mean a salary increase of $S'/(1 - t_p)$ dollars, having a net cost to the employer corporation of

$$C_s = (S')\frac{(1 - t_c)}{(1 - t_p)}\left[\frac{(N'_x - N'_{65})}{D'_x}\right].$$

This, conveniently, simplifies to

$$C_s = (S)(1 - t_c)\left(\frac{N'_x - N'_{65}}{D'_x}\right)$$

as in the situation where there were no personal income taxes. In effect, the reduction in the size of the computed equivalent salary increase which results from taking into account the taxes inevitably due on postretirement income is precisely offset by the requirement that sufficient before-tax salary be paid to enable the executive to meet the taxes thereon while still an active employee. The cost to the firm of the deferred payments remains

$$C_{dc} = (K)(1 - t_c)\left(\frac{N'_{65} - N'_{65+m}}{D'_x}\right)$$

and the relationship between the two costs continues to be as expressed above.

If, however—as seems more likely—the executive's income falls when he retires and therefore his personal tax rate in retirement is expected to be lower than that applicable to his present salary, there is a clear cost advantage to deferred compensation arrangements. Letting t_r again denote the relevant postretirement tax rate, we have

$$PVDC = (K)(1 - t_r)\left(\frac{N_{65} - N_{65+m}}{D_x}\right)$$

for the after-tax present value to the executive of the deferred payments. An after-tax salary increase of size

$$S'' = \frac{(PVDC)(D_x)}{(N_x - N_{65})}$$

extending from age x through age 64 would be as valuable. The necessary before-tax increase then is $S''/(1 - t_p)$, and the present value of its cost to the corporation becomes

$$C_s = \frac{(S'')(1 - t_c)(N'_x - N'_{65})}{(1 - t_p)(D'_x)}$$

$$C_s = \frac{(K)(1 - t_r)(1 - t_c)(N'_x - N'_{65})(N_{65} - N_{65+m})}{(N_x - N_{65})(1 - t_p)(D'_x)}.$$

This compares with a cost of

$$C_{dc} = \frac{(K)(1 - t_c)(N'_{65} - N'_{65+m})}{D'_x}$$

for the deferred payments, and leads to the conclusion that if

$$\frac{(1 - t_r)(N'_x - N'_{65})}{(1 - t_p)(N_x - N_{65})} > \frac{(N'_{65} - N'_{65+m})}{(N_{65} - N_{65+m})},$$

the cost of the current equivalent of those payments is greater than that of the payments themselves. Accordingly, even in the situation where the corporation's and the executive's discount rates are identical, it will be true in the reduced expression that

$$\frac{1 - t_r}{1 - t_p} > 1$$

as long as $t_r < t_p$, and the current equivalent will be the more expensive reward. The existence of *either* of two conditions therefore is sufficient to establish a preference for deferred compensation over an immediate salary increase of comparable value: the firm has better investment opportunities than do its employees, or the income of the latter is expected to fall upon retirement. The probabilities certainly seem to point in the direction of at least one of the two being fulfilled in virtually every instance.[10]

Stock Options

The conclusion in the case of stock options is no less precise, but the analysis suggests there is rather more room for the adjustment of com-

[10] The preceding discussion applies as well to deferred compensation plans under which payments are to be made in the form of shares of the corporation's common stock. Thus, it makes no difference to the arguments made whether the value for K in the various formulas is actually specified by the contract being considered or is estimated from stock price data. However the figure is obtained, the current equivalent format is the same: any increments in the value of the arrangement in subsequent years are treated separately as they occur; and the comparisons indicated hold without qualification. See Chapter 5.

pensation strategy to the circumstances of the individual employee. Consider an executive who exercises a stock option for m shares at a time when the market price of those shares is equal to P_m. Given an option price of P_o, his before-tax profit is $K = (m)(P_m - P_o)$. With a capital gains tax rate equal to t_g, his after-tax reward comes to $(K)(1 - t_g)$ dollars. The cost of that transaction to the employer corporation is measured simply by the dilution in the shareholders' equity occasioned by the sale of a portion of the ownership of the firm to the executive at a price less than its actual value—in short, by the same total price differential, K, which defines his before-tax reward. Since no deductions from taxable income are allowed the firm in connection with the granting or subsequent exercise of stock options, K also represents the *after-tax* cost to it of that instrument.

Now, in order to have provided the executive with the same level of remuneration, it would have been necessary to award him a bonus of $(K)(1 - t_g)/(1 - t_p)$ dollars in the year of exercise, where t_p is the personal tax rate he would be subject to on that increment.[11] The cost of this alternative scheme would have been

$$C_s = \frac{(K)(1 - t_c)(1 - t_g)}{(1 - t_p)}$$

given a corporate income tax rate of t_c. The question then is which of the two costs is the larger,

$$C_s = \frac{(K)(1 - t_c)(1 - t_g)}{(1 - t_p)} \lesseqgtr K = C_o$$

or, simply

$$\frac{(1 - t_c)(1 - t_g)}{(1 - t_p)} \lesseqgtr 1.$$

As it turns out, the inequality may run either way, depending on the tax rates applicable to the particular situation. If we assume a 50 percent corporate tax rate and adopt the 15 per cent figure for the "ad-

[11] More accurately, the proposal offered in the text was for a current equivalent in which the required payments would be spread over a period of years and have an after-tax *present value* equal to $(K)(1 - t_g)$. It is more convenient to deal here with only a single payment, however, and the conclusions reached are not affected by doing so.

justed" capital gains rate which was rationalized in Chapter 4,[12] we can solve for the marginal personal income tax bracket in which the cost of the option is just equal to the cost of its current equivalent:

$$(1 - .50)(1 - .15) = (1 - t_p^*)$$
$$t_p^* = 0.575.$$

Therefore, only if the executive under consideration must pay taxes on any additions to his current income at a rate greater than 57.5 per cent will the corporation find it less expensive to grant him stock options than to provide a salary increase of equivalent value.

According to the tax rates in effect during the last decade of the period studied here—1954 through 1963—this "breakeven" point was located at a salary level of approximately $77,700, a figure which is derived as follows: If we assume that deductions and exemptions from taxable income amount to about 15 per cent of gross income for the typical executive,[13] the critical marginal tax rate on *taxable* income is 57.5/.85 = 67.6 per cent. Thus, an extra dollar of salary or bonus received by the executive will normally give rise to just 85 cents of additional taxable income, and it is not until he attains a level of reward such that taxes are assessed on the taxable portion thereof at a 67.6 per cent marginal rate that he in fact incurs a tax liability of 57.5 cents on the extra dollar. Until 1964 the taxable income bracket in which that rate was exceeded for a married taxpayer was $76,000-to-$88,000, implying in the view here a gross income of at least $76,000/.85, or $89,400, before the indicated percentage took effect. Now, if we further assume—as was suggested in Chapter 2—that the executive is likely to have income from sources other than salary and bonus equal to 15 per cent of the latter, an annual direct current remuneration figure of $89,400/1.15, or $77,700, would have been sufficient to generate a total taxable income of $76,000 and therefore represents the point beyond which stock options were less costly to the employer corporation than matching increases in its executives' salaries and bonuses. A similar analysis

[12] Adjusted to reflect the impact of the additional deductions and exemptions from ordinary income likely to be generated by stock option profits and also the possibility that the optionee might not resell the shares involved before his death, thereby avoiding the capital gains tax entirely.

[13] See Chapter 2 and Appendix A.

using the lower personal tax rates introduced in 1964[14] reveals that nowadays only those executives with salaries and bonuses in excess of fully $163,700 should be granted options. For the rest—and that category obviously includes all but a very few individuals even in the largest firms—salary increases tied to the price of the corporation's stock are a less expensive form of reward.

[14] That is, the rates applicable to the years 1965 and thereafter, these being the end product of a two-step reduction begun in 1964.