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EMPLOYEE RETIREMENT AND A FIRM'S PENSION PLAN

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ABSTRACT

The provisions of the pension plan in a large corporation are described in detail. The implications of the provisions are indicated by pension accrual profiles. These profiles are set forth, together with standard age-earnings and Social Security accrual profiles, in the form of life-time budget constraints. The plan provided very strong incentives to retire beginning at age 55. After age 65, negative pension and negative Social Security accruals effectively impose almost a 100 percent tax rate on wage earnings for many employees of the firm. Departure rates from the firm are compared with economic incentives inherent in the plan provisions. The inducements in the plan provisions to retire early have had a very substantial effect on departure rates from the firm. Over 50 percent of those employed by the firm at age 50 leave before 60 and 90 percent before age 65. The jumps in departure rates at specific ages coincide precisely with the discontinuities and kink points in the worker compensation profiles that result from the pension plan provisions together with wage earnings profiles and Social Security accrual.

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In this paper, the relationship between pension accrual and retirement is analyzed, based on the experience in a large Fortune 500 firm engaged in sales. It's name may not be disclosed. The data are the employment and earnings histories between 1969 and 1984 of all workers who were employed by the firm in any of years between 1980 and 1984. The provisions of the firm pension plan are such that persons of the same age face very different pension accrual profiles, and thus pension compensation at a given age. Hence, different individuals face very different incentives for continued work versus retirement.

The paper begins with a detailed description of the plan and the incentive effects inherent in its provisions. The incentive effects of the provisions are described in terms of their effects on the budget constraints facing employees over their working lives. For completeness, the accrual of Social Security benefits is described together with pension benefit accrual. The evaluation of the incentive effects of plan provisions requires the estimation of wage earnings. The procedure used to estimate these profiles is described in the following section.

We then show the relationship between wage earnings, pension wealth accrual, and Social Security accrual on the one hand and departure rates from the firm on the other. It is apparent from this relationship that the effect of the pension plan provisions on departure rates is very substantial. In subsequent analysis we will develop a model that will allow us to predict the effect of changes in the provisions on departure rates. That is not possible based only on the relationships presented here. But the detail shown here provides information that is often lost in formal statistical models.

The analysis makes clear that estimation of the effects of pension plans on labor force participation of older workers can only be done by taking

EMPLOYEE RETIREMENT AND A FIRM'S PENSION PLAN

by

Laurence J. Kotlikoff and David A. Wise

In previous work we analyzed the incentive effects of the provisions of private pension plans.[1] The incentive effects were described by the accrual of pension wealth resulting from an additional year of work, treating the addition to pension wealth as a form of compensation in units comparable to the wage. We found that the provisions of almost all plans implied a large loss in pension wealth for work past the age of 65. Often this loss was more than 40 percent of the wage that would be earned for the additional work. In some plans wage earnings after 65 would be entirely offset by the concomitant loss in pension wealth. The typical plan also provided substantial incentive to retire at the age of early retirement provided in the plan. This was often as young as 55. In addition, the typical plan provides a strong incentive not to retire before the early retirement age. Although this work documented the incentive effects inherent in the timing of the accrual of pension benefits, no attempt was made to estimate the actual effects of these incentives on retirement. That is, we considered the effect of pension benefit accrual on compensation by age, but not the effect of compensation on continued labor force participation. Indeed, based on the data used for that analysis there was no way to relate the plan provisions to retirement, or to departure rates from the firm.

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[1]See Kotlikoff and Wise [1985, 1987].

account of the precise provisions of individual plans. Simply knowing that an employee has a private pension plan tells nothing about the labor force incentive effects of the plan's provisions. While a great deal of effort has been directed to estimating the effects of Social Security provisions on labor force participation, much less attention has been given to the effects of private pension plans. The data presented here suggests that pension plans are likely to have a much greater effect than the recent changes in Social Security benefits, for example.

I. The Firm Pension Plan

A. The Plan Provisions

The firm has a defined benefit pension plan with earnings-related benefits and a Social Security offset. The plan's early and normal retirement ages are 55 and 65 respectively with vesting after 10 years. Actuarially reduced benefits are available starting at age 55 for *vested terminators* -- vested workers who leave the firm prior to age 55. For *early retirees* -- workers who retire between ages 55 and 65 -- less than actuarially reduced benefits are provided. For workers who retire after age 65 there is no special actuarial benefit increase.

In addition to the more favorable benefit reduction afforded to early retirees, early retirees receive a supplemental benefit equal to their Social Security offset between the time they retire and the time they reach age 65. Hence, in comparison to a vested terminator who leaves the firm at age 54 and starts collecting benefits at age 55, an early retiree who leaves at age 55 enjoys a smaller benefit reduction and also receives a supplemental benefit until age 65. Not surprisingly, the profile of vested accrued benefits by age

jumps sharply for most workers at age 55. Thus there is a large bonus for remaining with the firm until age 55.

The formula for the basic benefit before reduction for early retirement and before any applicable Social Security offset is the average earnings base times x percent times the first N years of continuous service, plus y percent times the rest of continuous service:

$$
\begin{aligned}
&\text{Benefits} = (\text{Earnings Base})\,[(x)(\text{Service})] \\
&\qquad \text{if Service is less than N years} \\
&\qquad\qquad (1) \\
&\text{Benefits} = (\text{Earnings Base})\,[(x)(\text{Service}) + (y)(\text{Service} - N)] \\
&\qquad \text{if Service is greater than N years}
\end{aligned}
$$

The parameters x and y are both less than 0.05 and y is less than x. N lies between 15 and 30. The average earnings base is calculated based on earnings between the start year and the year of either vested termination or retirement. The start year has traditionally been increased by two years every other year, varying from k to k+1 years before the current year, where k is between 5 and 10. In our accrual calculations we assume a one or two year increase in the start year every two years. Excluding the two lowest years of earnings (except that the number of earnings years used can't be reduced below five), the earnings base is calculated as the average annual earnings from the start year to the year of vested termination or retirement.

The Social Security adjustment is (1) p (p lies between 0.5 and 1) of the Social Security benefit calculated by the firm, denoted SSB, times the ratio of completed service to the amount of service the worker would have if he or she stayed until age 65, less (2) Z (Z lies between $1,000 and $5,000) times the ratio of continuous service as of January 1, 1976 to the continuous service the worker would have if he or she stayed until age 65:

$$(2) \qquad SSADJ = pSSB \frac{S}{S + (65-A)} - Z \frac{S(76)}{S + (65-A)}$$

Here, S is years of service, and S(76) is the years of service the worker had in 1976. A is the worker's current age. The first term is smaller the younger the age of retirement, which reduces the adjustment. But if the worker has pre-1976 service, the second term is also smaller the younger the retirement age and this increases the adjustment.

The term SSB, the FIRM's calculation of the worker's age 65 Social Security benefit, is based on the worker's earnings to date with the firm. In the SSB formula earnings last year are extrapolated forward, assuming no growth factor, until the worker reaches age 65. The average of past earnings with the firm as well as extrapolated future earnings is then entered into a three bracket progressive benefit formula to determine SSB.

For early retirees the factor by which benefits are reduced depends on age and service. For example, if the worker retires at age 55 with 20 years of service the reduction is fifty percent; it would be only 33 percent if the worker had 26 or more years of service. For workers with 30 or more years of service, the reduction drops to zero at retirement ages between 60 and 64.

The pension accrual can vary widely for workers of the same age, but with different service and for workers with the same service, but of different ages. These accrual differences reflect the fact that many of the features of the benefit and Social Security formulae involve either age or service or both. Indeed, it is fair to say that the firm's benefit formula could hardly be better designed from the perspective of maximizing service and age-related differences in accruals. This variation comes at the cost of a fairly

complicated set of provisions which may not be fully understood by individual workers.

B. Pension Accrual

To describe the effect of the provisions on pension wealth, the accrual profiles for persons born and hired by the firm in several different years have been calculated for the calendar period beginning in 1980. For each employee group defined by year of birth and year of hire, accruals are calculated through age 70; the number of years of accruals that are presented thus depends on the age of the employee in 1980. One profile is graphed in Figure 1. It is used as an illustration to explain the derivation of such profiles. Profiles for different employee and age groups are compared in the next section.

The graph shows the pension accrual profile for male managers born in 1930 and hired by the firm in 1960. By 1980, they were 50 and had 20 years of service with the firm. (To calculate pension accrual, we have used the convention that a person hired in a given year has one year of experience in that year. Thus in some of the tables shown below, the person used in this example would be assumed to have 21 years of experience in 1980.) The accrual is the change in the discounted value of future pension benefit entitlements for an additional year of employment. The accrual of Social Security benefits is shown on the same graph. Predicted wage earnings for each year are also shown. These predictions are based on actual average earnings of firm employees, by age and years of service. The prediction method is described and the results are discussed in detail in section II. All of the numbers presented in this section are in real 1985 dollars.

At age 50, in 1980, the typical male manager has wage earnings of about $48,446 per year. Compensation in the form of pension accrual is $2,646, or

about 6 percent of wage earnings. If the manger were to retire at this age, he would be entitled to benefits at 65, based on his earnings in the seven or eight preceding years. The benefits would not be available until age 65, and thus have a relatively low present value at age 50.

As described above, normal retirement benefits could be taken earlier, as early as age 55, but they would be reduced actuarially such that the present discounted value of the benefits remains unchanged. The reduction in the benefit would be just enough to offset the fact that benefits would be received for more years. If the person remains in the firm until age 55 and then retires, however, benefits are available immediately and the reduction in benefits for early retirement is less than the actuarial reduction. In addition, the worker who remains until age 55 and then retires is eligible to receive a supplemental benefit until age 65 equal to his Social Security offset. Thus there is a very large increase in pension wealth at age 55, $72,527, corresponding to the large spike in the graph. In effect, there is a bonus of $72,527 for remaining in the firm from age 54 to 55.

After age 55, pension accrual falls, to about 10 percent of the wage at age 60 (in 1990). Accrual is higher than just before age 55 primarily because the early retirement reduction factor if the worker remains until 55 is less than it would be if he left the firm before 55. (If he leaves before 55, the reduction is actuarially fair.) But as the worker ages beyond 56 this effect is partially offset by the fact that an additional year of service adds only 1, instead of 2 percent to benefits. Pension accrual is in fact negative beginning at age 61 (in 1991). Indeed between ages 61 and 65 the loss in pension benefits is equivalent to about 20 percent of wage compensation.

The loss in compensation between ages 60 and 61 is equivalent to a wage cut of about 14 percent. The worker has 30 years of service at that age and,

because of the plan's early retirement reduction factors, is already eligible for full retirement benefits. Thus no increase in benefits will result for working another year from the application of one fewer year of early retirement reduction, as was the case before 30 years of service. In addition, for each year that benefits are not taken between age 55 and 65, the receipt of benefits for a year without the Social Security adjustment (reduction) is foregone. This advantage is lost at age 65 (in 1995). Thereafter, the loss in benefits from working an additional year is smaller because this formerly foregone opportunity is no longer available. In addition, the accruals depend on the Social Security adjustment, and to a small extent on the updating of the years used in the calculation of the earnings base.

Social Security accruals for the male managers considered in figure 1a range from about $1,000 to $8,000 between age 50 and 65. After 65, Social Security accrual becomes negative, about -$8,500 at age 66.

In summary, the typical manager in the firm, making about $48,000 per year in wage earnings at age 60, would lose about $42,000 in pension wealth were he to continue working until age 65. Thus, in addition to the expected concentration of retirement at age 55, we would expect a large proportion of this group to retire before 65. After age 65, Social Security benefit accrual also becomes negative. At 66, the loss in private pension benefits and Social Security benefits together amounts to about 32 percent of wage earnings at that age. This suggests a concentration of retirement at 65 as well.

The data in figure 1a are shown in the standard budget constraint form in figure 1b. Total compensation, including wage earnings, Social Security wealth, and pension wealth, is graphed against age, beginning in 1980. The vertical axis shows the total resources that the person would acquire from

employment with this firm. Accumulated earnings before 1980 are ignored in the graph.

There is a discontinuous jump in the graph at age 55. For reasonable preferences for income (that can be used for consumption) versus retirement leisure, one would expect to see a large proportion of workers facing this constraint retiring at age 55 and most retiring prior to age 65.

Additional graphs showing wage earnings, pension accrual, and Social Security accrual over the working span are shown in figures 2a and 2b; again, the first shows accruals by year, and the second shows cumulated amounts in the standard budget constraint form. These graphs pertain to a male manager who is hired in 1980, at age 20, and who continues working with the firm until age 70. For such workers, the pension accrual at age 55 is $168,000, equivalent to 164 percent of the wage at that age. Wage earnings for this group reach a maximum at age 59. Pension benefit accrual becomes negative at age 61, and Social Security benefit accrual becomes negative at age 65. In the first year of work after age 65 the loss in pension benefits and Social Security benefits together amounts to $40,000, about 45 percent of wage earnings at that age. Thus the lifetime budget constraint shows an upward discontinuity at age 55 and a decline in the rate of wage increase around age 60. The decline is especially abrupt after age 65.[2] Retirement at age 55, between 55 and 65, and possibly at 65 would seem to be quite likely for workers facing budget constraints like this one.

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[2]The decline in this firm at age 65 is likely to be mild compared to that in many other firms in which the fall in pension accrual at age 65 is much greater than it is here. See Kotlikoff and Wise [1985 and 1987].

C. Decomposition of Pension Accrual

The calculations underlying the pension accrual in figures 1a and 1b are explained in this section. The wage earnings and other dollar values in this section are in current dollars, however, while the graphs are in constant 1985 dollars. The nominal interest rate assumed throughout this analysis is 0.09, and the real interest is assumed to equal 0.03.

The calculations are shown in table 1 for male managers who were born in 1930 and hired by the firm in 1960, the same group whose accrual profile is illustrated in figures 1a and 1b. Columns (1) through (4) are self-explanatory. Column (5) is the average earnings base used to calculate pension benefits. The normal retirement benefit is shown in column (6). It is calculated using the formula in equation 1 above. The Social Security benefit in column (7) is calculated by the firm based on earnings projected forward to age 65. Column (8) is the Social Security adjustment shown in equation 2. Column (9) is (7) minus (8). Column (10) is 1 minus the early retirement adjustment, the proportion of the benefit that remains after the adjustment. Once the person has worked for 30 years there is, according to the firm's early retirement reduction provisions, no reduction even though the person is only 60 years old at that time.

Column (11) is column (10) times column (6). It is the benefit that a person who retired early would receive between the early retirement age and age 65. After age 65, benefits are based on the adjusted retirement benefits, reduced by the early retirement reduction factor. These benefits are shown in column (12), which is (10) times (9).

The annuity value of a dollar received each year from 65 until death is shown in column (13). It accounts for the probability that a person will be alive at each year in the future. The probability that a person will live

from the current age until 65 is shown in column (14). The current value of a dollar that will be received at age 65 is shown in column (15). At the current age, the present value of the pension benefits that the manager can receive at age 65 is shown in column (16), and is given by (12) x (13) x (14) x (15).

If the manager retires at age 55 or later, he will receive benefits until age 65 that are not reduced by the Social Security adjustment. He receives the normal retirement benefits in column (6) reduced only by the early retirement reduction factor, (10), and shown in column (11). The present value of these benefits from the year of first collection until age 65 is shown in column (17). These benefits plus those that will be received after age 65, are the present value of his pension wealth and are shown in column (18) ((16) plus (17)).

The change in pension wealth from one year to the next, I(a), the pension accrual, is shown in column (19). The accrual at age a is given by

$$(3) \qquad I(a) = Pw(a+1) - Pw(a)(1+r)$$

where a is pension wealth and r is the nominal interest rate, taken to be 0.09. Again, these pension accruals, together with Social Security accruals and the wage, are graphed in figure 1a above, but in 1985 dollars. The accrual as a percent of wage earnings is shown in column (20).[3]

D. Variation in Accrual Profiles by Age and Year of Hire

The two accrual profiles discussed above pertain to persons who were born in a given year and who were hired by the firm in a given year. The profile

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[3]For more algebraic detail on the calulation of pension wealth, see Kotlikoff and Wise [1985].

in the calendar period beginning in 1980 may be quite different for persons of different ages and with different years of service. Thus, profiles have been calculated for several additional groups, 15 in all, defined by year of birth and year of hire, as follows:

Year of Birth	Year of Hire				
1960	1980				
1950	1980	1975			
1940	1980	1975	1970		
1930	1980	1975	1970	1960	
1920	1980	1975	1970	1960	1950

Pension accruals for managers with these birth and hire years are shown in table 3. Those born in 1940 reach age 55 in 1995, and for each of these groups there is a discontinuous increase in pension wealth in that year. It is $29,639 for those with 15 years of service in that year and $82,953 for those with 25 years of service. Comparable jumps occur in 1985 for those born in 1930. Accruals are often negative for persons over 60.

Pension accruals provide a large incentive for some groups to stay in the firm for another year and strong incentive for others to leave. For example, staying with the firm in 1985 brings pension accrual of $72,527 for 55 year old managers with 25 years of service (born in 1930 and hired in 1960), but a loss of $14,936 for 65 year olds with 35 years of experience (born in 1920 and hired in 1950). Thus there is enormous variation in the effective compensation for continued service. One might expect therefore that some groups would be much more likely than others to retire in a given year.

In some instances there are erratic fluctuations from one year to the next, from negative to positive to negative for example. This typically

occurs if an increase in benefits in one year is not followed by a comparable increase in the next. For example, suppose that the normal retirement benefit is higher in year a than in either year a-1 or in year a+1. Then the accrual from a-1 to a will tend to be positive, but the accrual from a to a+1 will tend to be negative. Dropping a low earnings year and adding a higher one in the calculation of the earnings base may create this effect. Other provisions in the pension calculation formula may do so as well. For convenience, total cumulated pension wealth is shown in table 3 for the same groups. Social Security accruals and cumulated Social Security wealth are shown in tables 4 and 5 respectively. Annual wage earnings and cumulated earnings are shown in tables 6 and 7.

Graphs of two of the profiles are shown in figures 1 and 2 above; several others are shown below. Young new hires will have rapid wage growth in the subsequent 20 years, but very little accrual of pension wealth. This is shown in figure 2 above for persons born in 1960, and 20 years old at the time of hire in 1980. Their incomes will rise from about $20,000 in 1980 to over $70,000 in the year 2000, when they are 40 years old. But even in 2000 their pension accrual will be only $1,558. Their total accrued pension wealth at age 40 will be only $11,894, a very small fraction (1.2 percent) of their total earnings over the period.

A manager hired in 1980, but born in 1940, will have much lower wage growth over the next 20 years, from about $28,000 in 1980 to under $52,000 at age 60 in 2000. (See figures 3a and 3b.) This person will also have little pension wealth accrual through age 54, when his total pension wealth will be less than $13,000. In 1995, however, when the person is 55 and eligible for early retirement, it will increase by almost $30,000 to a total of over $47,000. In the next few years accrual is less than $7,000 per year. The age

55 spike in accrual suggests a potential concentration of retirement among this group at age 55 (in 1995). But the actual pension that would be received is still very small, only about 12 percent of salary (from tables not shown). Thus retirement may be unlikely.

Managers of the same age, but hired 10 years early may be much more likely to retire in that year. (Figures 4a and 4b.) They experience a much sharper increase in pension wealth in 1985, from just under $42,000 to over $133,000. The pension benefit to wage replacement rate at 55 for this group is about 26 percent. But accrual after 55 remains positive for this group; pension wealth increases to almost $209,000 by age 60. Thus pension wealth accrual may still provide a substantial incentive to remain with the firm.

In contrast, persons born in 1920 and hired by the firm at age 40 (in 1960) will have essentially no pension accrual in 1985, and, indeed, it will become negative in a few years. (Figures 5a and 5b.) Earnings for this group are declining as well. One might think that persons who are in this group and are still working would be likely to retire. But, if still working, they chose not to retire earlier, when compensation from continued work began to decline. They would have been eligible for early retirement at age 55 (in 1975), when they had been employed for 15 years.

At that time they would have faced earnings and pension accrual profiles like those shown in figures 6a and 6b. The group described in these graphs was born and hired 10 years later (in 1930 and 1970 respectively) and thus had 15 years of service at age 55 (in 1985), when pension accrual was at a maximum. Thereafter, accrual declines and becomes negative around age 65, after 25 years of service. That the group pictured in figure 5 didn't retire earlier may suggest that their preferences are such that they are also not likely to retire in a given subsequent year either. They may want to work

more than others and that's why they didn't retire when pension accrual and earnings started to decline. In addition, however, the group had not accumulated substantial pension wealth at any time, even before it began to decline, and thus may always have been in a poor position to leave the labor force.

E. Variation by Employee Type

The pension accrual profiles for other employee groups look very much like those described above. Accrual is minimal during the first years of service. There is typically a discontinuous increase in pension wealth at age 55. And accrual typically becomes negative after 30 years of service, sometimes before that. Social Security accrual becomes negative after 65. The major differences among the groups stem from different age-earnings profiles. An illustration of the similarity and difference is provided by graphs like that in figure 2, but for different employee groups. They are shown in figures 7 through 11 for male managers, salesmen, saleswomen, male office workers, and female office workers, respectively. (The graphs for male managers are reproduced here for ease of comparison.) In each case the data pertain to persons born in 1960 and hired in 1980. Thus they all pertain to compensation over the life cycle for persons who remain in the firm. As is clear from the graphs, the accrual profiles are qualitatively similar; but there are some important differences.

First, managers earn more than the other employee groups. The wage earnings profiles also differ in shape. The peak earnings for managers occurs at age 59. At age 66, if they still are in the labor force, 45 percent of their wage earnings is offset by negative pension and Social Security accrual. The earnings of salesmen peak much earlier, at age 50. At age 66, almost 95

percent of their wage earnings are offset by loss in pension and Social Security wealth. Thus this effect creates a greater incentive for the salesmen than for the managers to retire after age 65.[4] The peak wage earnings for saleswomen occurs at age 57; at 66 almost 75 percent of their wage earnings is offset by pension and Social Security wealth losses. The peak earnings for male and female office workers occurs at ages 59 and 62, respectively. At age 66, 48 and 46 percent, respectively, of their earnings would be offset by loss in pension and Social Security wealth.[5]

The budget constraints for all groups show a discontinuous jump at age 55, but it seems most pronounced for managers. The budget constraint for salesmen is essentially flat after 65; their net compensation after 65 is virtually zero. The same is true for saleswomen. The net compensation of managers and male office workers is positive, but declining rapidly at age 65, and the budget constraints for these two groups become flatter after 65. The budget constraint nonlinearities seem to be the least pronounced for female office workers.

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[4]Managerial compensation is primarily in the form of salary, whereas the compensation of salesmen is in the form of commissions to a large extent. They may be more like self-employed or piece rate workers. In particular, their earnings may be determined to a large extent by the number of hours that they choose to work. This may also effect the relationship between compensation and retirement. Firm officials inform us, however, that most salespeople work only for the Firm. To the extent that the numbers of hours that they work do not decline substantially with the wage, profiles reflect age-productivity profiles.

[5]There should be no presumption that men and women classified by us as office workers are performing the same jobs. The classification does not assure that.

II. The Prediction of Earnings of the Firm's Workers

Data are available for each worker employed in the firm from the beginning of 1980 through the end of 1984. Most were in the firm in more than one year and many for all years. These years define the sample. Earnings for anyone in the sample are available beginning in 1969 if the person was employed then or beginning in the year that the person joined the firm if it was after 1969. Thus it is possible to follow the same person for up to 17 years. In particular, it is possible to estimate individual-specific earnings effects. By combining data for workers of different ages and with different years of service in the firm, it is possible to predict earnings. We use these predicted earnings in considering whether a person leaves the firm in a given sample year, like 1980. The probability of departure in a given year is related to how much the person would have earned during that year and on pension and Social Security accrual during that year. In future estimation, we will consider not only next year's earnings and pension and Social Security accrual, but also the effects of future earnings and pension and Social Security accrual.

Because earnings in the first and last years in the firm are likely to represent pay for only part of the year, they are excluded in the estimation of earnings. To be included, a person must have earnings data for at least three years. Workers with three years of data would have only one usable earnings observation. This group must be distinguished in the estimation procedure. Although persons with fewer than three years of earnings are not used in the estimation of earnings equations, they are included in the analysis of retirement discussed in section III. In this section the earnings

estimation procedure is discussed first and then the results are presented. In addition to their use in the subsequent prediction of retirement, the earnings results are of considerable interest in their own right. It is rare to have access to earnings data for the same persons over such a long period. It is often claimed, for example, that real wage earnings decline late in a person's working life. We are able to determine with relative certainty whether this is true for this firm.

A. The Method

Earnings histories from 1969 are available for workers employed during the period 1980 through 1984. To explain the main features of the estimation procedure, figure 12 describes the earnings of two persons who are in the data set for seven years. The first person is age 40 to 46 over these seven years, and the second is age 45 to 51. (They could also have different years of service, but that is ignored in this example.) Earnings by age for the typical person in the firm are represented by the solid line in the middle of the graph. The first person has higher earnings than the average employee. His earnings exceed those of the typical person by an amount u_1, the individual-specific earnings effect for person 1. It may arise, for example, because this person works harder than the typical employee or because he has greater ability or more training. Earnings for person 1 fluctuate from year to year, however. The deviations with age from the central tendency of his earnings, indicated by the person 1 average, are indicated by n_{1t}, where t indicates the deviation in year t. Future earnings for person 1 must be estimated for our analysis. They are indicated by the dashed part of the line. They depend on u_1 and on the estimated relationship between age and earnings, which, aside from the individual-specific term, is assumed to be the

same for individuals within a sex-occupation group. The earnings model is presented more formally in the following sections.

1. Earnings Equation Specification

To simplify the presentation, we include only one right-hand variable, age. In practice estimation is based on age and years of service. The exact specification is presented below. An earnings equation that captures the ideas discussed above is:

$$(4)\quad \ln E_{it} = \beta_0 + \beta_1 A_{it} + \beta_2 A_{it}^2 + \epsilon_{it}$$

$$= \mu_{it} + \epsilon_{it}$$

$$\epsilon_{it} = u_i + \eta_{it}$$

$$\mathrm{Var}(\epsilon) = \mathrm{Var}(u) + \mathrm{Var}(\eta) = \sigma_\epsilon^2 \ , \ \mathrm{Var}\ (u) = \sigma_u^2 \ , \ \mathrm{Var}\ (\eta) = \sigma_\eta^2$$

$$\mathrm{Cov}(u_i, \eta_{it}) = \mathrm{Cov}(\eta_{it}, \eta_{it'}) = 0$$

E = Annual earnings

A = Age

i = Indexes individuals

t = Indexes year (e.g., 1978, ..., 1983)

u_i = Individual-specific earnings effect

$$E_{it} = e^{\mu_{it}} e^{\epsilon_{it}} = e^{\mu_{it}} e^{u_i} e^{\eta_{it}}$$

$$E(E_{it} | \mu_{it}, u_i) = e^{\mu_{it}} e^{u_i} E(e^{\eta_{it}}) \doteq e^{\mu_{it}} e^{u_i} (1 + \frac{\sigma_\eta^2}{2})$$

The last approximation is a reminder that because of the nonlinear relationship between earnings and age, the expected value of $\exp[\eta_{it}]$ is not equal to 1, even though the expected value of η_{it} is 0.

In addition to the parameters β, the variances of u and η are also of interest. The first indicates the systematic earnings variation across individuals due to individual-specific effects. The second is a measure of the extent of non-systematic variation. The method of estimation used here does not allow for the possibility that the individual-specific terms u may be correlated with age. For example, it may be that persons whose earnings are higher, because of the attributes u, are more likely to continue working at older ages. We did obtain such estimates using a differencing procedure. But for our purposes the procedure has two important shortcomings: First, it means that certain age and service parameters are not identified. Second, it imposes the rate of salary increase by age that existed over the period of the data, because this relationship depends only on changes in earnings over the period of the data. (The method we use allows the effect of age to be determined in part by comparison of the earnings of workers with very different ages.) This increase is apparently low relative to longer term increases, and hence may imply expected future increases with age and service that are too low. We also discovered that individual specific terms based on the method that we have used are not correlated with firm departure rates.

2. Estimation Method

Estimation of equation (4) yields residuals

$$(5) \quad e_{it} = \ln E_{it} - \hat{\beta}_0 - \hat{\beta}_1 A_{it} - \hat{\beta}_2 A_{it}^2$$

The estimated variance of e is given by

$$(6)\quad \hat{\sigma}_{\epsilon}^2 = \frac{\sum_{i,t} e_{it}^2}{\sum_{i} n_i - k},$$

where n_i is the number of observations for person i and k is the number of parameters (3 in this example). To obtain estimates of additional parameters of interest we need to distinguish persons with more than one observation from those with only 1.

a. Using Persons With $n_i > 1$

From the residuals for person i the individual-specific effect for i is calculated by

$$(7)\quad \hat{u}_i = \frac{\sum_{t} e_{it}}{n_i}$$

The variances of η and u are then given, respectively, by

$$(8)\quad \hat{\sigma}_{\eta}^2 = \frac{\sum_{i,t} (e_{it} - \hat{u}_i)^2}{\sum_{i} n_i - k - I}, \text{ and}$$

$$(9)\quad \text{Var}(u) = \text{Var}(e) - \text{Var}(n)$$

where I is the number of persons in the sample (in this instance those with $n_i \geq 2$), and

$$(10)\quad \hat{\eta}_{it} = e_{it} - \hat{u}_i$$

b. For Persons With $n_i = 1$.

If a person has only one observation we can't distinguish η_{it} from u_i, since we don't observe any variation around an average. First note that if u and η are normally distributed, and thus ϵ is also,

$$E(u|E) = E(u) + \rho_{u,\epsilon} \frac{\sigma_u}{\sigma_\epsilon} (\epsilon - E(\epsilon))$$

$$= 0 + \rho_{u,\epsilon} \frac{\sigma_u}{\sigma_\epsilon} (\epsilon - 0)$$

$$= \rho_{u,\epsilon} \frac{\sigma_u}{\sigma_\epsilon} ,$$

$$Cov(u,\epsilon) = E[u(u+\eta)] = \sigma_u^2 ,$$

$$\rho_{u,\epsilon} = \frac{Cov(u,\epsilon)}{\sqrt{Var(u)} \cdot \sqrt{Var(\epsilon)}} = \frac{\sigma_u^2}{\sigma_u \sqrt{\sigma_u^2 + \sigma_\eta^2}} = \frac{\sigma_u}{\sigma_\epsilon} ,$$

$$\rho_{u,\epsilon} \cdot \frac{\sigma_u}{\sigma_\epsilon} = \frac{\sigma_u^2}{\sigma_\epsilon^2}$$

where ρ is a correlation coefficient. Thus

$$E(u_i|\epsilon_{it}) = \frac{\sigma_u^2}{\sigma_\epsilon^2} \epsilon_{it} = \frac{\sigma_\epsilon^2 - \sigma_\eta^2}{\sigma_\epsilon^2} \cdot \epsilon_{it} .$$

If σ_η^2 were 0 and we observed ϵ_{it}, we would assume it represented entirely an individual specific effect u_i. If σ_u^2 were 0, we would assume the ϵ_{it} were equal to the random term η_{it}, and that there was no individual effect u_i. Letting e_{it} be the sample analog of ϵ_{it} and using the estimates in (2) and (4) for σ_ϵ^2 and σ_η^2 respectively, u_i for persons with only one observation is estimated by

$$(11) \quad \hat{u}_i = \frac{\hat{\sigma}_\epsilon^2 - \hat{\sigma}_\eta^2}{\hat{\sigma}_\epsilon^2} e_{it} .$$

And η_{it} by

$$\hat{\eta}_{it} = e_{it} - \hat{u}_i .$$

c. Predicted Earnings

For estimation of the likelihood that a person will retire in the next year, we need to use predicted earnings in that year. For future analysis we will need to predict earnings in subsequent years as well. The predictions are given by

$$\hat{E}_{it} = e^{\hat{\mu}_{it}} e^{\hat{u}_i} E(e^{\eta_{it}}) = e^{\hat{\mu}_{it}+\hat{u}_i} (1 + \hat{\sigma}_\eta^2/2) \qquad \text{for } n_i \geq 2$$

(12)

$$\hat{E}_{it} = e^{\hat{\mu}_{it}} e^{\hat{u}_i} E(e^{\eta_{it}}) = e^{\hat{\mu}_{it}+\hat{u}_i} (1 + \hat{\sigma}_\eta^2/2) \qquad \text{for } n_i = 1$$

For out-of-sample estimates, $\hat{\mu}_{it}$ would be predicted from future age, for example.[6]

d. The Estimated Components of Earnings

To consider how much earnings deviate from what might be predicted for that person, or from what that person himself might predict, it is useful to divide earnings into expected and unexpected components. We do that by defining

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[6]Simulated actual future earnings could be obtained by taking a random draw $\tilde{\eta}_{it}$ from the estimate distribution of η, $N(0,\hat{\sigma}_\eta^2)$, for each future year and using

$$E_{it} = e^{\hat{\mu}_{it}+\hat{u}_i} e^{\tilde{\eta}_{it}} .$$

If E_{it} were used in equation (4) instead of ln E_{it}, there is no need to use the non-linearity correction.

(13) $\ln E_{it} = \hat{\mu}_{it} + \hat{u}_i + \hat{\eta}_{it}$

$\hat{\mu}_{it} + \hat{u}_i$ = "permanent" or "expected" component

$\hat{\eta}_{it}$ = "transitory" or "unexpected" component

These definitions do not necessarily correspond to usual definitions of permanent versus transitory income, so the expected versus unexpected terminology may be better. In levels the two components are given by

(14) $E_{it} = e^{\hat{\mu}_{it}+\hat{u}_i} \cdot e^{\hat{\eta}_{it}}$

$= e^{\hat{\mu}_{it}+\hat{u}_i} + e^{\hat{\mu}_{it}+u_i}(e^{\hat{\eta}_{it}} - 1)$

$=$ permanent component $+$ transitory component

3. A More Detailed Specification of the Earnings Function

Earnings were predicted using the following variables:

Age

Age Squared

Age Squared x Service

Service

Service Squared

Service Squared x Age

Age x Service

Age Squared x Service Squared

Calendar Year Variables for 1969,...,1979 and 1981,...,1983.

The calendar year variables pick up changes in real earnings over time. Each of the year estimates is relative to the 1980 base.

4. Earnings Function Estimates

The estimated earnings function parameters are shown in table 8. The implications of the estimates are shown in figures 12a through 12e, distinguished by employee group. Figure 12a, for example, shows earnings profiles for managers by age of hire in 1980, where the nine profiles on the graph pertain to persons hired at successively older ages--from 20 to 60 in five-year intervals. Earnings are calculated through age 70 for each cohort. First, it is clear that, for any age, earnings increase substantially with years of service. Earnings at the time of hire increase with age, but the bulk of the difference in earnings is accounted for by years of service in the firm. For example, persons who are 55 and just hired (profile 8) earn much less than those who are 55, but have been working for the firm since age 20 (profile 1). Finally, the decline in earnings for older workers is much greater for long-term employees than for those who have been hired recently.

Similar patterns apply to other employee groups, but with some significant variations. The earnings of male office workers at the time of hire vary greatly by age, increasing and then declining rapidly. The importance of these profiles for our work is that future expected earnings depend in an important way on the age and years of service of an employee, and the employee group.

In our prediction of earnings beyond 1984 we use the 1984 year dummy and add a 1.5 percent real wage growth factor; i.e., the predicted earnings for year t is the predicted earnings for 1984 times (1.5)(t-1984).

III. The Relationship Between Retirement, Age, and Years of Service

In this section, the relationship of retirement to age and years of service is described. The intention is to consider the extent to which

retirement behavior is consistent, by economic reasoning, with the budget constraints described in section II. To do this, we consider in detail empirical hazard rates by age and years of service. These results will serve as a guide to future development and estimation of more formal models of retirement. They are the empirical regularities with which the models must be consistent. In addition, however, this extensive descriptive analysis supports several initial conclusions:

- The favorable early retirement benefits have a very strong effect on departures from the firm, possibly increasing departure rates between ages 55 and 60 by as much as 30 percentage points (e.g. from 14 to 44 percent).
- The loss in compensation do to negative pension accrual for many employees after age 60 and negative Social Security accrual after age 65 apparently also induce departure; only 58 percent of those employed at age 54 remain through age 59, and only 21 percent of those employed at 59 remain through 64. About half of the few remaining at 65 retire at that age.
- The special early retirement incentive offered in one year increased departure rates very substantially.

A. Empirical Hazard Rates

Hazard rates by age and years of service are shown for all employees combined in table 9. The yearly hazard rate is the proportion of those employeed at the beginning of the year that retires--more strictly speaking, leaves the firm--during the forthcoming year. Several aspects of the data stand out. There is substantial turnover in the first 9 years of employment, especially during the first five years. On average, about 15 percent of those employed five years or less leave in a given year. The table shows rates only for employees 40 and older. The departure rates are somewhat higher for younger workers, 16 or 17 percent for those employeed 5 years or less and 10 to 12 percent for those employed 6 to 9 years. There is a sharp decline in

departure rates at 10 years of service, when employees are about to become vested in the pension plan. Before the early retirement age, 55, the typical decline is from 8 or 9 to 4 or 5 percent. After 55, when vesting caries with it eligibility for early retirement, it is much sharper, often from 10 percent or more to 3 percent or less.

The availability of early retirement benefits at 55 apparently has a substantial effect on retirement. Before 55 departure rates are typically around 2 percent. At 55, they jump to 10 percent or more. It is important to notice that the departure rates stay at that level until age 60, when there is another jump in the rate of departure. The jump at 60 corresponds to the age at which pension accrual becomes negative for many employees. (For those with 25 or more years of service, benefits increase at one instead of two percent per year. After age 60 with 30 years of service there is no early retirement reduction; full retirement benefits are available.)

To understand the potential importance of the early retirement benefits, suppose that if it were not for this inducement, the departure rates would remain at 3 percent until age 60 instead of the 10 or 12 percent rates that are observed. (Notice that the departure rates for employees aged 55 to 61 who are in their tenth year of service--not yet vested and hence not eligible for early retirement benefits--are also two or three percent on average.) Departure at 3 percent per year would mean that 14 percent of those who were employed at 55 would have left before age 60. At a departure rate of 11 percent per year, 44 percent would leave between 55 and 59. Such a difference, even if only for a small proportion of all firms, can have a very substantial effect on aggregate labor force participation rates. It is in part the dramatic fall in labor force participation rates for the older population that has motivated research such as ours.

The jump in departure rates at 60, especially noticeable for persons with 25 or more years of service, has been mentioned just above. There is another sharp increase in departure rates at 62 when Social Security benefits are first available. (There is no sharp kink in the budget constraint at this age because of the actuarially fair increase in Social Security benefits if their receipt is postponed until age 65.) The increase at 62 is also noticeable for employees with less than ten years of service and not yet vested in the firm pension plan. They can take Social Security benefits, of course.

Finally, there is a very sharp increase in the departure rate at age 65. At this age the loss in Social Security benefits with continued work induces a kink in the budget constraint. As described above, the budget constraint for many workers becomes essentially flat at this age, due to negative pension accruals and falling wage earnings, as well as the loss in Social Security wealth. The fall in wage earnings and pension wealth typically begins at an earlier age, as emphasized above. It is important to keep in mind that the large departure rates before 65 mean that most employees have left well before that age. Thus high departure rates at 65 indicate only that a large proportion of the few that continue work until 65 retire then. The cumulative hazard rates below highlight this point.

A more compact version of table 9 is shown in the tabulation below for salesmen. About 40.7 percent of employees are salesmen and women, about 56.2 percent are office workers, and only 3.1 percent managers. Thus for purposes of comparison, it is best to have in mind the accrual and budget constraint graphs for sales and office workers.

Hazard Rates for Salesmen by Age and Years of Service

Age	Years of Service						
	< 10	11-15	16-20	21-25	26-30	-----	----
< 50	19	9	5	4	3	--	--
50-54	14	7	4	3	3	2	0
55	11	14	9	11	12	15	--
56-59	14	13	9	11	11	14	--
60	11	12	14	19	14	29	35
61	13	12	13	13	19	32	28
62	12	27	32	38	36	52	35
63	20	28	33	36	47	48	56
64	0	37	36	30	36	38	28
65	34	56	51	50	49	47	43
66	17	28	10	34	18	16	12
67	20	16	25	21	8	5	18

These results confirm the findings for all employees discussed above. They may be summarized briefly:

- There is a large increase in the departure rates at the early retirement age of 55, but only for vested employees, those with at least 10 years of service. For employees with 16 or more years of service, the jump in departure rates increases very noticeably with age.
- The departure rates remain at these higher rates through age 59.
- At age 60, the departure rates increase very precipitously for persons with 30 or more years service, for whom full benefits are available; there is no longer an early retirement reduction and subsequent pension accrual is negative.
- When Social Security benefits become available at 62, the departure rates increase very sharply, but apparently only for those who are vested in the firm plan, contrary to the results for all employees taken together.
- Finally, there is a large increase in departure rates at 65, after which Social Security accrual rates become strongly negative.

Cumulative hazard rates for all employees are shown below for three years, together with the rates by age. The cumulative rates are actually one minus the percent who have departed.

Cumulative and Yearly Hazard Rates
by Calendar Year, Years of Service, and Age

	Yearly Hazards				Cumulative Hazards		
	8-10 YOS	11+ YOS			11+ YOS		
Age	1980	1981	1982	1983	1981	1982	1983
50	7	3			97	97	97
51	9	3			94	94	94
52	3	5	5	5	89	89	89
53	0	4	4	4	85	86	86
54	4	3	4	2	83	83	84
55	5	11	12	10	74	73	75
56	4	12	14	10	66	63	68
57	2	9	12	11	60	56	61
58	5	10	14	12	54	48	54
59	2	11	20	10	48	38	48
60	4	17	29	17	40	27	40
61	0	17	32	18	33	18	33
62	8	36	48	31	21	10	23
63	14	37	54	37	13	5	14
64	11	29	49	26	10	2	11
65	25	53	58	45	5	1	6

These departure rates were obtained by calculating hazard rates over the next four years separately for persons who were age 50 in 1980, age 51 in 1980, ... , and age 63 in 1980. Those who were age 50 in 1980 were 51 in 1981, 52 in 1983, etc. Thus these calculations yield hazard rates in different years for employees of the same age. In particular, given employment at age 50, the cumulative rates show the percent still employeed at older ages. (The cumulative rates for those aged 50 are all based on the 1980 departure rate of

.031. The rates for those aged 51 are all based on the 1981 rate of .033. The 1983 rate for those aged 52 is based on the 1982 rate. The rate for those who were 65 in 1981 is based on the 1983 rate.)

Note first that departure rates of employees who have been in the firm for only 8 to 10 years, and are not yet vested, are very low at every age, as emphasized above. And again, the increase in the departure rates at 55, 60, 62, and 65 stands out. Based on the 1981 and 1982 departure rates, only 48 percent of those employed at 50 would still be employeed at 60, and then 17 percent of these would leave. Only 10 percent would remain until age 65 and then about 50 percent of these would leave.

The data also show the effect of a special early retirement incentive that was in effect in 1982 only. The incentive program provided a bonus to employees who were eligible for early retirement in 1982; that is, those who were vested and were 55 years old or older. The bonus was equivalent to three months salary for 55 year old employees and increased to 12 months salary for 60 year olds. At age 65, the bonus was 12 months salary for employees with 20 or fewer years of service and declined to 6 months salary for those with 30 to 39 years of service.

It is clear that the effect of the incentive was large. The departure rates for 1981 and for 1983 are virtually identical. But the rates were much higher in 1982. For example, the departure rate for 60 year olds was 17 percent in 1981 and in 1983, but 32 percent in 1982. For those age 63, the departure rate was 37 percent in 1981 and in 1983, but 54 percent in 1982. Of those employeed at age 50, 40 percent would still have been employeed after age 60 based on the 1981 and 1983 departure rates. Only 27 percent would remain after age 60 based on the 1982 rates.[7]

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[7]This comparison may not be precise because the special incentive, were

Even under the normal plan, only 10 percent of those employeed at age 50 would still be employeed at 65. Only 1 percent would remain until 65 with the special incentive.

IV. Summary and Conclusions

The provisions of the pension plan in a large corporation have been described in detail. The implications of the provisions are described by pension accrual profiles. The pension accrual profiles are set forth together with standard age-earnings profiles and Social Security accrual profiles in the form of life-time budget constraints. The plan provides very strong incentives to retire beginning at age 55. After age 65, negative pension accruals and negative Social Security accruals effectively impose almost a 100 percent tax rate on wage earnings for many employees of the firm.

Departure rates from the firm have been compared with economic incentives inherent in the plan provisions. It is clear from this descriptive analysis that the inducements in the plan provisions to retire early have had a very substantial effect on departure rates from the firm. Indeed over 50 percent of those employed by the firm at age 50 leave before 60 and 90 percent before age 65. The jumps in departure rates at specific ages coincide precisely with the discontinuities and kink points in the worker compensation profiles that result from the pension plan provisions together with wage earnings profiles and Social Security accrual.

A great deal of effort has been devoted to estimating the effect of Social Security provisions on labor force participation. In particular,

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it to be prolonged, would alter the retirement rates prior to each of the ages considered in 1982.

Hausman and Wise [1985], Burtless [1986], and Boskin and Hurd [198_] have attempted to estimate the effect on labor force participation of the increases in Social Security benefits during the early 1970's. It would appear from the results here that the effects of these across the board increases in Social Security benefits are likely to be small relative to the effects of the private pension provisions. For example, it seems clear that shifting the age of early retirement from 55 to 60 would have a very dramatic effect on departure rates. Leaving the early retirement age at 55, but eliminating negative pension and Social Security accruals thereafter would apparently also have a substantial effect on retirement rates. Precise estimates of the effects of such changes will be made in future work.

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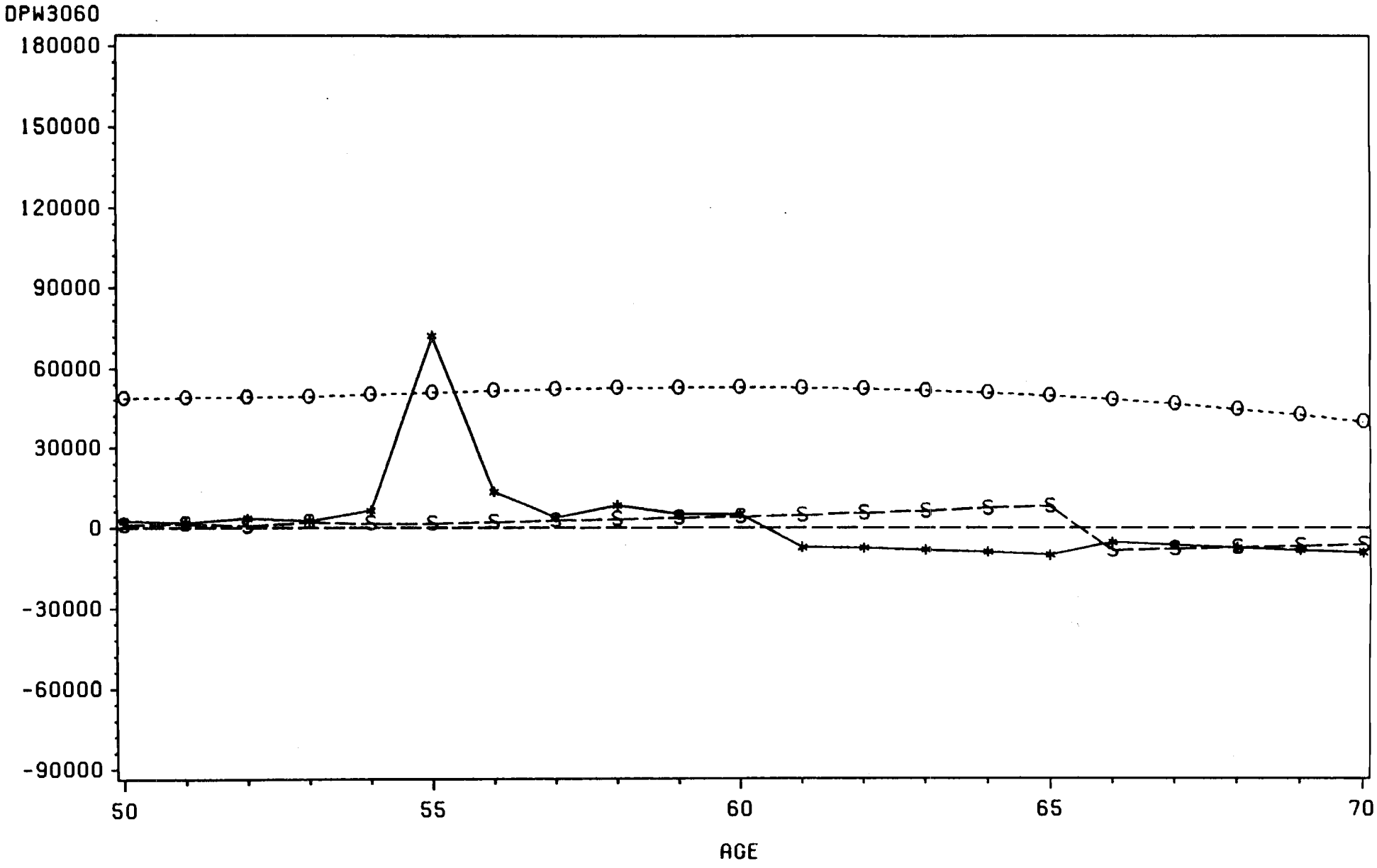
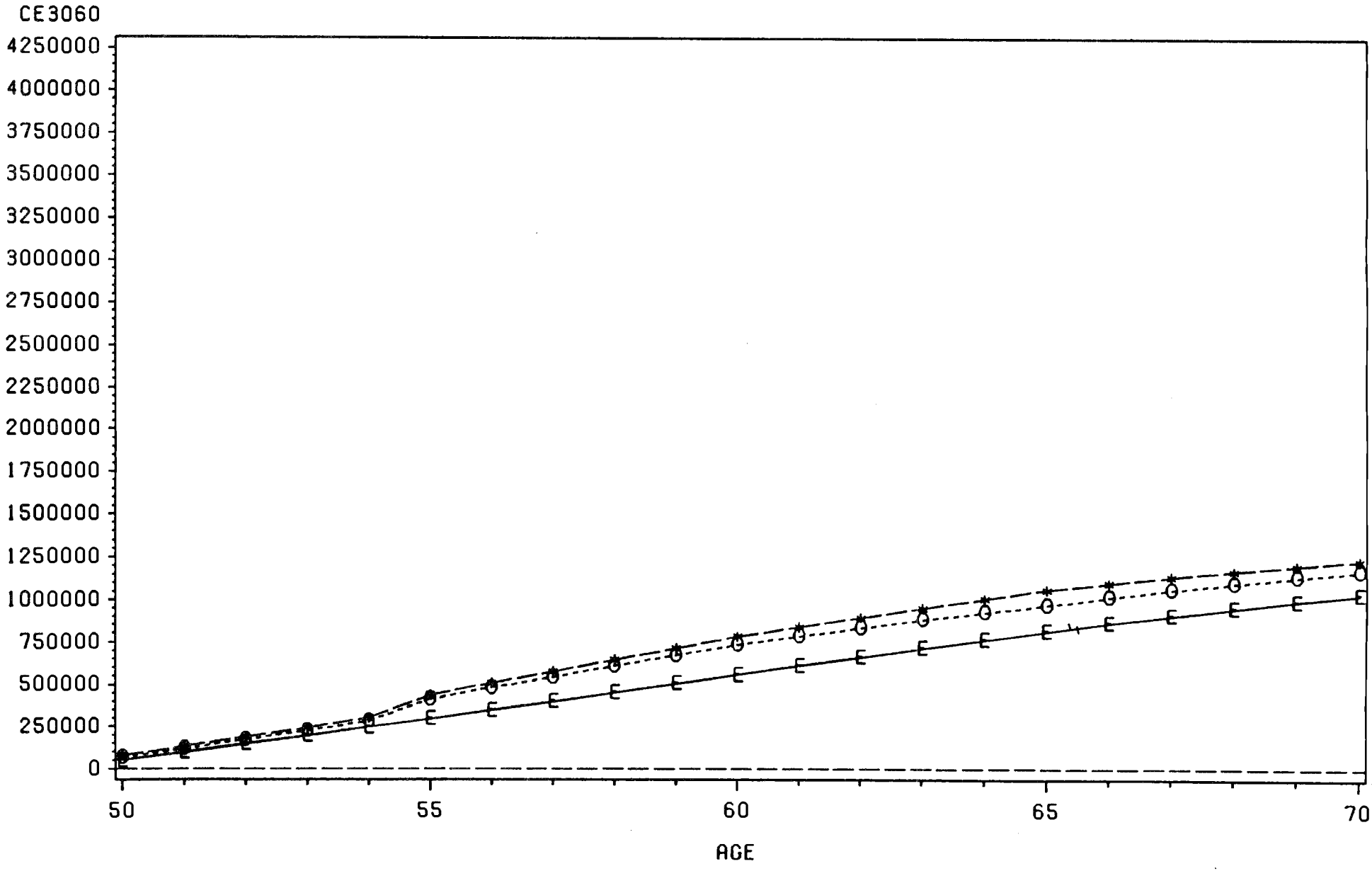
FIGURE 1a. PENSION WEALTH ACCRUAL, SS ACCRUAL, AND WAGE EARNINGS FOR MALE MANAGERS BORN IN 1930 AND HIRED IN 1960, IN REAL 1985 DOLLARS



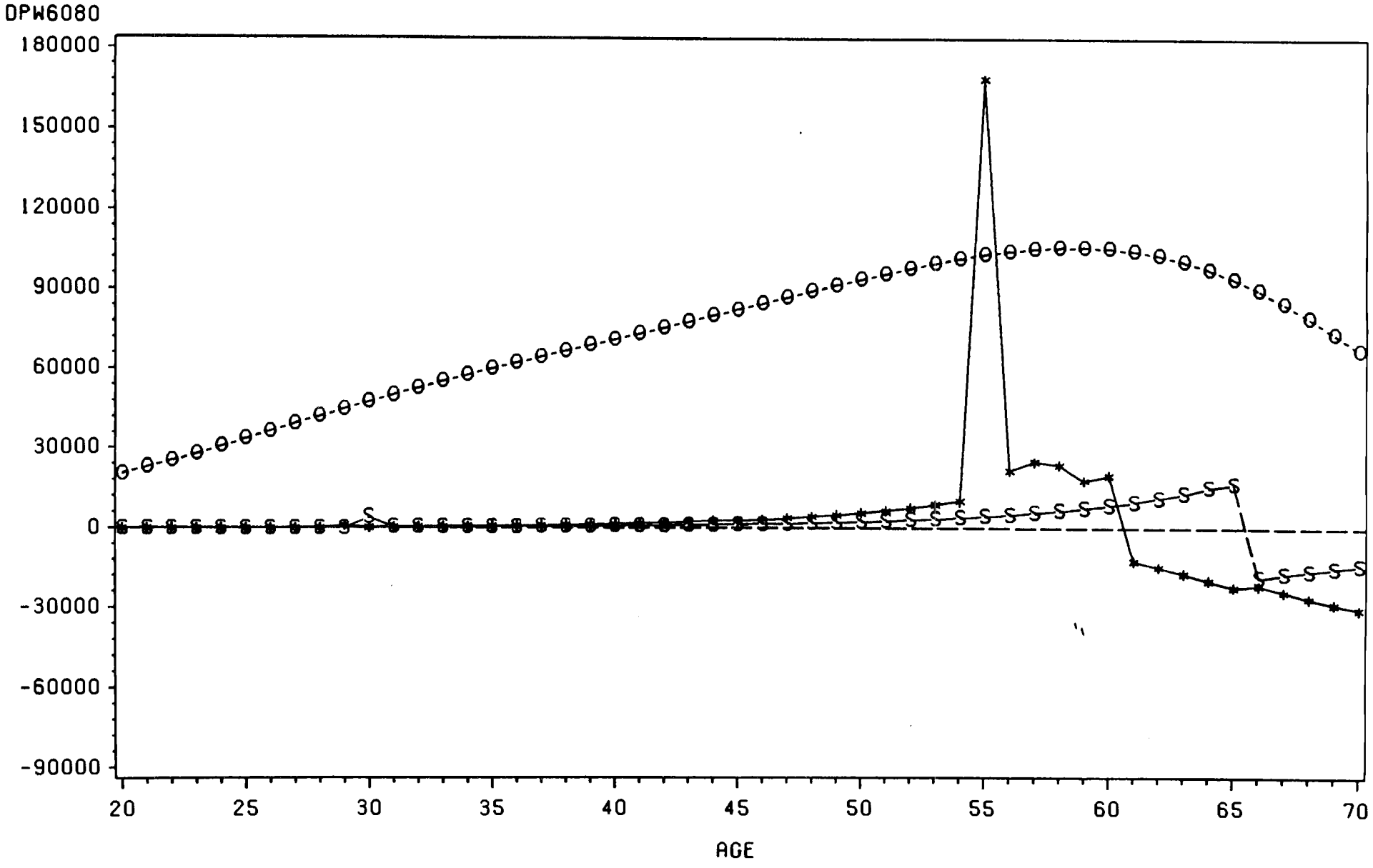
* = PENSION WEALTH ACCRUAL
O = REAL EARNINGS
S = SOCIAL SECURITY ACCRUAL

FIGURE 1b. CUMULATED TOTAL INCOME FROM EMPLOYMENT VERSUS YEAR OF RETIREMENT, MALE MANAGERS BORN IN 1930 AND HIRED IN 1960



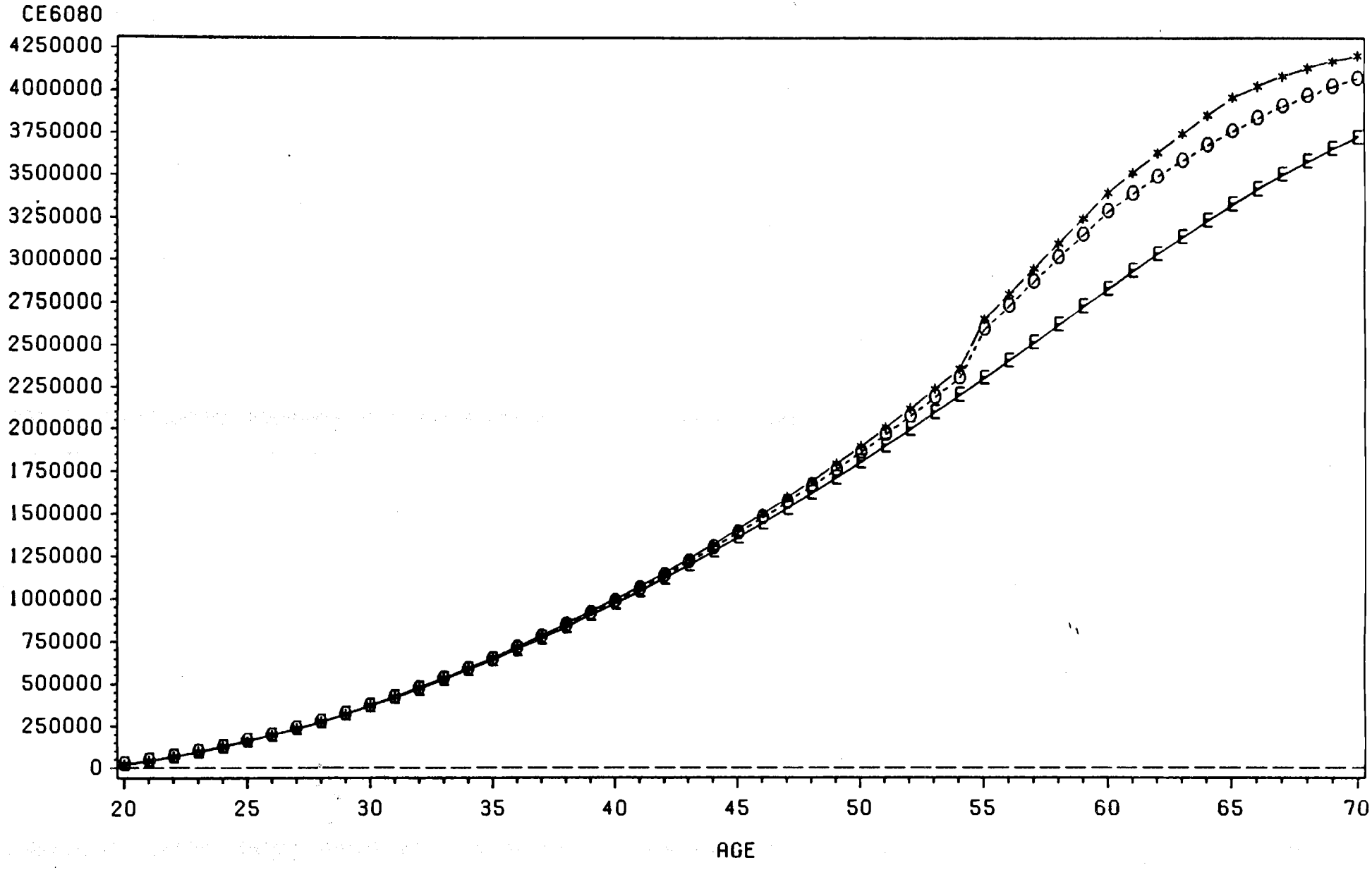
E = CUM. EARNINGS
O = CUM. EARNINGS + PW
* = CUM. EARNINGS + PW + SSW

FIGURE 2a. PENSION WEALTH ACCRUAL, SS ACCRUAL, AND WAGE EARNINGS FOR MALE MANAGERS BORN IN 1960 AND HIRED IN 1980, IN REAL 1985 DOLLARS



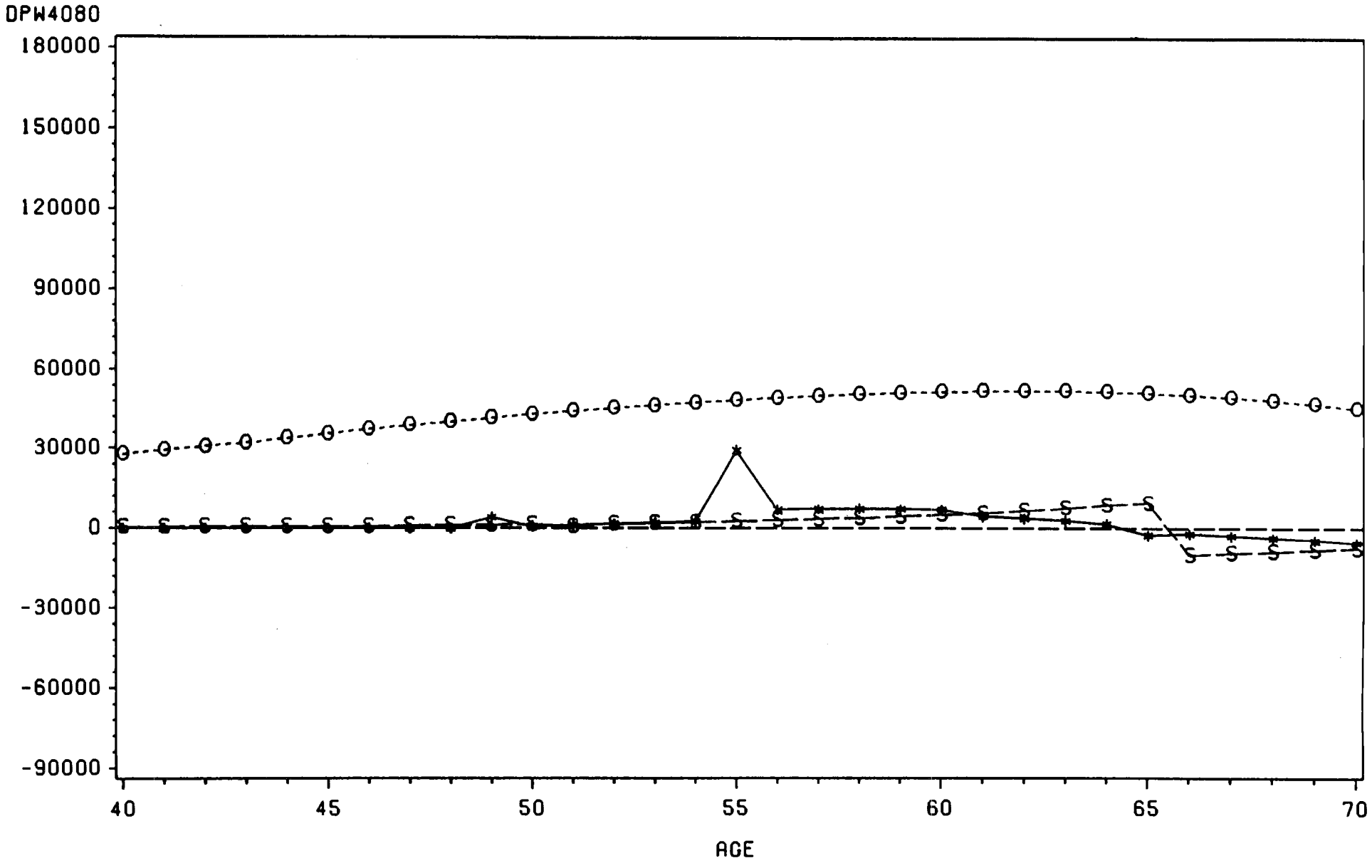
* = PENSION WEALTH ACCRUAL
O = REAL EARNINGS
S = SOCIAL SECURITY ACCRUAL

FIGURE 2b. CUMULATED TOTAL INCOME FROM EMPLOYMENT VERSUS YEAR OF RETIREMENT, MALE MANAGERS BORN IN 1960 AND HIRED IN 1980



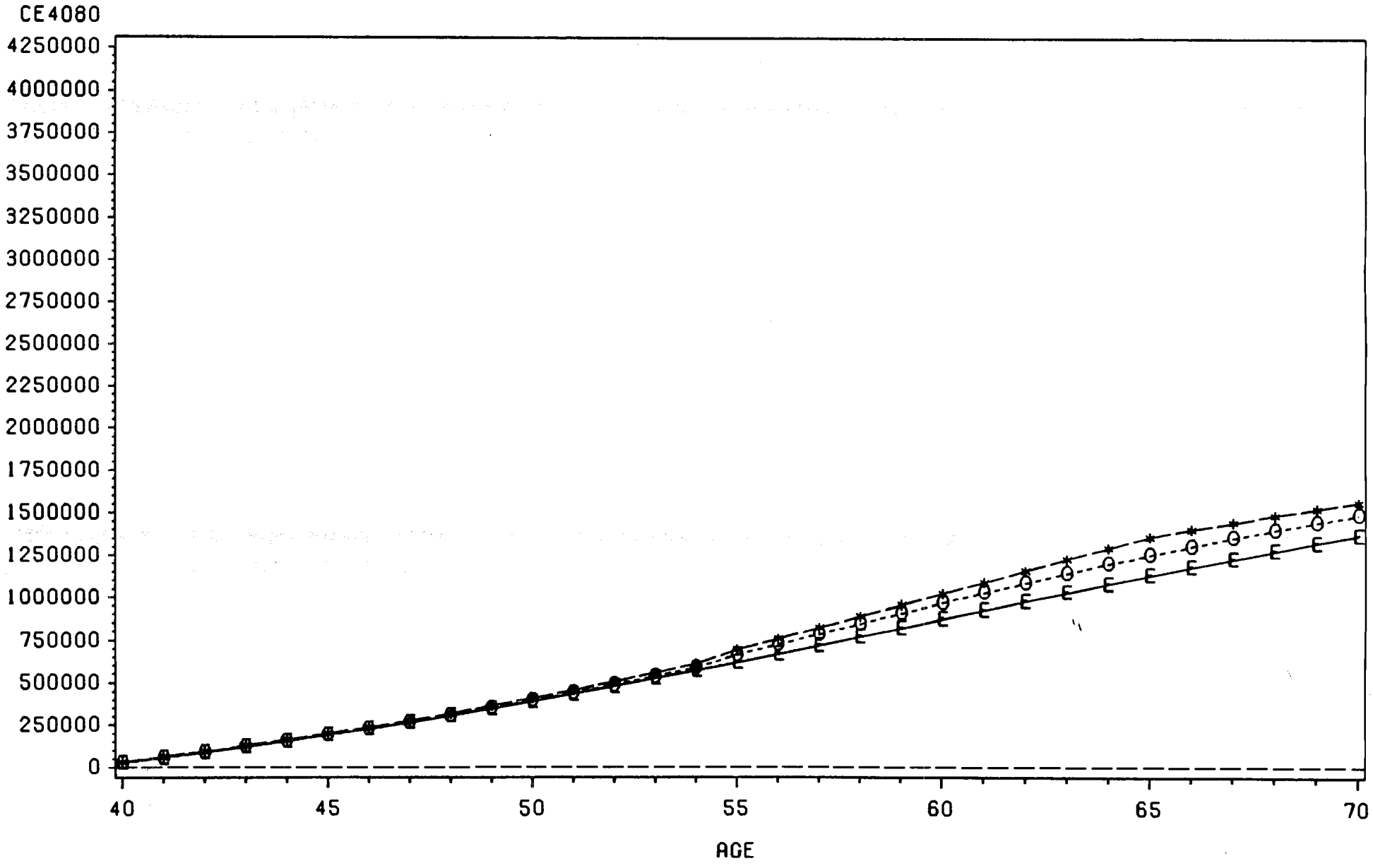
E = CUM. EARNINGS
O = CUM. EARNINGS + PW
* = CUM. EARNINGS + PW + SSW

FIGURE 3a. PENSION WEALTH ACCRUAL, SS ACCRUAL, AND WAGE EARNINGS FOR MALE MANAGERS BORN IN 1940 AND HIRED IN 1980, IN REAL 1985 DOLLARS



* = PENSION WEALTH ACCRUAL
O = REAL EARNINGS
S = SOCIAL SECURITY ACCRUAL

FIGURE 3b. CUMULATED TOTAL INCOME FROM EMPLOYMENT VERSUS YEAR OF RETIREMENT, MALE MANAGERS BORN IN 1940 AND HIRED IN 1980



E = CUM. EARNINGS
O = CUM. EARNINGS + PW
* = CUM. EARNINGS + PW + SSW

FIGURE 4a. PENSION WEALTH ACCRUAL, SS ACCRUAL, AND WAGE EARNINGS FOR MALE MANAGERS BORN IN 1940 AND HIRED IN 1970, IN REAL 1985 DOLLARS

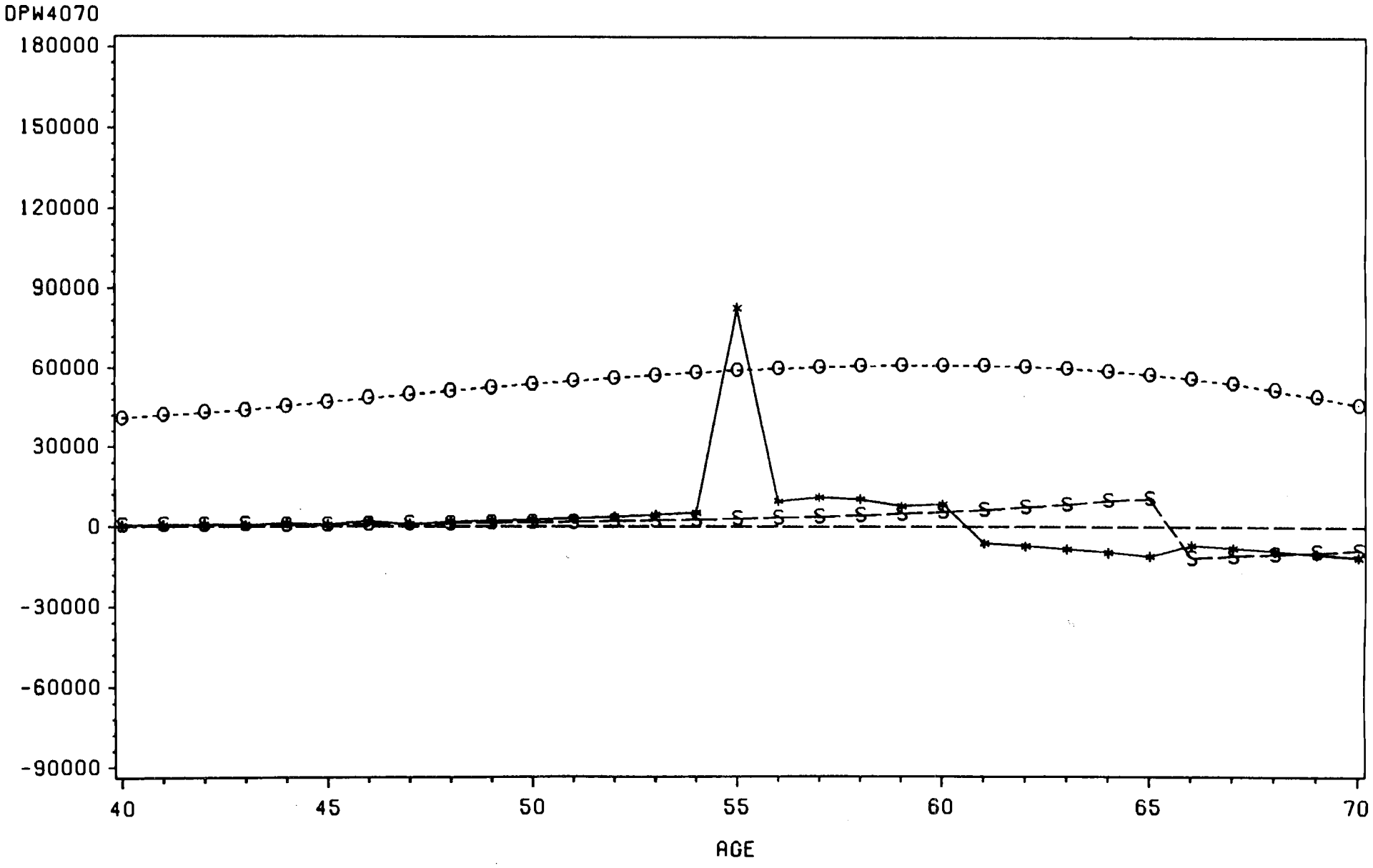
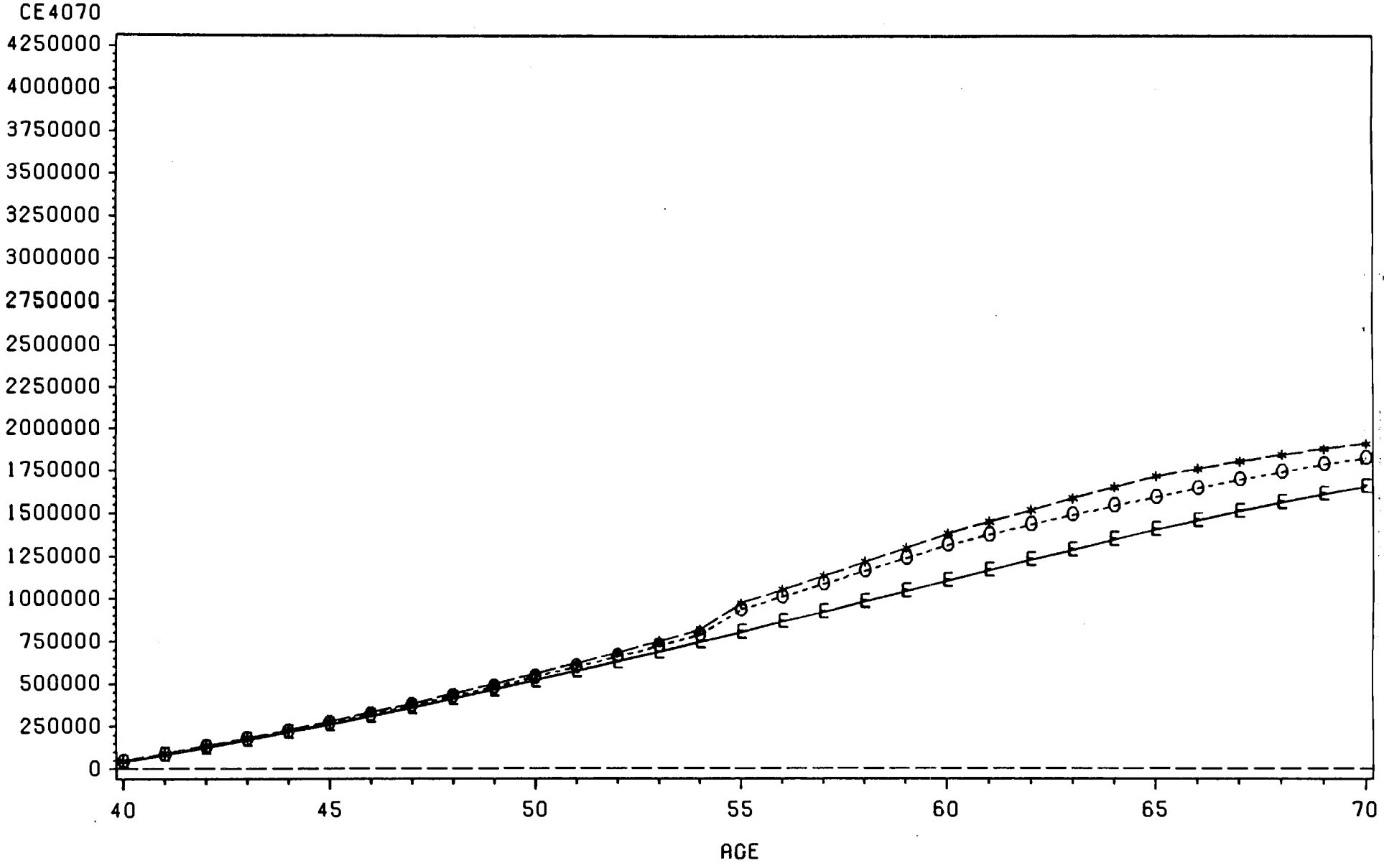
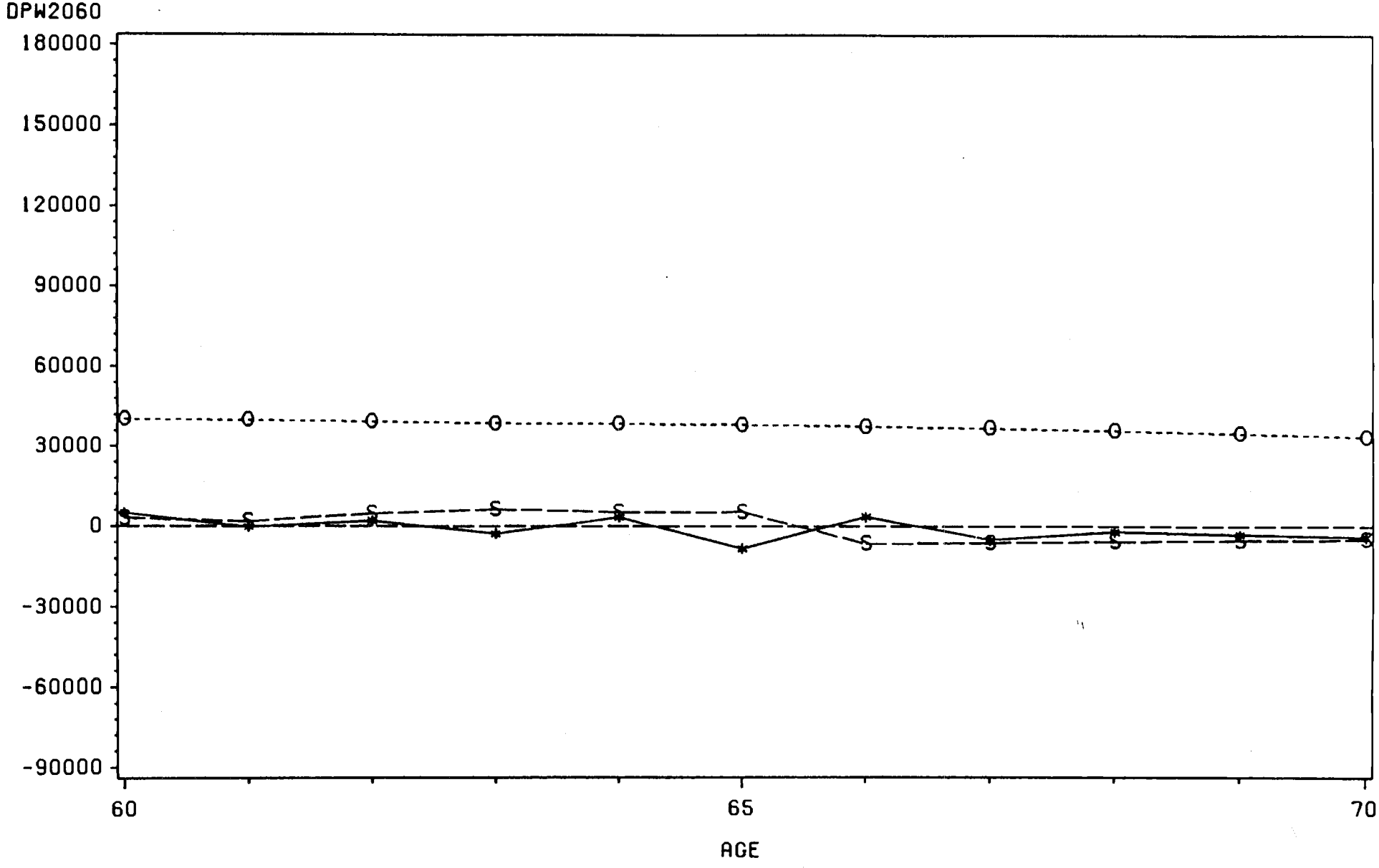


FIGURE 4b. CUMULATED TOTAL INCOME FROM EMPLOYMENT VERSUS YEAR OF RETIREMENT, MALE MANAGERS BORN IN 1940 AND HIRED IN 1970



E = CUM. EARNINGS
O = CUM. EARNINGS + PW
* = CUM. EARNINGS + PW + SSW

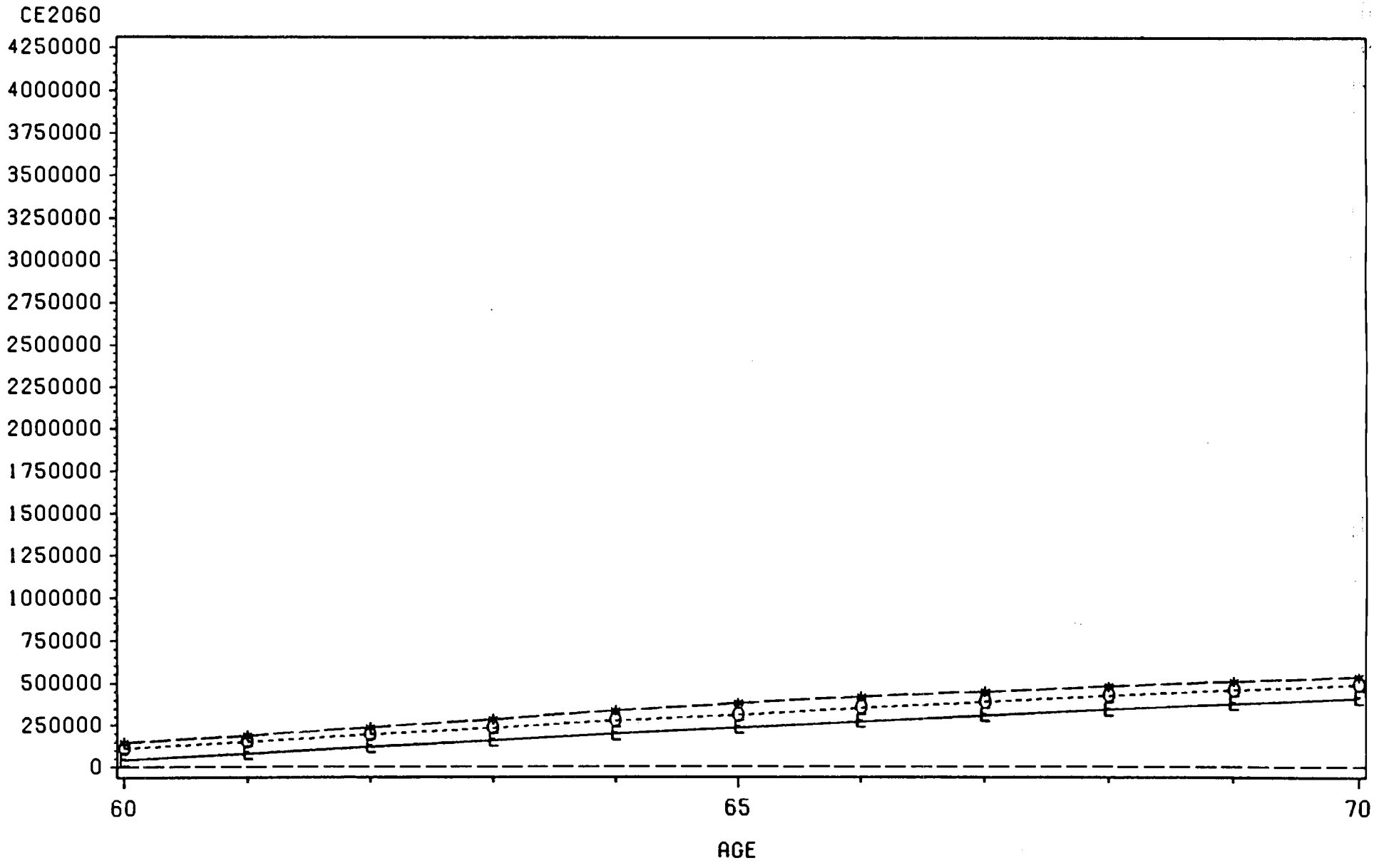
FIGURE 5a. PENSION WEALTH ACCRUAL, SS ACCRUAL, AND WAGE EARNINGS FOR MALE MANAGERS BORN IN 1920 AND HIRED IN 1960, IN REAL 1985 DOLLARS



* = PENSION WEALTH ACCRUAL
O = REAL EARNINGS
S = SOCIAL SECURITY ACCRUAL

FIGURE 5b. CUMULATED TOTAL INCOME FROM EMPLOYMENT VERSUS YEAR OF RETIREMENT,

MALE MANAGERS BORN IN 1920 AND HIRED IN 1960



E = CUM. EARNINGS
O = CUM. EARNINGS + PW
* = CUM. EARNINGS + PW + SSW

FIGURE 6a. PENSION WEALTH ACCRUAL, SS ACCRUAL, AND WAGE EARNINGS FOR MALE MANAGERS BORN IN 1930 AND HIRED IN 1970, IN REAL 1985 DOLLARS

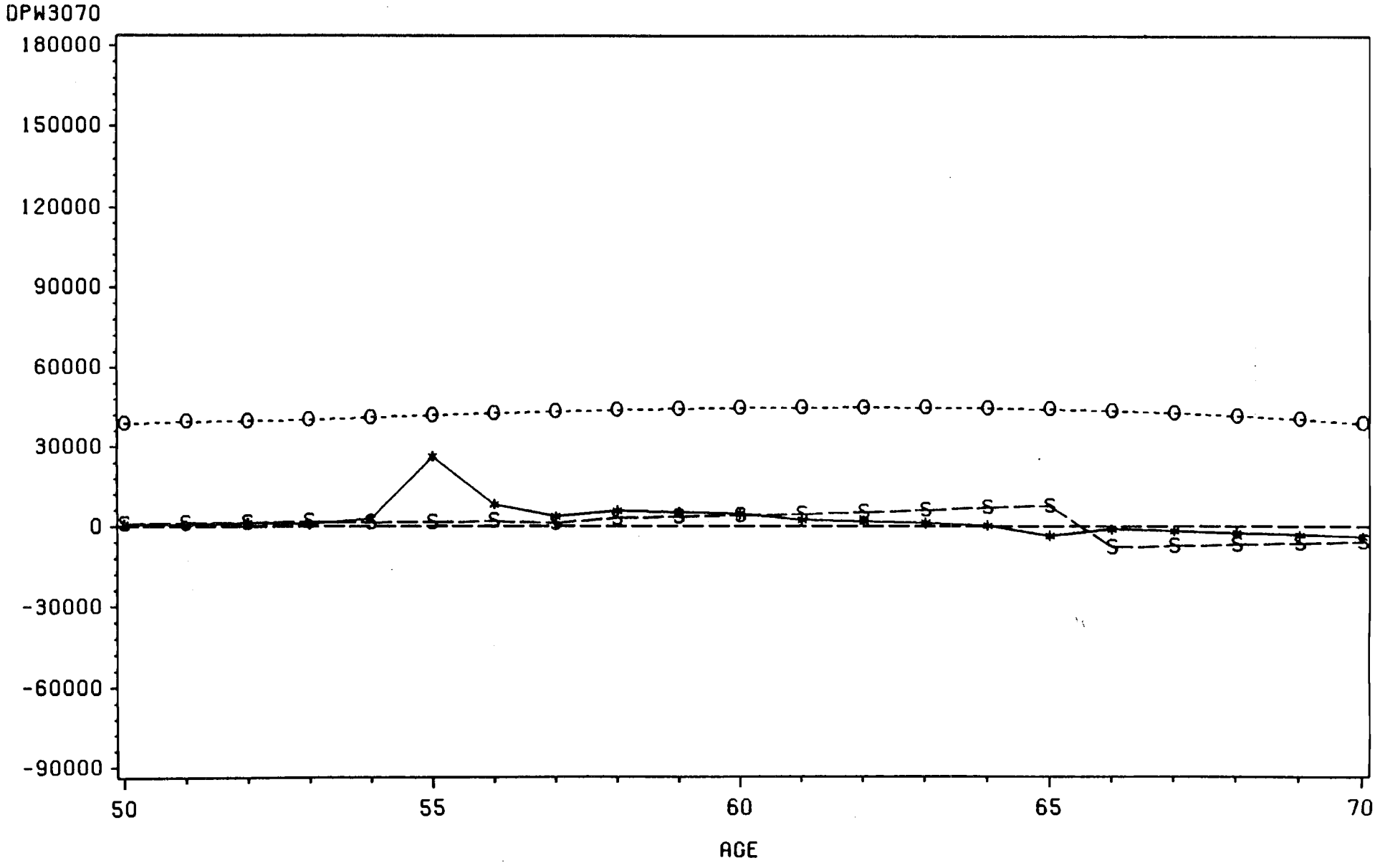
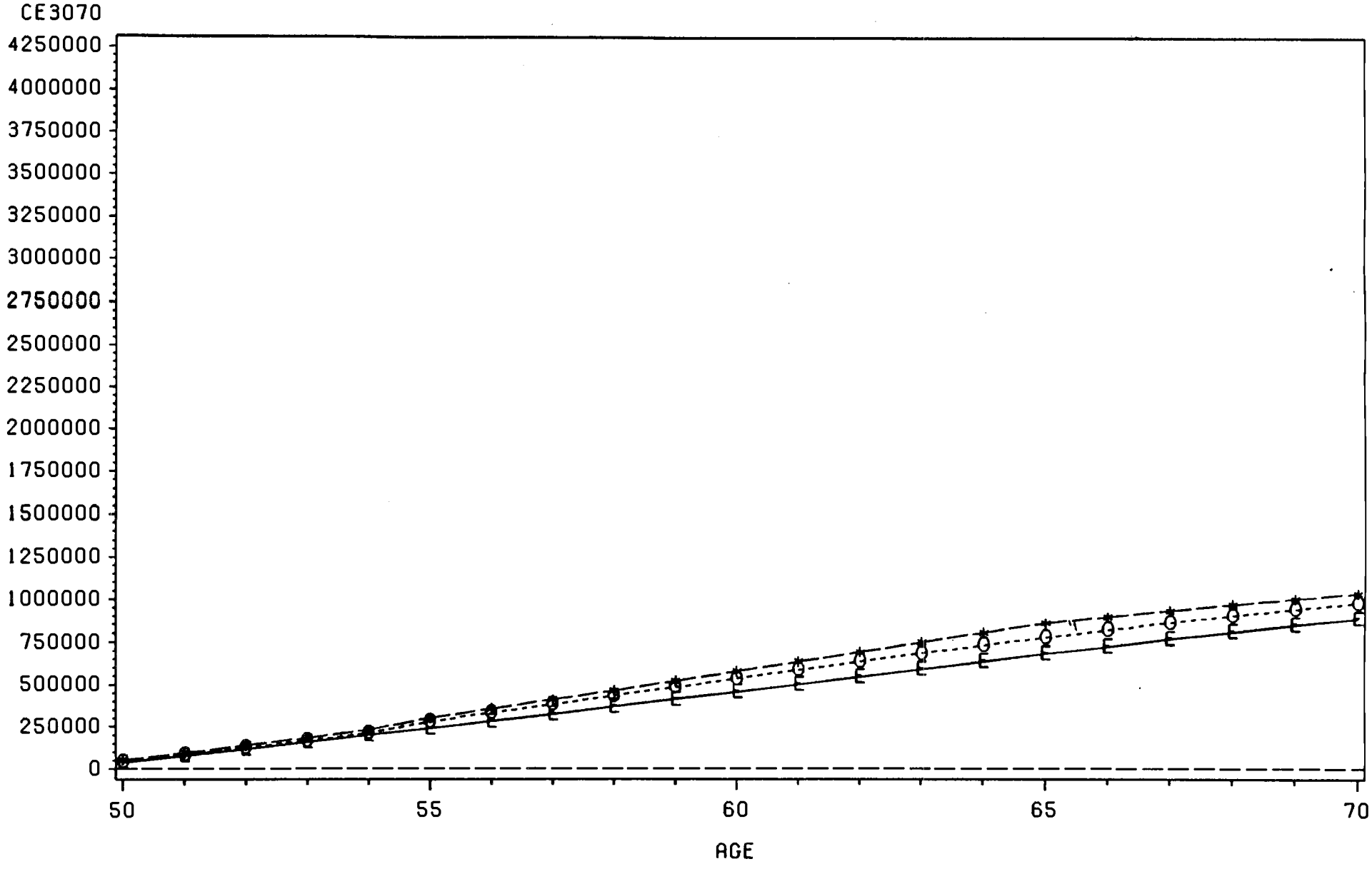
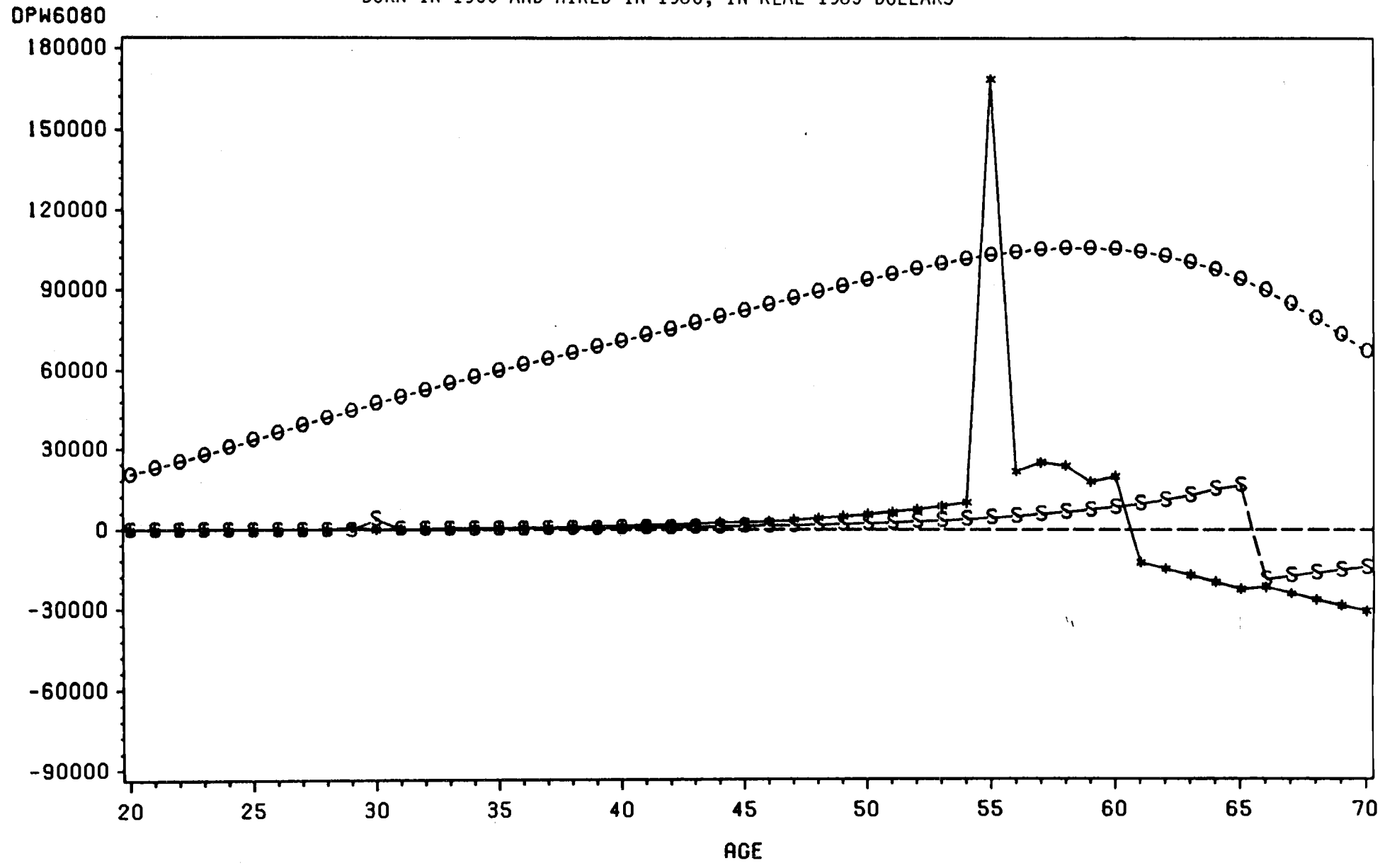


FIGURE 6b. CUMULATED TOTAL INCOME FROM EMPLOYMENT VERSUS YEAR OF RETIREMENT, MALE MANAGERS BORN IN 1930 AND HIRED IN 1970



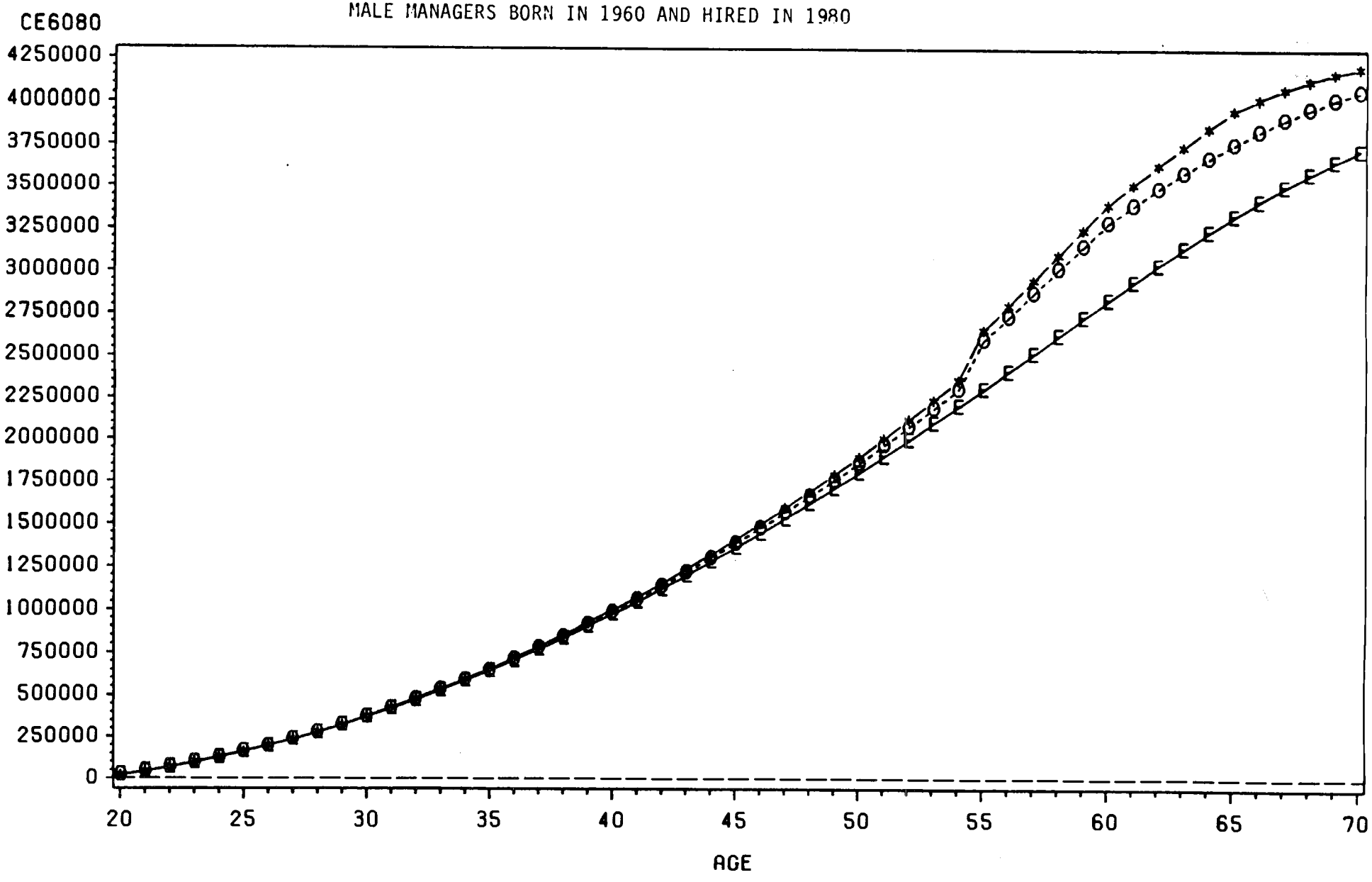
E = CUM. EARNINGS
O = CUM. EARNINGS + PW
* = CUM. EARNINGS + PW + SSW

FIGURE 7a. PENSION WEALTH ACCRUAL, SS ACCRUAL, AND WAGE EARNINGS FOR MALE MANAGERS BORN IN 1960 AND HIRED IN 1980, IN REAL 1985 DOLLARS



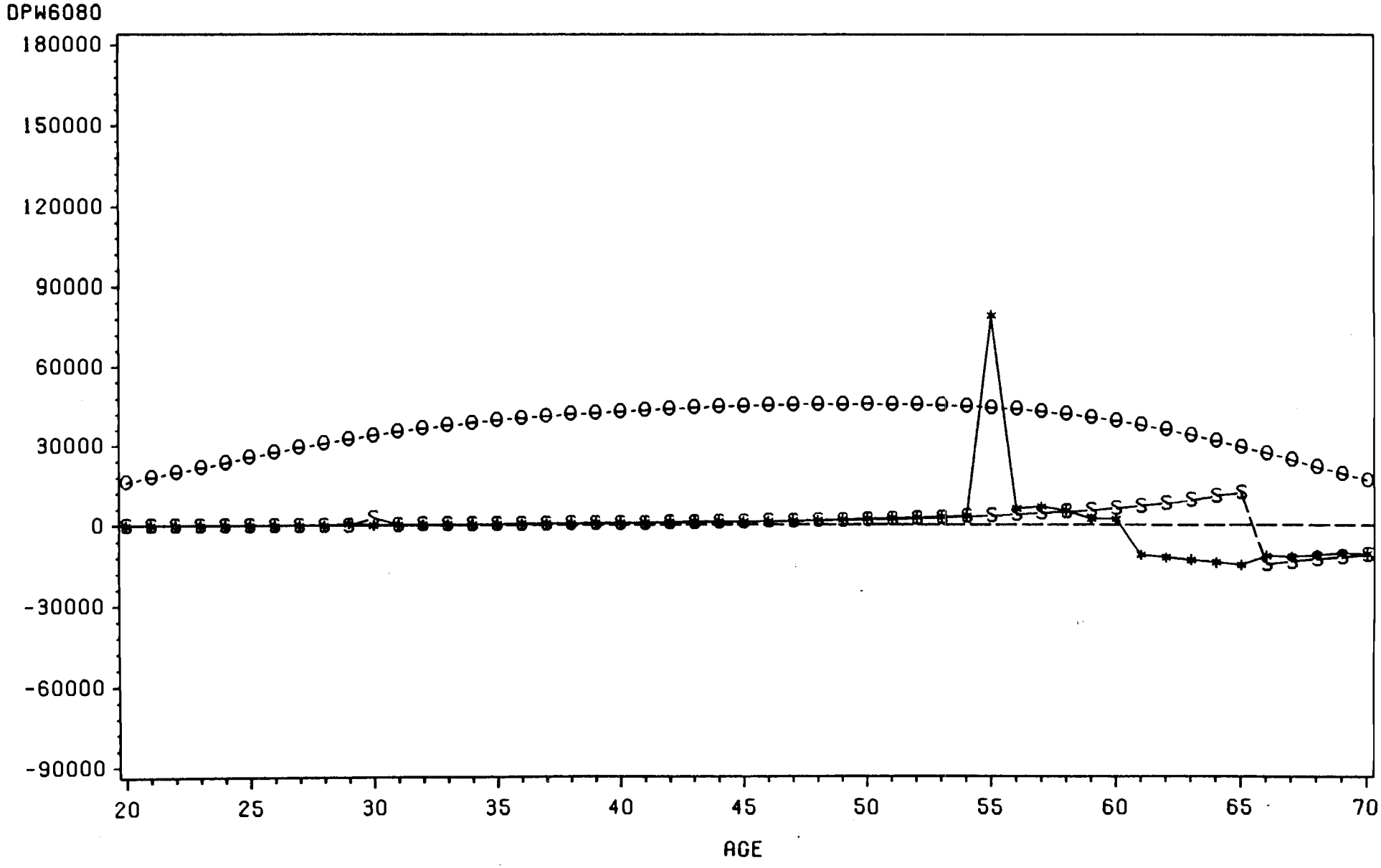
* = PENSION WEALTH ACCRUAL
0 = REAL EARNINGS
S = SOCIAL SECURITY ACCRUAL

FIGURE 7b. CUMULATED TOTAL INCOME FROM EMPLOYMENT VERSUS YEAR OF RETIREMENT,
MALE MANAGERS BORN IN 1960 AND HIRED IN 1980



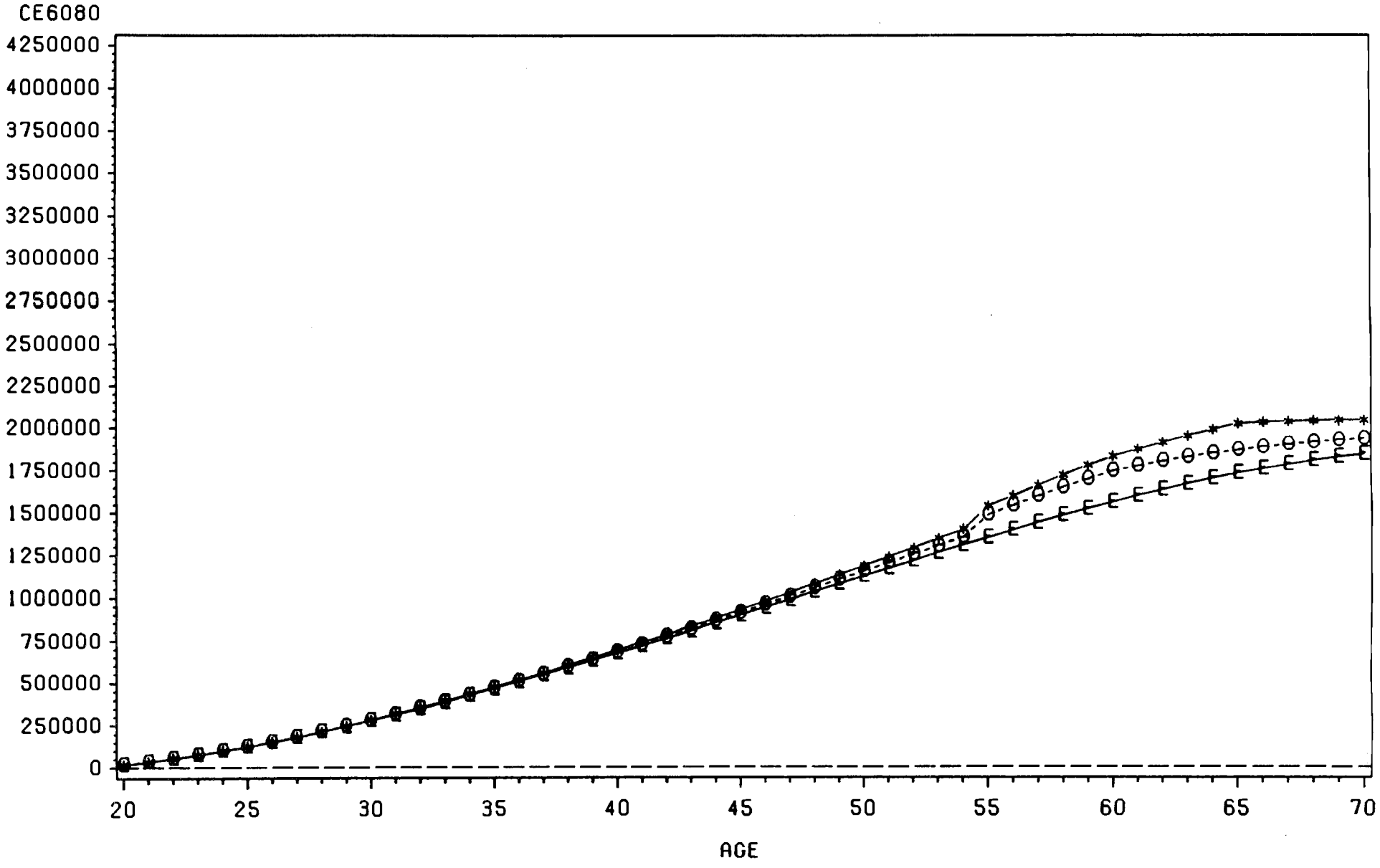
E = CUM. EARNINGS
O = CUM. EARNINGS + PW
* = CUM. EARNINGS + PW + SSW

FIGURE 8a. PENSION WEALTH ACCRUAL, SS ACCRUAL, AND WAGE EARNINGS FOR SALESMEN BORN IN 1960 AND HIRED IN 1980, IN REAL 1985 DOLLARS



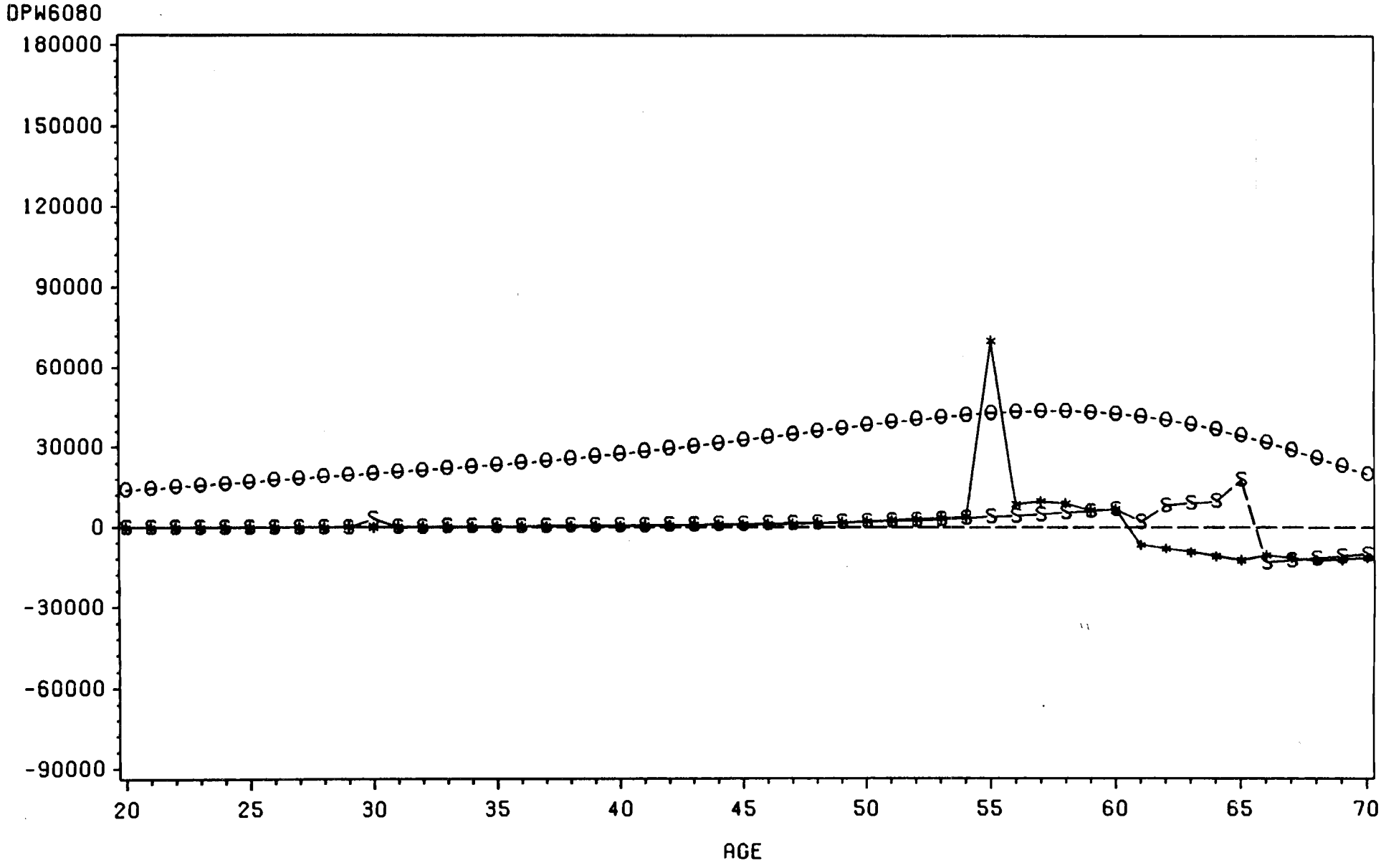
* = PENSION WEALTH ACCRUAL
0 = REAL EARNINGS
S = SOCIAL SECURITY ACCRUAL

FIGURE 8b. CUMULATED TOTAL INCOME FROM EMPLOYMENT VERSUS YEAR OF RETIREMENT, SALESMEN BORN IN 1960 AND HIRED IN 1980



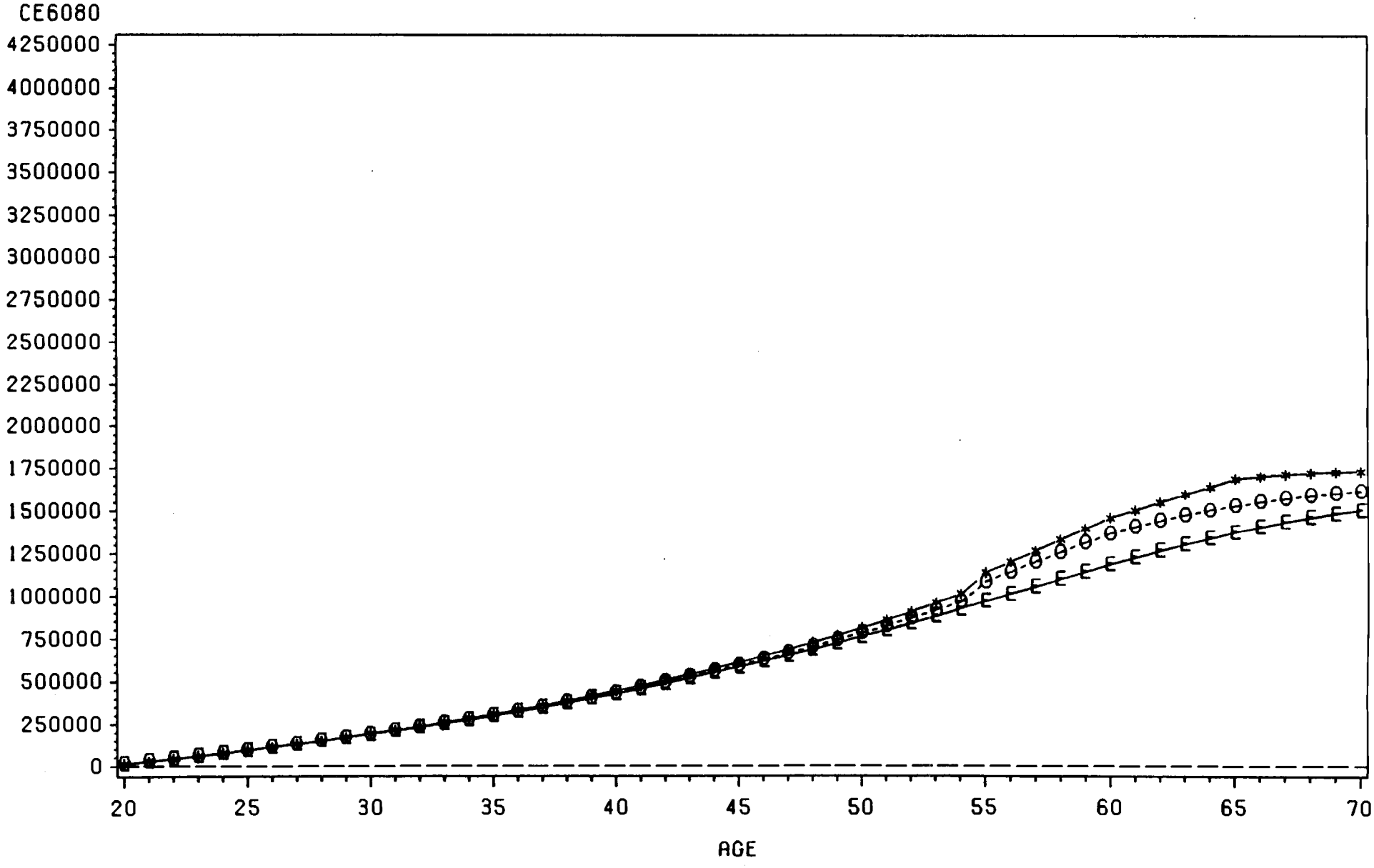
E = CUM. EARNINGS
O = CUM. EARNINGS + PW
* = CUM. EARNINGS + PW + SSW

FIGURE 9a. PENSION WEALTH ACCRUAL, SS ACCRUAL, AND WAGE EARNINGS FOR SALESWOMEN BORN IN 1960 AND HIRED IN 1980, IN REAL 1985 DOLLARS



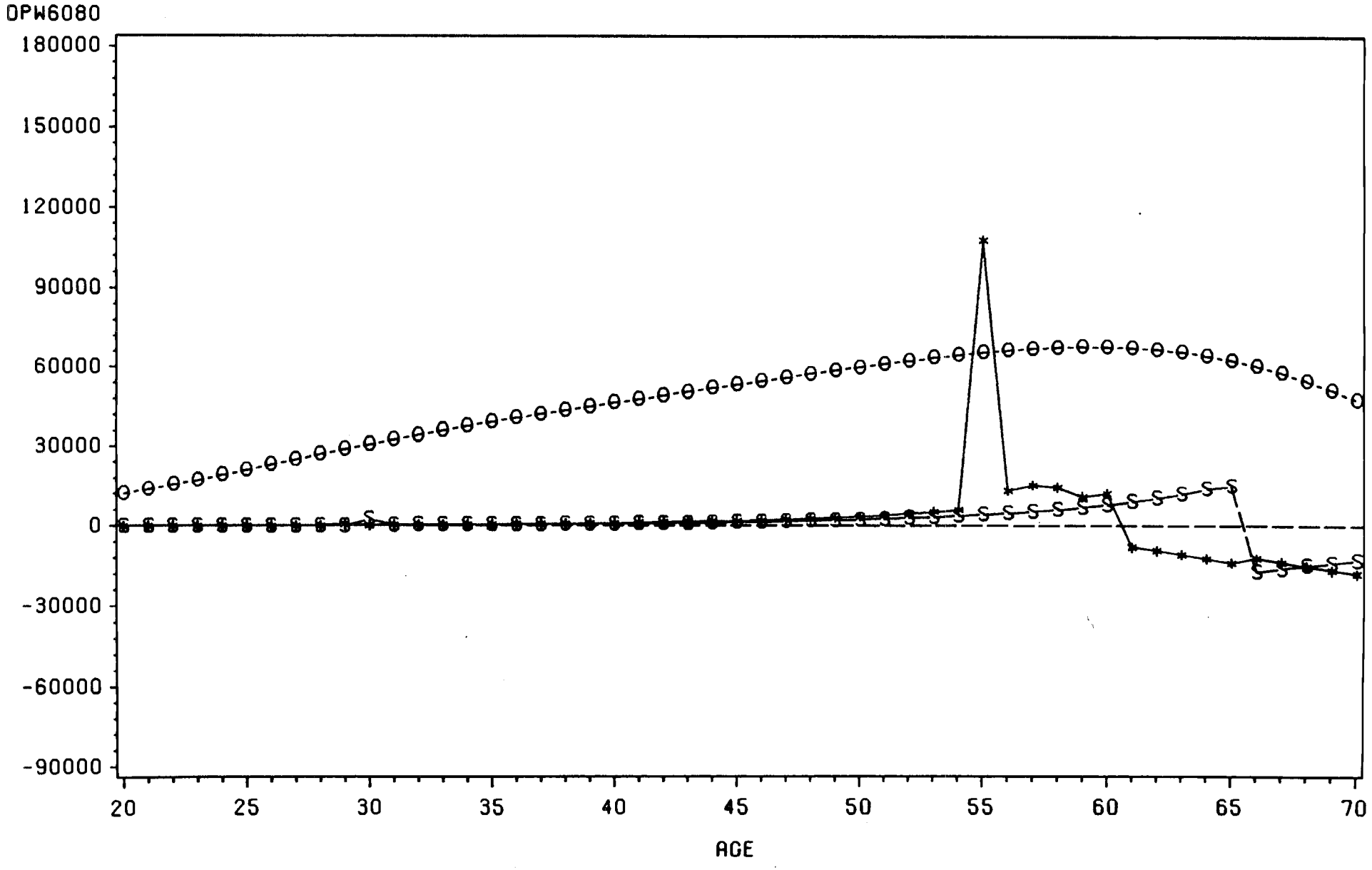
* = PENSION WEALTH ACCRUAL
O = REAL EARNINGS
S = SOCIAL SECURITY ACCRUAL

FIGURE 9b. CUMULATED TOTAL INCOME FROM EMPLOYMENT VERSUS YEAR OF RETIREMENT, SALESWOMEN BORN IN 1960 AND HIRED IN 1980



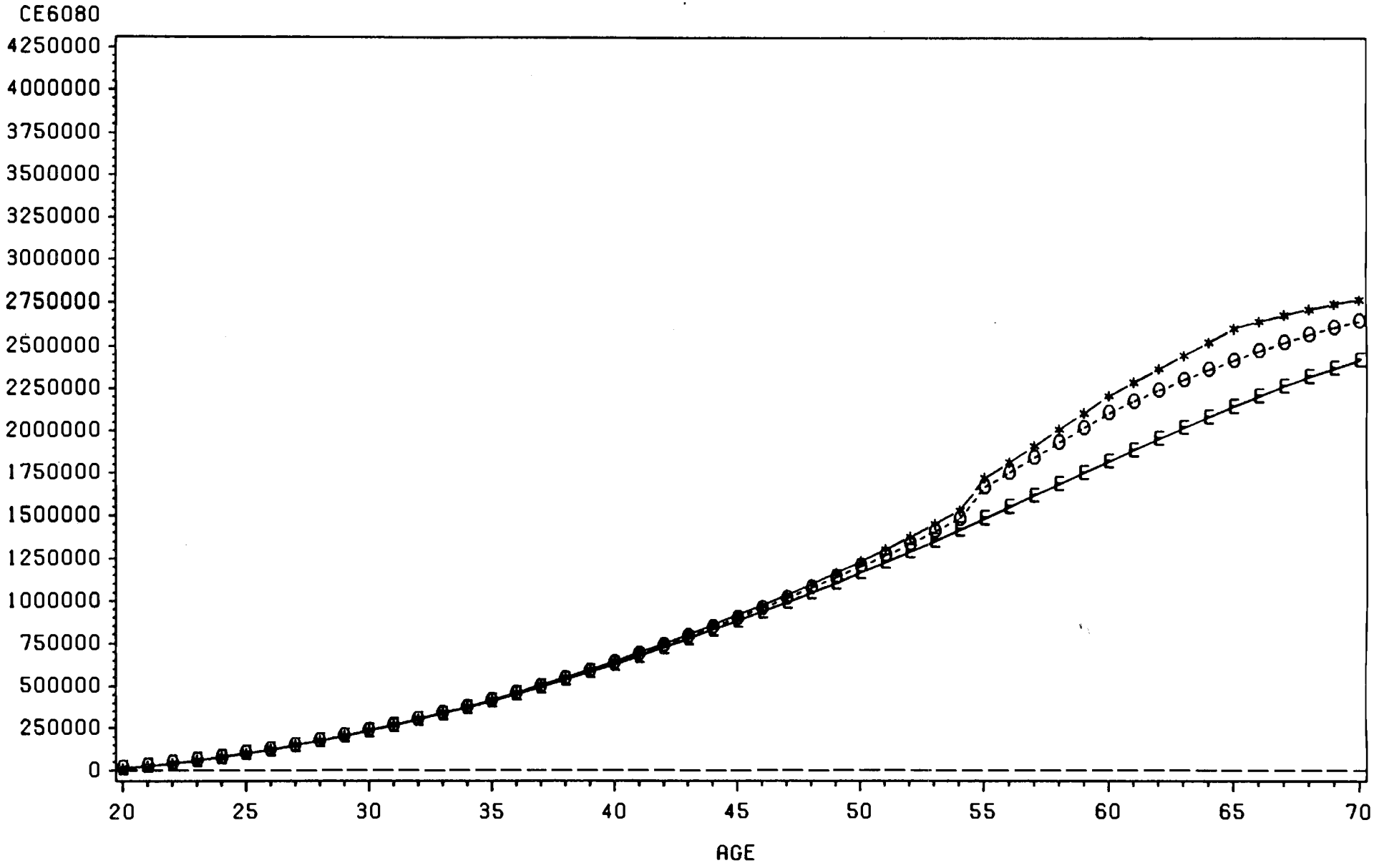
E = CUM. EARNINGS
0 = CUM. EARNINGS + PW
* = CUM. EARNINGS + PW + SSW

FIGURE 10a. PENSION WEALTH ACCRUAL, SS ACCRUAL, AND WAGE EARNINGS FOR MALE OFFICE WORKERS BORN IN 1960 AND HIRED IN 1980, IN REAL 1985 DOLLARS



* = PENSION WEALTH ACCRUAL
0 = REAL EARNINGS
S = SOCIAL SECURITY ACCRUAL

FIGURE 10b. CUMULATED TOTAL INCOME FROM EMPLOYMENT VERSUS YEAR OF RETIREMENT,
MALE OFFICE WORKERS BORN IN 1960 AND HIRED IN 1980



E = CUM. EARNINGS
O = CUM. EARNINGS + PW
* = CUM. EARNINGS + PW + SSW

FIGURE 11a. PENSION WEALTH ACCRUAL, SS ACCRUAL, AND WAGE EARNINGS FOR FEMALE OFFICE WORKERS BORN IN 1960 AND HIRED IN 1980, IN REAL 1985 DOLLARS

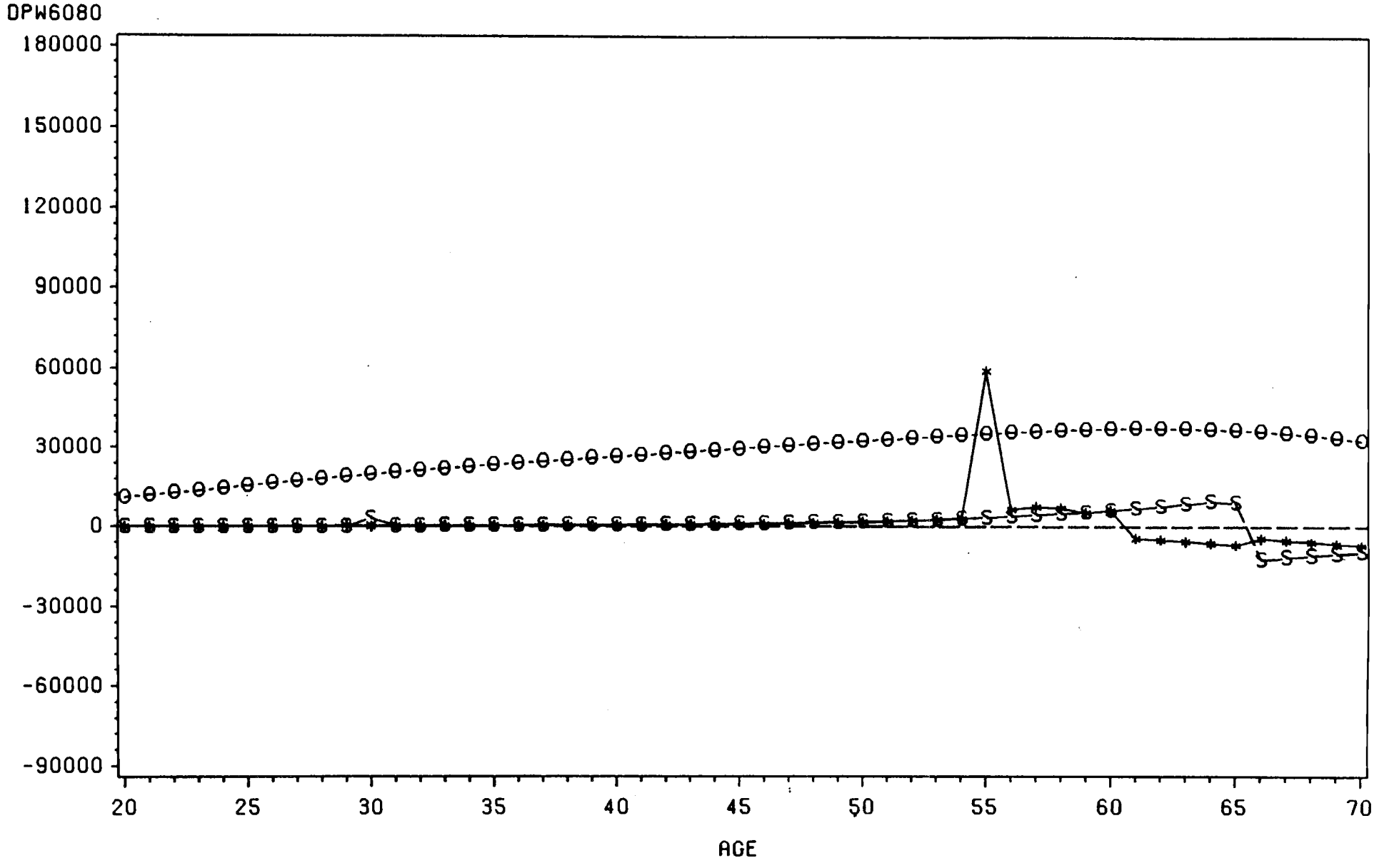
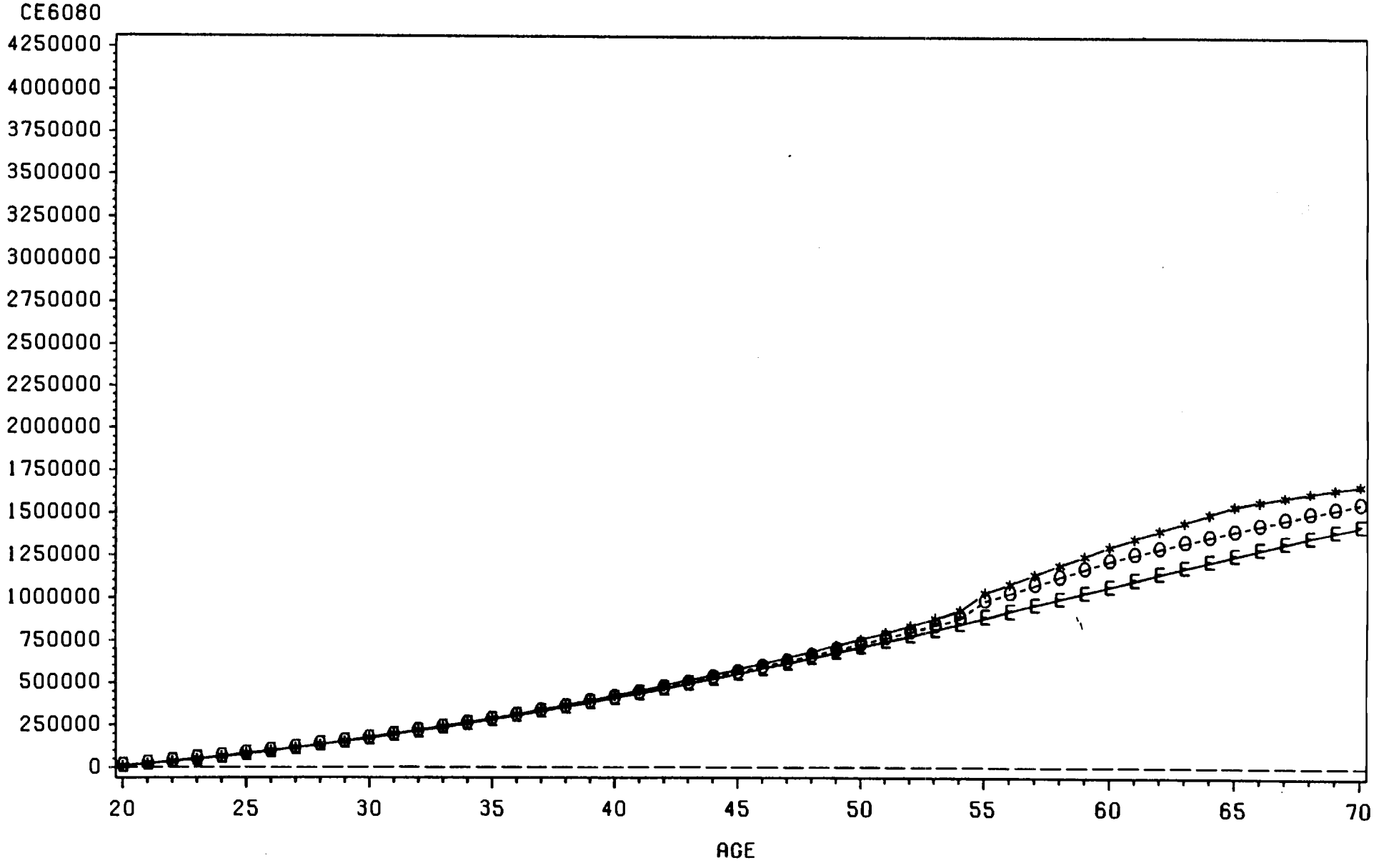


FIGURE 11b. CUMULATED TOTAL INCOME FROM EMPLOYMENT VERSUS RETIREMENT, FEMALE OFFICE WORKERS BORN IN 1960 AND HIRED IN 1980



E = CUM. EARNINGS
0 = CUM. EARNINGS + PW
* = CUM. EARNINGS + PW + SSW

FIGURE 12.

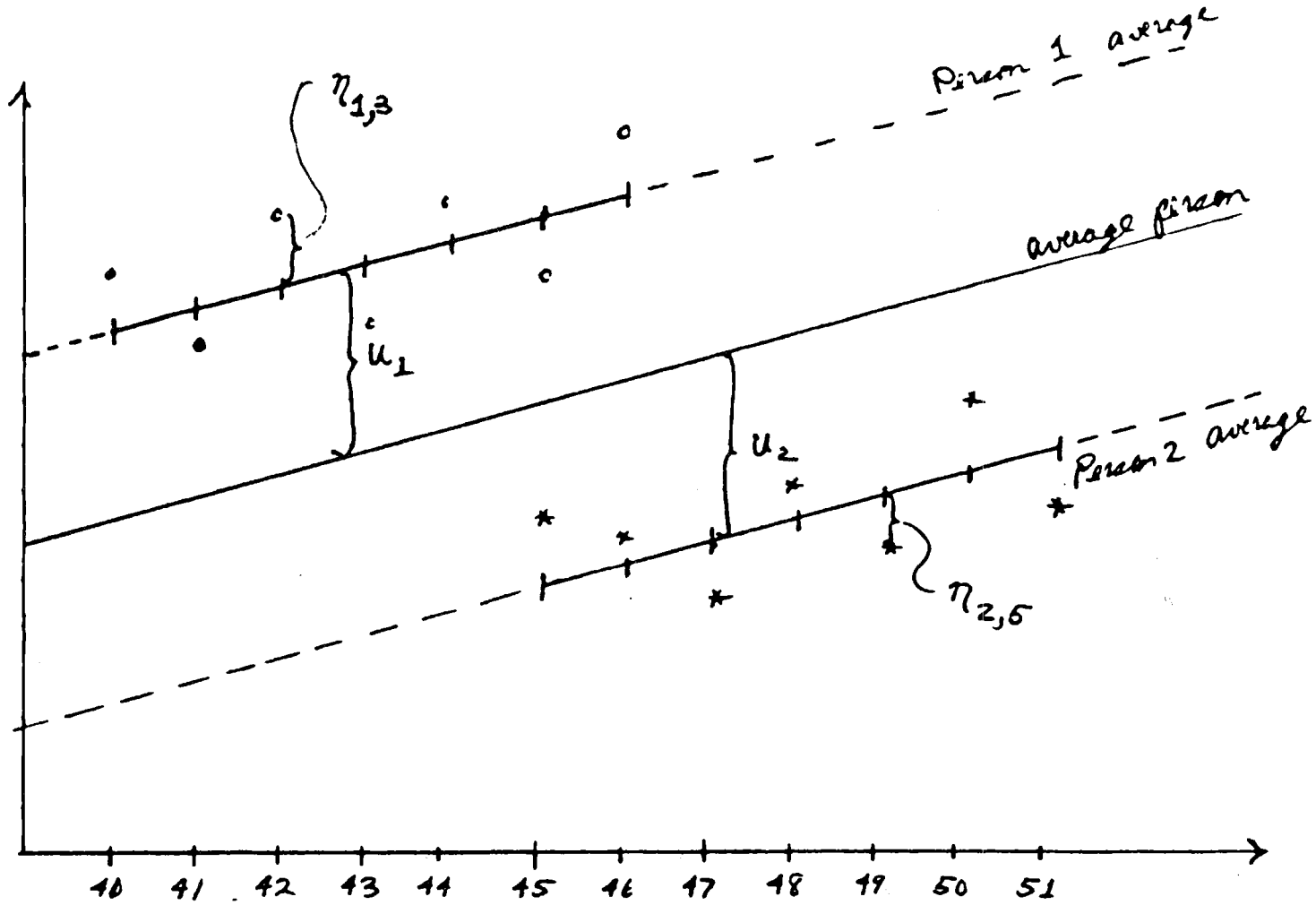

$\eta_{1,3}$
Person 1 average
average person
u_1
u_2
Person 2 average
$\eta_{2,6}$
40
41
42
43
44
45
46
47
48
49
50
51

FIGURE 12a. AGE-EARNINGS PROFILES FOR PERSONS HIRED IN 1980, BY AGE WHEN HIRED, MALE MANAGERS

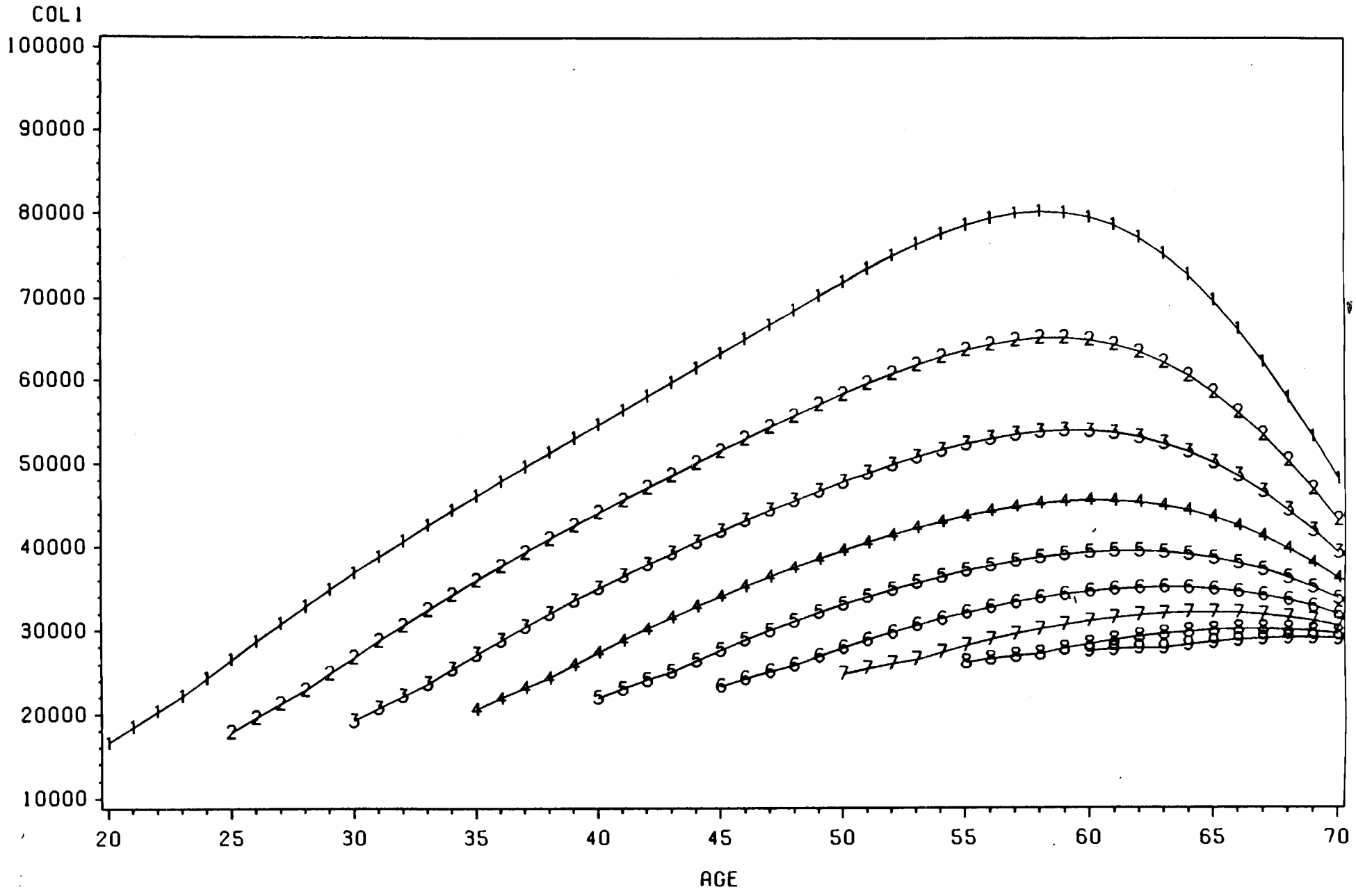


FIGURE 12b. AGE-EARNINGS PROFILES FOR PERSONS HIRED IN 1980, BY AGE WHEN HIRED, SALESMEN

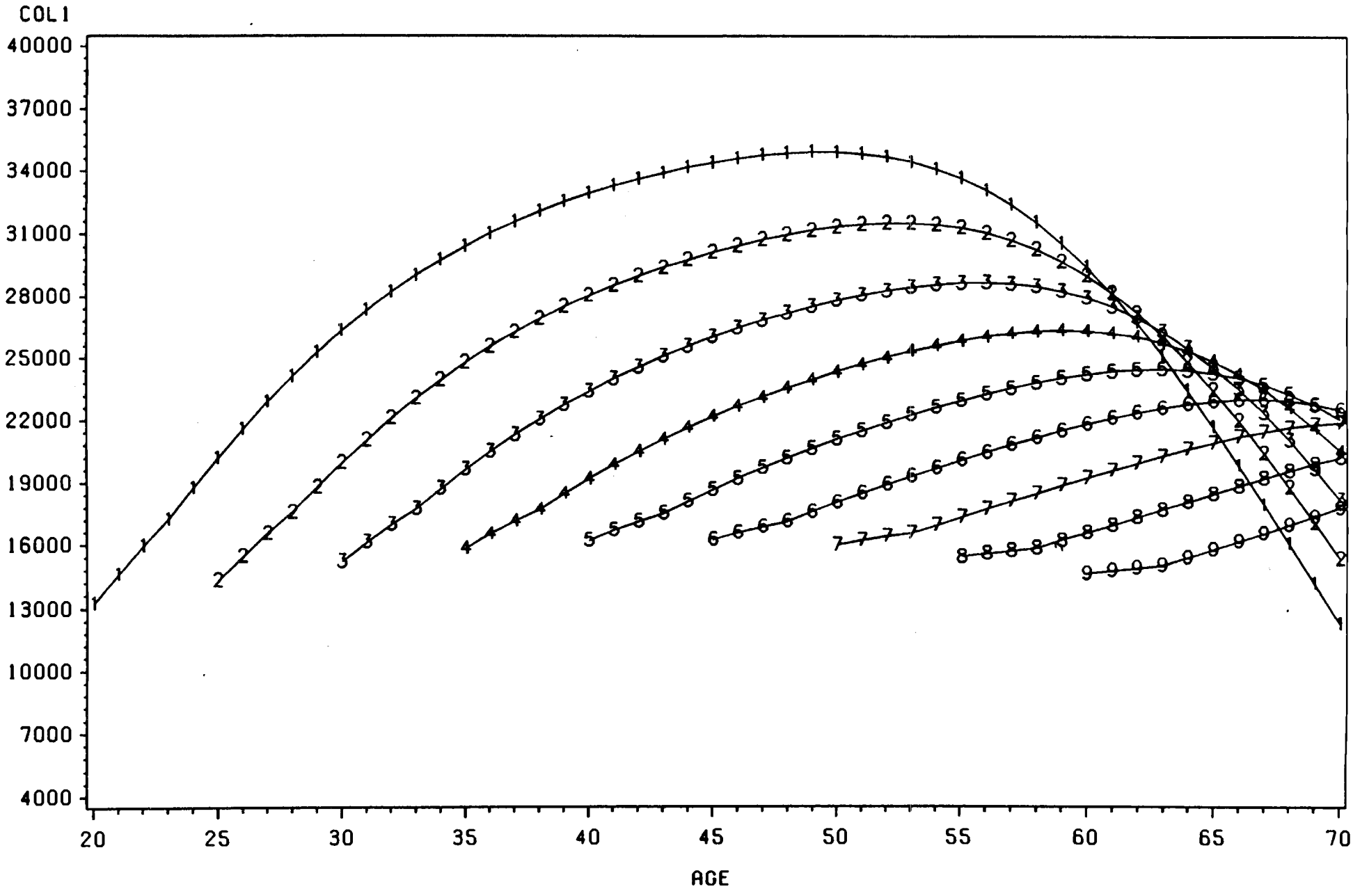


FIGURE 12c. AGE-EARNINGS PROFILES FOR PERSONS HIRED IN 1980, BY AGE WHEN HIRED, SALESWOMEN

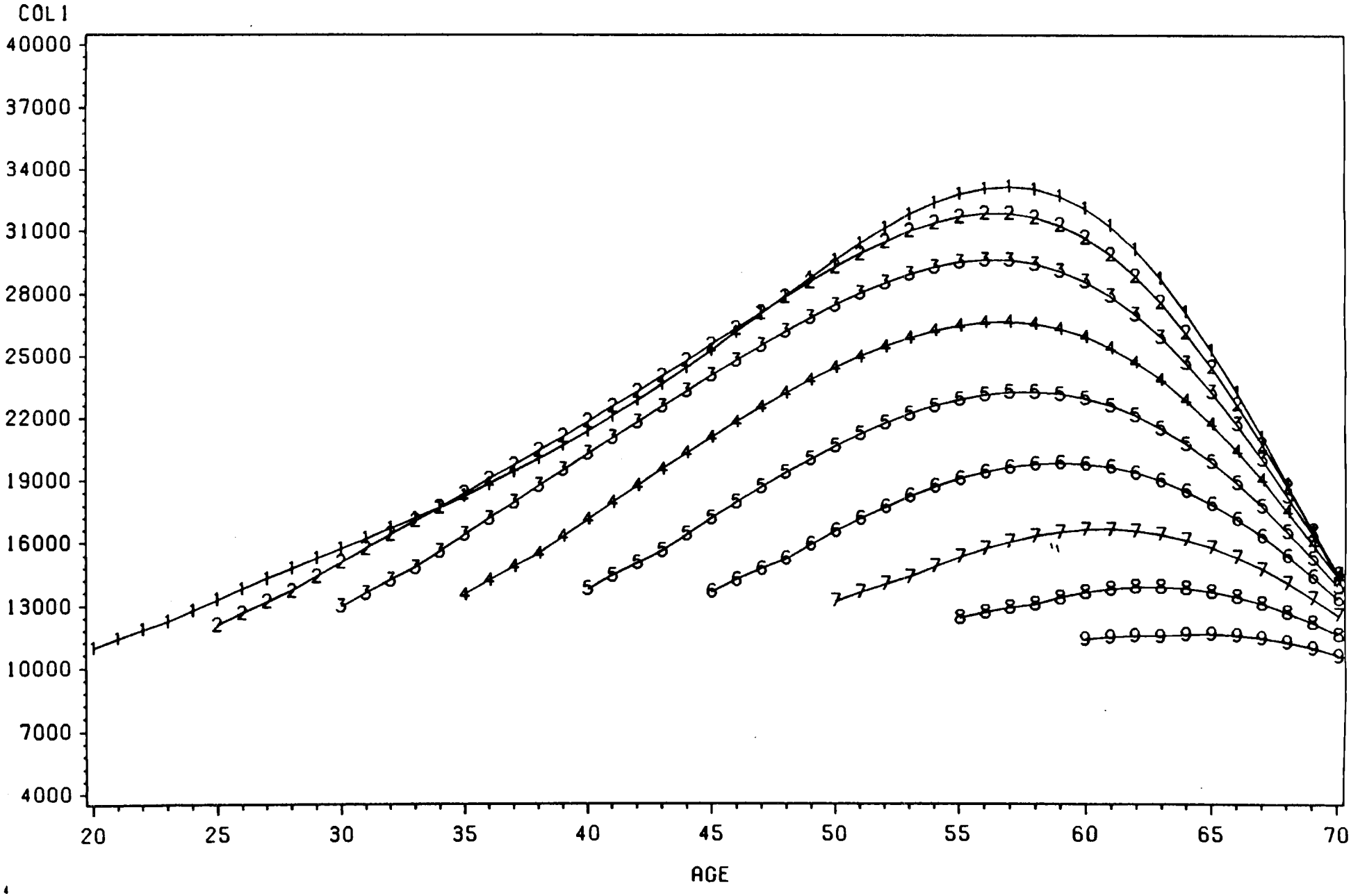


FIGURE 12d. AGE-EARNINGS PROFILES FOR PERSONS HIRED IN 1980, BY AGE WHEN HIRED, MALE OFFICE WORKERS

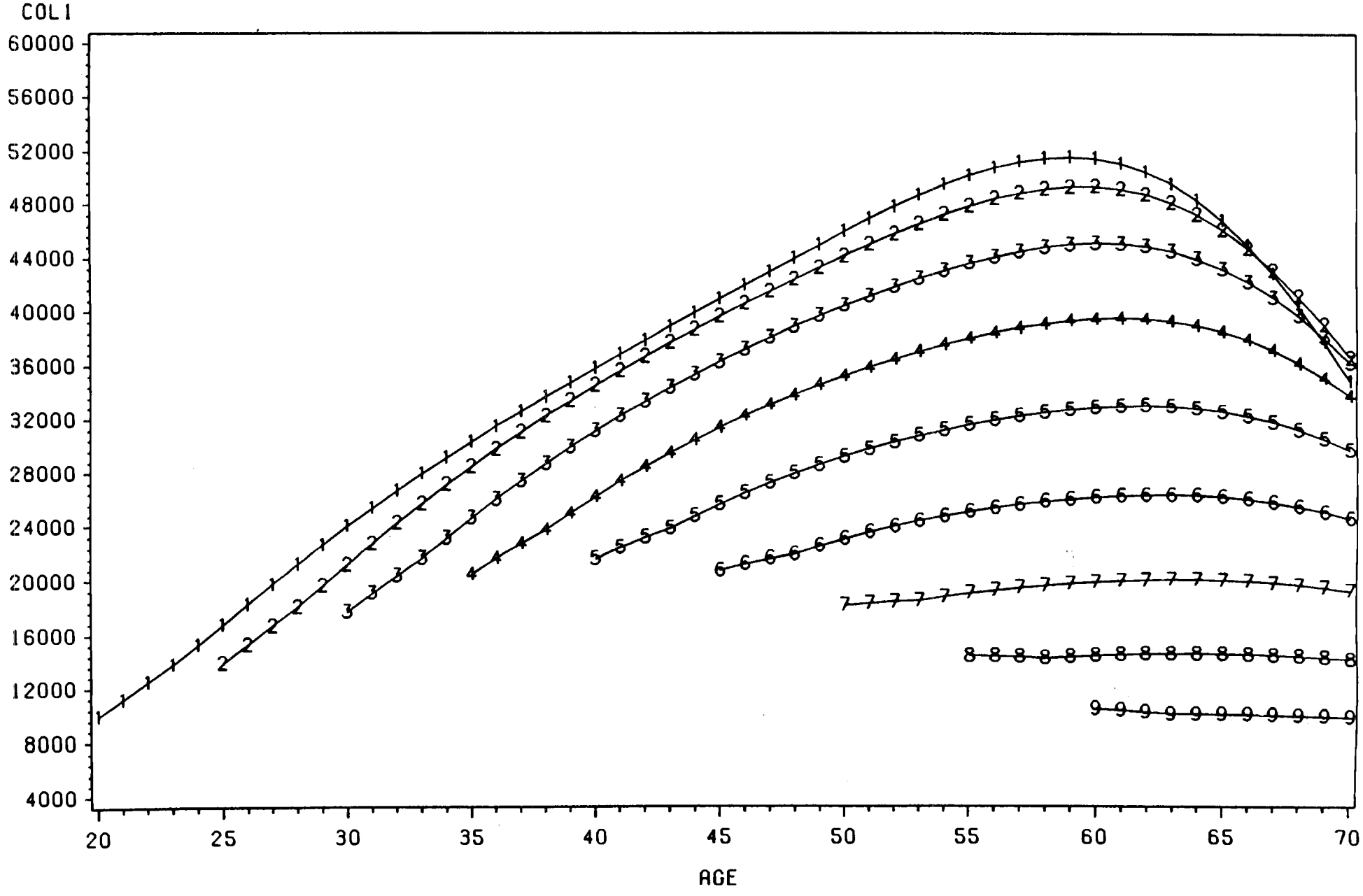


FIGURE 12e. AGE-EARNINGS PROFILES FOR PERSONS HIRED IN 1980, BY AGE WHEN HIRED, FEMALE OFFICE WORKERS

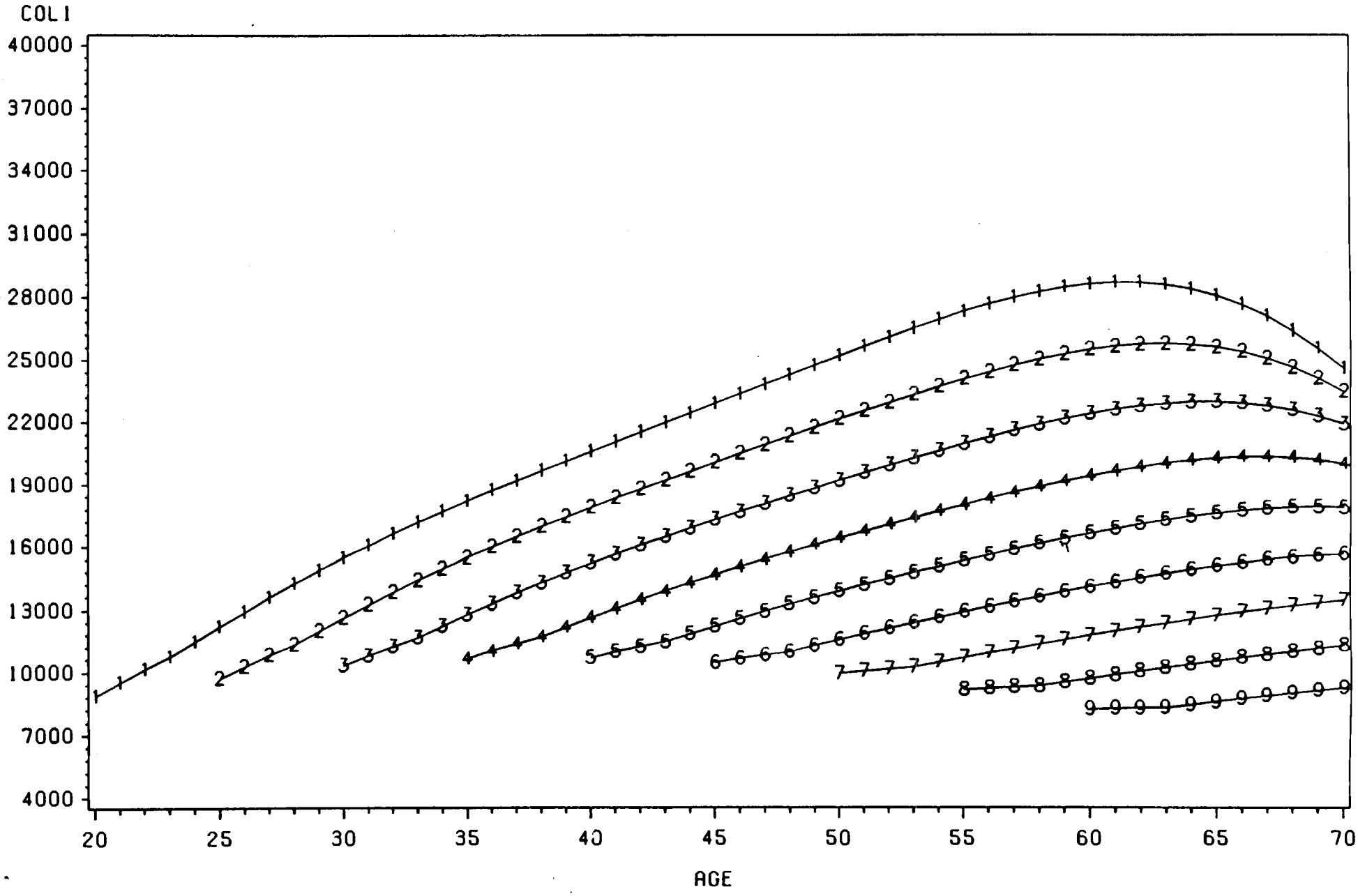


Table 1. Calculation of pension benefits and wealth accrual.

Year	Age	Yrs. Svc.	Wage	Avg. Earn. Base	Normal Ret. Ben.	SS	SS Adjmt.	Adj. Ret. Ben. Factor	Early Ret. Reduct. Ben.	Reduced Normal Ret. Ben.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1979	49	20	32393	24788	9915	10227	3846	6069	1.00	9915
80	50	21	37109	27501	11550	10626	4276	7274	1.00	11550
81	51	22	41266	29221	12857	10921	4673	8185	1.00	12857
82	52	23	44055	32165	14796	11060	5000	9796	1.00	14796
83	53	24	45661	33664	16159	11128	5293	10866	1.00	16159
84	54	25	48426	38018	19009	11248	5620	13388	1.00	19009
1985	55	26	50919	39451	20120	11341	5937	14183	0.67	13480
86	56	27	54674	44313	23043	11528	6316	16727	0.73	16821
87	57	28	58564	45896	24325	11719	6707	17618	0.80	19460
88	58	29	62556	49248	26594	11911	7107	19487	0.87	23137
89	59	30	66616	52526	28890	12099	7513	21377	0.93	26867
1990	60	31	70697	55797	31246	12289	7929	23317	1.00	31246
91	61	32	74741	59206	33747	12475	8352	25395	1.00	33747
92	62	33	78682	62875	36468	12658	8781	27687	1.00	36468
93	63	34	82443	66655	39326	12848	9223	30103	1.00	39326
94	64	35	85930	70545	42327	13047	9682	32645	1.00	42327
1995	65	36	89053	74365	45362	13264	10164	35198	1.00	45362
96	66	37	91700	78046	48389	13757	10575	37814	1.00	48389
97	67	38	93772	81515	51354	14273	11005	40349	1.00	51354
98	68	39	95164	84687	54200	14813	11455	42745	1.00	54200
99	69	40	95769	87473	56857	15377	11926	44932	1.00	56857
2000	70	41	95509	89780	59255	15972	12421	46834	1.00	59255

Table 1, continued

Reduced Ajusted Ret. Ben. (12)	Annuity Value (13)	Prob. Survive To 65 (14)	Discount 65 To Current Age (15)	Present Value Ret. Ben. From 65 (16)	Present Value Ret. Ben. To 65 (17)	Pension Wealth (18)	Pension Accrual (19)	Pension Accrual/ Wage (20)	Age (21)
6069	7.999	0.8196	0.2519	10023	0	10023	0	0.0	49
7274	7.999	0.8243	0.2745	13167	0	13167	2057	6.4	50
8185	7.999	0.8294	0.2993	16250	0	16250	1741	4.7	51
9796	7.999	0.8351	0.3262	21346	0	21346	3334	8.1	52
10866	7.999	0.8415	0.3555	26004	0	26004	2510	5.7	53
13388	7.999	0.8485	0.3875	35216	0	35216	6205	13.8	54
9503	7.999	0.8562	0.4224	27494	89947	117441	72527	149.8	55
12210	7.999	0.8648	0.4604	38891	105041	143932	14607	28.7	56
14095	7.999	0.8742	0.5019	49468	112461	161930	4627	8.5	57
16954	7.999	0.8847	0.5470	65637	121970	187606	10187	17.4	58
19880	7.999	0.8963	0.5963	84994	126740	211734	6645	10.6	59
23317	7.999	0.9092	0.6499	110219	128422	238640	7202	10.8	60
25395	7.999	0.9235	0.7084	132909	116203	249112	-10097	-14.3	61
27687	7.999	0.9395	0.7722	160676	98801	259477	-11060	-14.8	62
30103	7.999	0.9574	0.8417	194046	74665	268711	-12953	-16.5	63
32645	7.999	0.9774	0.9174	234174	42327	276501	-15040	-18.2	64
35198	7.999	1.0000	1.0000	281568	0	281568	-18181	-21.2	65
37814	7.824	1.0000	1.0000	295848	0	295848	-10148	-11.4	66
40349	7.646	1.0000	1.0000	308518	0	308518	-12804	-14.0	67
42745	7.466	1.0000	1.0000	319112	0	319112	-15754	-16.8	68
44932	7.281	1.0000	1.0000	327147	0	327147	-18978	-19.9	69
46834	7.093	1.0000	1.0000	332181	0	332181	-22394	-23.4	70

Table 2. Accrual in Pension Wealth by Year of Birth and Year of Hire for Managers

Year

Born	1960	1950		1940			1930			
Hired	1980	1980	1975	1980	1975	1970	1980	1975	1970	1960
1980	0	0	0	0	0	508	0	0	835	2686
1981	0	0	0	0	0	380	0	0	562	2059
1982	0	0	0	0	0	770	0	0	1413	3716
1983	0	0	0	0	0	582	0	0	1079	2710
1984	0	0	1278	0	2470	1494	0	2968	3053	6530
1985	0	0	251	0	475	767	0	18226	26481	72527
1986	0	0	663	0	1335	2090	0	5616	8227	13781
1987	0	0	353	0	651	994	0	2593	3691	4118
1988	0	0	663	0	1289	1978	0	4105	5874	8553
1989	1008	2158	767	4037	1479	2323	22194	3745	5342	5263
1990	194	388	890	688	1709	2676	831	3280	4726	5382
1991	341	690	1051	1297	2174	3168	1060	1685	2376	-7118
1992	418	845	1260	1601	2675	3820	609	1389	2029	-7356
1993	504	1016	1485	2021	3202	4515	-89	683	1312	-8127
1994	606	1220	1756	2603	3851	5351	-908	-155	419	-8902
1995	716	1441	2043	29639	40727	82953	-2067	-1384	-3515	-10152
1996	843	1695	2555	7130	9538	9898	5217	3628	-939	-5346
1997	987	1986	2992	7349	9672	11334	4579	2855	-1652	-6363
1998	1153	2422	3499	7437	9641	10665	3902	2041	-2384	-7386
1999	1342	2969	4085	7377	9426	7844	3186	1187	-3129	-8394
2000	1558	3492	3900	7140	6196	8643	2423	-1882	-3874	-9344
2001	1807	4095	4481	4432	2198	-6178	0	0	0	0
2002	2093	4790	5149	3750	1206	-7237	0	0	0	0
2003	2517	5587	5904	2870	-15	-8380	0	0	0	0
2004	3037	6502	6763	1791	4378	-9658	0	0	0	0
2005	2918	95433	117775	-2553	-8981	-11004	0	0	0	0
2006	3361	11955	14674	-1993	-4042	-6843	0	0	0	0
2007	3872	13705	16840	-2784	-4988	-7994	0	0	0	0
2008	4461	13022	15944	-3601	-5955	-9155	0	0	0	0
2009	5139	9809	11879	-4436	-6930	-10299	0	0	0	0
2010	5910	10923	13211	-5265	-7875	-11375	0	0	0	0
2011	6792	-6583	-8668	0	0	0	0	0	0	0
2012	7801	-7785	-10184	0	0	0	0	0	0	0
2013	8940	-9069	-11809	0	0	0	0	0	0	0
2014	10223	-10418	-13531	0	0	0	0	0	0	0
2015	168439	-11848	-15345	0	0	0	0	0	0	0
2016	21859	-8684	-12662	0	0	0	0	0	0	0
2017	25137	-9994	-14317	0	0	0	0	0	0	0
2018	23904	-11319	-15955	0	0	0	0	0	0	0
2019	17968	-12627	-17524	0	0	0	0	0	0	0
2020	19964	-13849	-18933	0	0	0	0	0	0	0
2021	-12355	0	0	0	0	0	0	0	0	0
2022	-14649	0	0	0	0	0	0	0	0	0
2023	-17087	0	0	0	0	0	0	0	0	0
2024	-19659	0	0	0	0	0	0	0	0	0
2025	-22287	0	0	0	0	0	0	0	0	0
2026	-21570	0	0	0	0	0	0	0	0	0
2027	-24026	0	0	0	0	0	0	0	0	0
2028	-26391	0	0	0	0	0	0	0	0	0
2029	-28576	0	0	0	0	0	0	0	0	0
2030	-30436	0	0	0	0	0	0	0	0	0

Table 2, continued

Year Born / Hired	1920				
	1980	1975	1970	1960	1950
1980	0	0	1178	5146	7442
1981	0	0	-616	-105	-9132
1982	0	0	451	2175	-5043
1983	0	0	-2739	-2721	-13235
1984	0	5090	658	3575	-2995
1985	0	-5357	-5328	-8152	-14936
1986	0	0	8151	3728	831
1987	0	0	2108	-4957	-10017
1988	0	4176	3987	-1882	-6347
1989	0	5038	2968	-3049	-7920
1990	0	4265	2109	-3889	-8984
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	0	0	0	0
2005	0	0	0	0	0
2006	0	0	0	0	0
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2008	0	0	0	0	0
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2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0
2022	0	0	0	0	0
2023	0	0	0	0	0
2024	0	0	0	0	0
2025	0	0	0	0	0
2026	0	0	0	0	0
2027	0	0	0	0	0
2028	0	0	0	0	0
2029	0	0	0	0	0
2030	0	0	0	0	0

Table 3. Pension Wealth by Year of Birth and Year of Hire for Managers

Year Born	1960	1950		1940			1930			
Hired	1980	1980	1975	1980	1975	1970	1980	1975	1970	1960
1980	0	0	0	0	0	2356	0	0	3747	17190
1981	0	0	0	0	0	2741	0	0	4313	19221
1982	0	0	0	0	0	3654	0	0	5969	23790
1983	0	0	0	0	0	4493	0	0	7480	28076
1984	0	0	1393	0	2692	6327	0	3235	11149	36475
1985	0	0	1740	0	3350	7494	0	23271	40597	117141
1986	0	0	2513	0	4901	9985	0	30051	50713	135785
1987	0	0	2969	0	5750	11351	0	33728	56172	144117
1988	0	0	3775	0	7317	13828	0	39157	64165	157520
1989	1098	2352	4718	4400	9136	16751	24192	44347	71802	167710
1990	1341	2842	5821	5274	11257	20142	25781	49175	78983	178316
1991	1750	3675	7132	6837	13946	24166	27668	52407	83814	175617
1992	2256	4700	8707	8776	17257	29015	29115	55404	88399	172570
1993	2869	5940	10572	11227	21234	34755	29840	57713	92326	168587
1994	3610	7439	12785	14382	26033	41572	29695	59178	95397	163658
1995	4493	9220	15373	47095	71162	133166	28282	59343	94264	157222
1996	5539	11329	18594	56201	83574	147728	34770	64980	95910	155849
1997	6772	13814	22381	65802	96481	164262	40746	69931	96824	153324
1998	8220	16844	26827	75768	109717	180531	46151	74133	96962	149607
1999	9915	20558	32040	85956	123101	194197	50931	77527	96299	144698
2000	11894	24946	37197	96169	133336	209110	55012	77669	94800	138605
2001	14201	30116	43135	103721	139506	208294	0	0	0	0
2002	16884	36190	49968	110745	144770	206303	0	0	0	0
2003	20105	43304	57817	117006	148850	203005	0	0	0	0
2004	23984	51616	66824	122269	157833	198220	0	0	0	0
2005	27844	157100	197093	122952	152517	191845	0	0	0	0
2006	32295	174574	218662	124257	152424	189811	0	0	0	0
2007	37429	194452	243204	124738	151301	186468	0	0	0	0
2008	43351	214150	267468	124345	149092	181767	0	0	0	0
2009	50180	230907	287992	123032	145761	175690	0	0	0	0
2010	58041	249344	310538	120773	141301	168260	0	0	0	0
2011	67087	249226	309879	0	0	0	0	0	0	0
2012	77489	247793	307546	0	0	0	0	0	0	0
2013	89425	244918	303375	0	0	0	0	0	0	0
2014	103100	240494	297212	0	0	0	0	0	0	0
2015	289618	234391	288904	0	0	0	0	0	0	0
2016	321636	231555	283275	0	0	0	0	0	0	0
2017	358138	227214	275686	0	0	0	0	0	0	0
2018	394330	221307	266097	0	0	0	0	0	0	0
2019	425077	213809	254529	0	0	0	0	0	0	0
2020	458866	204763	241094	0	0	0	0	0	0	0
2021	458390	0	0	0	0	0	0	0	0	0
2022	455392	0	0	0	0	0	0	0	0	0
2023	449660	0	0	0	0	0	0	0	0	0
2024	440956	0	0	0	0	0	0	0	0	0
2025	429144	0	0	0	0	0	0	0	0	0
2026	417780	0	0	0	0	0	0	0	0	0
2027	403414	0	0	0	0	0	0	0	0	0
2028	386063	0	0	0	0	0	0	0	0	0
2029	365842	0	0	0	0	0	0	0	0	0
2030	343022	0	0	0	0	0	0	0	0	0

Table 3, continued

Year Born / Hired	1920				
	1980	1975	1970	1960	1950
1980	0	0	20270	69954	157647
1981	0	0	19347	68974	145742
1982	0	0	20361	73204	144173
1983	0	0	18515	74336	137819
1984	0	5549	20077	81625	140844
1985	0	0	15322	77017	131943
1986	0	0	24639	83260	136584
1987	0	0	27634	80214	129531
1988	0	4552	32763	80434	126280
1989	0	10173	36925	79385	121217
1990	0	15109	40267	77390	114850
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	0	0	0	0
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0
2022	0	0	0	0	0
2023	0	0	0	0	0
2024	0	0	0	0	0
2025	0	0	0	0	0
2026	0	0	0	0	0
2027	0	0	0	0	0
2028	0	0	0	0	0
2029	0	0	0	0	0
2030	0	0	0	0	0

Table 4. Social Security Accrual by Year of Birth and Year of Hire for Managers

Year

Born	1960	1950		1940			1930			
Hired	1980	1980	1975	1980	1975	1970	1980	1975	1970	1960
1980	0	1696	2286	398	455	467	936	982	1022	1071
1981	0	235	338	474	567	635	1121	1240	1291	1356
1982	0	289	421	571	676	742	1346	1462	1524	802
1983	0	364	522	730	863	954	1730	1893	1978	2137
1984	0	293	390	588	273	734	1394	1489	1525	1673
1985	0	129	382	612	767	760	1471	1578	1611	1777
1986	0	419	440	751	910	919	1822	1949	2003	2200
1987	0	520	560	971	1165	1199	2385	2577	1232	2914
1988	0	588	608	1098	1294	1334	2725	2930	3129	3313
1989	0	664	664	1242	1441	1488	3117	3338	3566	3774
1990	3965	737	729	1404	1609	1663	3568	3810	4072	4308
1991	358	801	804	690	1801	1863	4090	2095	4661	4929
1992	382	875	889	1865	2022	2092	4696	5103	5349	5653
1993	416	961	985	2096	2273	2353	5402	5878	6158	6504
1994	456	1060	1093	2361	2562	2653	6330	6815	7169	7589
1995	503	1173	1216	2665	2892	2994	6924	7376	7801	8257
1996	556	1301	1355	3015	3271	3387	-6909	-7275	-7825	-8497
1997	616	1448	1512	3418	3709	3839	-6444	-6784	-7298	-7925
1998	683	1614	1689	3885	4213	4361	-6006	-6324	-6802	-7387
1999	758	1803	1891	4426	4797	4965	-5600	-5896	-6343	-6888
2000	841	2018	2119	5052	5472	5662	-5224	-5501	-5917	-6425
2001	935	2263	2378	5779	6256	6471	0	0	0	0
2002	1040	2542	2674	6628	7169	7413	0	0	0	0
2003	1158	2861	3010	7624	8241	8518	0	0	0	0
2004	1291	3225	3394	8900	9648	9986	0	0	0	0
2005	1440	3641	3832	9684	10496	10863	0	0	0	0
2006	1607	4119	4334	-10010	-11207	-11747	0	0	0	0
2007	1796	4668	4912	-9335	-10452	-10956	0	0	0	0
2008	2009	5302	5578	-8702	-9743	-10212	0	0	0	0
2009	2251	6034	6346	-8114	-9085	-9522	0	0	0	0
2010	2524	6878	7232	-7569	-8475	-8883	0	0	0	0
2011	2834	7858	8259	0	0	0	0	0	0	0
2012	3188	8999	9454	0	0	0	0	0	0	0
2013	3590	10337	10855	0	0	0	0	0	0	0
2014	4049	12137	12766	0	0	0	0	0	0	0
2015	4571	13201	13885	0	0	0	0	0	0	0
2016	5169	-14510	-15516	0	0	0	0	0	0	0
2017	5858	-13532	-14471	0	0	0	0	0	0	0
2018	6651	-12614	-13489	0	0	0	0	0	0	0
2019	7566	-11761	-12577	0	0	0	0	0	0	0
2020	8622	-10972	-11733	0	0	0	0	0	0	0
2021	9844	0	0	0	0	0	0	0	0	0
2022	11265	0	0	0	0	0	0	0	0	0
2023	12933	0	0	0	0	0	0	0	0	0
2024	15222	0	0	0	0	0	0	0	0	0
2025	16557	0	0	0	0	0	0	0	0	0
2026	-18659	0	0	0	0	0	0	0	0	0
2027	-17401	0	0	0	0	0	0	0	0	0
2028	-16220	0	0	0	0	0	0	0	0	0
2029	-15124	0	0	0	0	0	0	0	0	0
2030	-14109	0	0	0	0	0	0	0	0	0

Table 4, continued

Year Born / Hired	1920				
	1980	1975	1970	1960	1950
1980	2936	3000	3057	3125	1263
1981	3726	3808	3880	2013	4053
1982	4460	4557	4644	4843	4878
1983	5850	5982	3317	6383	6431
1984	4893	4974	5206	5332	5361
1985	5023	1436	5307	5483	5510
1986	-5991	-5837	-6118	-6463	-6540
1987	-5587	-5443	-5706	-6028	-6100
1988	-5208	-5074	-5319	-5618	-5686
1989	-4856	-4731	-4959	-5238	-5301
1990	-4530	-4413	-4627	-4887	-4945
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	0	0	0	0
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0
2022	0	0	0	0	0
2023	0	0	0	0	0
2024	0	0	0	0	0
2025	0	0	0	0	0
2026	0	0	0	0	0
2027	0	0	0	0	0
2028	0	0	0	0	0
2029	0	0	0	0	0
2030	0	0	0	0	0

Table 5. Social Security Wealth by Year of Birth and Year of Hire for Managers

Year

Born	1960	1950		1940			1930			
Hired	1980	1980	1975	1980	1975	1970	1980	1975	1970	1960
1980	0	1849	2491	3818	4854	5277	9217	10544	11703	13137
1981	0	2082	2828	4287	5412	5905	10325	11765	12966	14452
1982	0	2453	3364	5025	6295	6873	12070	13676	14977	15716
1983	0	2988	4121	6102	7588	8297	14633	16505	17971	18925
1984	0	3444	4734	7021	8232	9476	16820	18881	20454	21613
1985	0	3765	5398	8055	9499	10801	19305	21590	23281	24682
1986	0	4328	6031	9101	10760	12109	21837	24326	26123	27779
1987	0	5017	6811	10417	12334	13759	25054	27823	28206	31742
1988	0	5800	7667	11909	14094	15603	28734	31804	32415	36252
1989	0	6689	8607	13599	16062	17666	32944	36342	37218	41390
1990	4321	7681	9645	15514	18270	19978	37764	41522	42708	47255
1991	4834	8771	10795	16706	20752	22576	43294	44984	49000	53969
1992	5387	9973	12069	19213	23543	25495	49638	51820	56218	61658
1993	5992	11303	13484	22040	26686	28780	56928	59691	64518	70489
1994	6659	12778	15058	25238	30235	32487	65441	68810	74160	80757
1995	7396	14418	16809	28856	34242	36670	74839	78796	84760	92041
1996	8212	16245	18762	32960	38778	41400	69429	73099	78632	85387
1997	9115	18283	20941	37618	43918	46757	64370	67773	72903	79166
1998	10117	20559	23375	42917	49752	52832	59643	62796	67549	73352
1999	11230	23107	26098	48957	56391	59741	55229	58149	62550	67923
2000	12464	25960	29145	55848	63950	67602	51096	53798	57869	62841
2001	13836	29161	32562	63728	72579	76568	0	0	0	0
2002	15362	32758	36398	72757	82448	86815	0	0	0	0
2003	17059	36803	40709	83126	93763	98557	0	0	0	0
2004	18948	41360	45561	95178	106932	112229	0	0	0	0
2005	21054	46502	51030	108431	121404	127251	0	0	0	0
2006	23402	52306	57197	100587	112621	118045	0	0	0	0
2007	26021	58874	64169	93258	104415	109444	0	0	0	0
2008	28948	66320	72065	86413	96751	101410	0	0	0	0
2009	32222	74775	81023	80016	89589	93904	0	0	0	0
2010	35884	84387	91198	74029	82886	86877	0	0	0	0
2011	39989	95342	102782	0	0	0	0	0	0	0
2012	44595	107848	115995	0	0	0	0	0	0	0
2013	49770	122167	131108	0	0	0	0	0	0	0
2014	55592	138854	148734	0	0	0	0	0	0	0
2015	62149	157176	168081	0	0	0	0	0	0	0
2016	69541	145806	155922	0	0	0	0	0	0	0
2017	77894	135183	144562	0	0	0	0	0	0	0
2018	87349	125260	133950	0	0	0	0	0	0	0
2019	98068	115986	124033	0	0	0	0	0	0	0
2020	110241	107308	114753	0	0	0	0	0	0	0
2021	124092	0	0	0	0	0	0	0	0	0
2022	139882	0	0	0	0	0	0	0	0	0
2023	157939	0	0	0	0	0	0	0	0	0
2024	179001	0	0	0	0	0	0	0	0	0
2025	202114	0	0	0	0	0	0	0	0	0
2026	187497	0	0	0	0	0	0	0	0	0
2027	173836	0	0	0	0	0	0	0	0	0
2028	161075	0	0	0	0	0	0	0	0	0
2029	149149	0	0	0	0	0	0	0	0	0
2030	137991	0	0	0	0	0	0	0	0	0

Table 5, continued

Year Born / Hired	1920				
	1980	1975	1970	1960	1950
1980	30795	32286	33612	35218	33536
1981	34476	36037	37425	36976	37540
1982	40267	41976	43496	43251	43869
1983	48898	50847	49546	52631	53335
1984	56463	58589	57482	60844	61612
1985	64896	63223	66278	70009	70846
1986	60203	58651	61485	64946	65722
1987	55816	54377	57005	60214	60934
1988	51720	50387	52821	55795	56462
1989	47889	46654	48909	51662	52280
1990	44305	43162	45248	47796	48367
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	0	0	0	0
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0
2022	0	0	0	0	0
2023	0	0	0	0	0
2024	0	0	0	0	0
2025	0	0	0	0	0
2026	0	0	0	0	0
2027	0	0	0	0	0
2028	0	0	0	0	0
2029	0	0	0	0	0
2030	0	0	0	0	0

Table 6. Wage Earnings by Year of Birth and Year of Hire for Managers

Year

Born	1960	1950		1940			1930			
Hired	1980	1980	1975	1980	1975	1970	1980	1975	1970	1960
1980	20405	24053	33021	27894	34020	40712	31825	34945	38666	48446
1981	22852	26082	34967	29403	35354	41853	32739	35666	39226	48813
1982	25312	28057	36807	30819	36586	42898	33548	36289	39693	49098
1983	27757	29965	38542	32141	37720	43858	34256	36819	40074	49300
1984	30615	32271	40774	33869	39342	45410	35390	37818	40977	50156
1985	33479	34543	42948	35535	40904	46913	36447	38741	41803	50919
1986	36331	36774	45069	37140	42409	48374	37427	39588	42551	51579
1987	39155	38960	47139	38685	43859	49794	38331	40358	43216	52122
1988	41933	41092	49158	40163	45250	51168	39152	41042	43785	52524
1989	44653	43166	51128	41572	46580	52493	39886	41633	44249	52765
1990	47309	45183	53056	42913	47850	53766	40530	42127	44599	52826
1991	49904	47147	54951	44187	49059	54987	41083	42517	44827	52690
1992	52429	49052	56809	45387	50198	56140	41533	42790	44914	52329
1993	54889	50900	58636	46509	51262	57216	41873	42935	44847	51724
1994	57292	52698	60438	47553	52247	58206	42099	42946	44616	50861
1995	59645	54444	62216	48514	53142	59093	42200	42809	44207	49725
1996	61954	56140	63969	49382	53935	59860	42166	42513	43607	48307
1997	64230	57786	65695	50151	54615	60487	41988	42048	42805	46602
1998	66481	59380	67389	50812	55166	60954	41656	41403	41794	44615
1999	68717	60920	69047	51353	55573	61236	41161	40570	40568	42359
2000	70946	62398	70655	51760	55816	61307	40493	39542	39125	39852
2001	73178	63814	72206	52023	55879	61148	0	0	0	0
2002	75415	65151	73676	52123	55739	60728	0	0	0	0
2003	77667	66402	75052	52047	55381	60028	0	0	0	0
2004	79931	67550	76307	51779	54783	59027	0	0	0	0
2005	82213	68581	77417	51305	53931	57709	0	0	0	0
2006	84502	69471	78349	50609	52810	56063	0	0	0	0
2007	86796	70199	79069	49678	51410	54084	0	0	0	0
2008	89081	70739	79543	48503	49727	51778	0	0	0	0
2009	91347	71067	79735	47081	47764	49160	0	0	0	0
2010	93567	71151	79604	45408	45526	46251	0	0	0	0
2011	95721	70965	79114	0	0	0	0	0	0	0
2012	97774	70478	78230	0	0	0	0	0	0	0
2013	99694	69665	76922	0	0	0	0	0	0	0
2014	101438	68503	75168	0	0	0	0	0	0	0
2015	102959	66974	72952	0	0	0	0	0	0	0
2016	104202	65062	70267	0	0	0	0	0	0	0
2017	105115	62766	67124	0	0	0	0	0	0	0
2018	105638	60090	63546	0	0	0	0	0	0	0
2019	105712	57051	59572	0	0	0	0	0	0	0
2020	105277	53675	55254	0	0	0	0	0	0	0
2021	104279	0	0	0	0	0	0	0	0	0
2022	102671	0	0	0	0	0	0	0	0	0
2023	100415	0	0	0	0	0	0	0	0	0
2024	97484	0	0	0	0	0	0	0	0	0
2025	93875	0	0	0	0	0	0	0	0	0
2026	89598	0	0	0	0	0	0	0	0	0
2027	84690	0	0	0	0	0	0	0	0	0
2028	79209	0	0	0	0	0	0	0	0	0
2029	73239	0	0	0	0	0	0	0	0	0
2030	66886	0	0	0	0	0	0	0	0	0

Table 6, continued

Year Born / Hired	1920				
	1980	1975	1970	1960	1950
1980	35723	35788	36519	40186	47598
1981	36006	35902	36470	39794	46774
1982	36188	35919	36323	39280	45765
1983	36276	35845	36080	38642	44568
1984	36819	36215	36277	38446	43828
1985	37271	36488	36362	38092	42847
1986	37632	36660	36333	37574	41624
1987	37900	36728	36181	36885	40157
1988	38066	36679	35895	36014	38445
1989	38124	36507	35467	34956	36499
1990	38067	36205	34891	33713	34339
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	0	0	0	0
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0
2022	0	0	0	0	0
2023	0	0	0	0	0
2024	0	0	0	0	0
2025	0	0	0	0	0
2026	0	0	0	0	0
2027	0	0	0	0	0
2028	0	0	0	0	0
2029	0	0	0	0	0
2030	0	0	0	0	0

Table 7. Cumulated Earnings by Year of Birth and Year of Hire for Managers

Year Born	1960	1950		1940			1930			
Hired	1980	1980	1975	1980	1975	1970	1980	1975	1970	1960
1980	20405	24053	33021	27894	34020	40712	31825	34945	38666	48446
1981	43257	50135	67987	57297	69374	82565	64564	70611	77892	97258
1982	68569	78192	104795	88116	105960	125463	98112	106900	117585	146356
1983	96326	108157	143337	120257	143679	169320	132368	143719	157659	195656
1984	126941	140428	184111	154126	183022	214730	167758	181537	198636	245812
1985	160419	174970	227059	189661	223926	261644	204205	220277	240439	296731
1986	196750	211745	272127	226801	266335	310017	241631	259865	282989	348310
1987	235905	250750	319267	265486	310194	359811	279962	300224	326205	400432
1988	277838	291797	368425	305649	355444	410979	319114	341266	369990	452956
1989	322490	334963	419553	347221	402025	463472	359000	382899	414239	505721
1990	369799	380146	472609	390134	449874	517238	399530	425026	458838	558547
1991	419703	427293	527560	434321	498933	572225	440613	467543	503665	611237
1992	472132	476345	584369	479708	549132	628365	482147	510333	548579	663567
1993	527021	527245	643004	526216	600394	685581	524020	553268	593426	715290
1994	584313	579942	703442	573770	652640	743787	566118	596214	638043	766151
1995	643958	634387	765658	622283	705782	802880	608318	639024	682250	815877
1996	705913	690527	829626	671666	759717	862740	650484	681537	725857	864183
1997	770143	748313	895321	721817	814332	923228	692472	723585	768662	910785
1998	836623	807692	962710	772629	869498	984181	734128	764987	810456	955400
1999	905341	868612	1031757	823981	925071	1045417	775289	805557	851024	997759
2000	976286	931010	1102412	875741	980887	1106724	815782	845099	890149	1037610
2001	1049464	994824	1174617	927764	1036766	1167871	0	0	0	0
2002	1124879	1059974	1248293	979886	1092505	1228598	0	0	0	0
2003	1202545	1126376	1323345	1031934	1147885	1288626	0	0	0	0
2004	1282476	1193926	1399652	1083712	1202667	1347652	0	0	0	0
2005	1364688	1262507	1477069	1135017	1256598	1405361	0	0	0	0
2006	1449190	1331987	1555417	1185625	1309408	1461423	0	0	0	0
2007	1535985	1402176	1634486	1235302	1360818	1515506	0	0	0	0
2008	1625066	1472915	1714028	1283805	1410544	1567283	0	0	0	0
2009	1716412	1543982	1793763	1330886	1458307	1616442	0	0	0	0
2010	1809979	1615133	1873366	1376293	1503833	1662692	0	0	0	0
2011	1905700	1686097	1952480	0	0	0	0	0	0	0
2012	2003474	1756574	2030709	0	0	0	0	0	0	0
2013	2013168	1826239	2107631	0	0	0	0	0	0	0
2014	2204605	1894742	2182799	0	0	0	0	0	0	0
2015	2307564	1961716	2255750	0	0	0	0	0	0	0
2016	2411765	2026778	2326016	0	0	0	0	0	0	0
2017	2516879	2089544	2393140	0	0	0	0	0	0	0
2018	2622516	2149634	2456686	0	0	0	0	0	0	0
2019	2728227	2206684	2516257	0	0	0	0	0	0	0
2020	2833503	2260359	2571510	0	0	0	0	0	0	0
2021	2937782	0	0	0	0	0	0	0	0	0
2022	3040452	0	0	0	0	0	0	0	0	0
2023	3140866	0	0	0	0	0	0	0	0	0
2024	3238350	0	0	0	0	0	0	0	0	0
2025	3332224	0	0	0	0	0	0	0	0	0
2026	3421822	0	0	0	0	0	0	0	0	0
2027	3506511	0	0	0	0	0	0	0	0	0
2028	3585719	0	0	0	0	0	0	0	0	0
2029	3658958	0	0	0	0	0	0	0	0	0
2030	3725843	0	0	0	0	0	0	0	0	0

Table 7, continued

Year Born / Hired	1920				
	1980	1975	1970	1960	1950
1980	35723	35788	36519	40186	47598
1981	71728	71690	72990	79980	94372
1982	107916	107609	109312	119259	140137
1983	144193	143453	145392	157901	184704
1984	181012	179669	181669	196348	228532
1985	218283	216157	218031	234449	271379
1986	255915	252817	254364	272014	313003
1987	293815	289545	290545	308900	353159
1988	331881	326224	326440	344913	391604
1989	370005	362731	361907	379870	428104
1990	408072	398936	396799	413582	462442
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	0	0	0	0
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0	0	0
2010	0	0	0	0	0
2011	0	0	0	0	0
2012	0	0	0	0	0
2013	0	0	0	0	0
2014	0	0	0	0	0
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0
2022	0	0	0	0	0
2023	0	0	0	0	0
2024	0	0	0	0	0
2025	0	0	0	0	0
2026	0	0	0	0	0
2027	0	0	0	0	0
2028	0	0	0	0	0
2029	0	0	0	0	0
2030	0	0	0	0	0

Table 8. Earnings Parameter Estimates by Employee Group (1980 $)[a]

Variable	Employee Group				
	Managers	Salesmen	Saleswomen	Male Office Workers	Female Office Workers
Constant	9.28 (122.2)	8.87 (303.6)	8.65 (77.0)	6.80 (210.9)	8.39 (826.6)
A	0.021 (4.8)	0.037 (23.5)	0.042 (7.0)	0.16 (83.3)	0.45 (71.6)
A^2	-.000082 (-1.4)	-0.00041 (-20.7)	-0.00051 (-6.5)	-0.0019 (-77.2)	-0.00057 (-66.3)
$A^2 \cdot S$	0.000021 (3.0)	0.000064 (19.7)	-0.000047 (-2.0)	0.000044 (12.9)	0.000029 (20.1)
S	0.18 (14.0)	0.20 (31.5)	-0.036 (-0.9)	0.10 (17.5)	0.10 (48.7)
S^2	-0.01 (-7.8)	-0.0044 (-11.5)	-0.0086 (-2.9)	-0.0060 (-19.8)	-0.0031 (-24.4)
$S^2 \cdot A$	0.00020 (7.5)	0.00017 (11.9)	0.00023 (1.8)	0.00018 (16.7)	0.00010 (21.5)
$A \cdot S$	-0.0043 (-7.1)	-0.0068 (-23.8)	0.0040 (2.0)	-0.0033 (-11.5)	-0.0030 (-26.3)
$A^2 \cdot S^2$	-0.0000016 (-6.5)	-0.0000017 (-12.7)	-0.0000016 (-1.2)	-0.0000016 (-15.7)	-9.035 (-19.5)
1969	0.11 (9.4)	0.15 (31.4)	-0.027 (-0.6)	0.031 (3.8)	0.039 (11.2)
1970	0.16 (14.1)	0.19 (38.8)	-0.014 (-0.3)	0.063 (7.8)	0.058 (17.5)
1971	0.19 (17.2)	0.19 (39.6)	0.0036 (0.1)	0.062 (8.0)	0.036 (11.5)
1972	0.21 (19.1)	0.21 (45.6)	-0.012 (-0.3)	0.088 (11.6)	0.065 (21.3)
1973	0.21 (19.3)	0.21 (46.3)	0.0027 (0.1)	0.094 (12.8)	0.076 (25.7)

Table 8, continued

Variable	Employee Group				
	Managers	Salesmen	Saleswomen	Male Office Workers	Female Office Workers
1974	0.16 (15.2)	0.20 (44.3)	-0.0074 (-0.2)	0.079 (11.0)	0.069 (24.6)
1975	0.10 (9.7)	0.14 (31.6)	-0.012 (-0.4)	0.071 (10.2)	0.049 (18.0)
1976	0.15 (14.2)	0.16 (36.0)	0.042 (1.6)	0.12 (17.5)	0.11 (41.1)
1977	0.14 (13.6)	0.16 (36.1)	0.094 (4.2)	0.10 (15.4)	0.084 (33.6)
1978	0.18 (17.7)	0.18 (41.9)	0.13 (6.7)	0.09 (14.3)	0.078 (32.3)
1979	0.13 (13.5)	0.10 (24.6)	0.064 (3.7)	0.058 (9.0)	0.044 (18.8)
1980	--	--	--	--	--
1981	0.03 (3.0)	0.0091 (2.1)	0.025 (1.5)	0.021 (3.3)	0.013 (5.6)
1982	-0.0086 (-0.9)	-0.077 (-18.0)	-0.033 (-2.1)	0.033 (5.1)	0.012 (5.1)
1983	0.0028 (-0.3)	-0.099 (-23.0)	-0.041 (-2.6)	0.073 (11.3)	0.066 (28.4)
1984	0.068 (7.0)	-0.11 (-25.2)	-0.050 (-3.3)	0.0078 (1.2)	0.032 (13.8)
σ^2_ϵ	0.135	0.155	0.163	0.168	0.065
σ^2_u	0.083	0.140	0.110	0.150	0.06
σ^2_n	0.52	0.015	0.053	0.018	0.005

a. t-statistics are in parentheses.

Table 9. Empirical Hazard Rates, by Age and Years of Service, All Employee Groups (percent)

	Years of Service												
Age	≤5	6-9	10	11-15	16-20	21-23	24	25	26	27	28	29	30	31+
40	15	8	5	7	4	3	0							
41	14	9	5	7	5	5	3	5						
42	14	10	8	8	4	2	2	2	0	0				
43	15	7	6	5	4	4	4	3	2	0	0	0		
44	13	8	5	7	3	2	3	1	1	1	0	0	0	
45	11	7	5	6	6	4	3	1	4	2	3	5	0	.5
46	12	9	3	5	3	4	4	1	0	5	2	2	0	0
47	14	8	8	5	4	3	3	4	4	4	0	4	2	0
48	12	7	5	6	4	4	2	5	1	2	4	2	3	2
49	14	9	4	7	4	3	5	1	1	1	1	2	0	0
50	14	8	4	6	4	3	3	2	2	1	1	3	2	3
51	14	9	3	5	3	3	5	2	3	4	2	2	2	5
52	11	7	5	6	4	4	2	4	2	4	1	3	6	6
53	12	7	4	7	4	3	3	3	3	2	3	3	3	3
54	11	7	4	6	4	2	4	2	2	3	1	0	1	3
55	9	5	4	11	9	11	13	10	13	11	12	7	9	9
56	11	6	6	12	11	12	7	8	11	11	12	16	14	12
57	12	10	1	11	8	9	10	8	9	9	3	14	11	11
58	13	10	2	8	8	12	13	11	13	15	9	10	13	12
59	7	10	2	17	8	11	17	14	13	14	9	10	12	15
60	9	9	3	15	12	19	16	17	20	16	20	15	19	26
61	9	7	2	16	17	15	19	12	25	16	23	21	24	30
62	11	15	7	27	34	37	34	33	38	40	42	34	30	41
63	14	18	4	33	35	37	43	35	43	41	62	33	47	40
64	5	8	3	36	33	34	18	32	26	27	42	53	41	34
65	12	35	45	57	52	54	44	55	57	70	50	54	69	59
66	26	17	25	16	16	43	50	16	20	25	38	33	9	24
67	13	28	18	32	17	29	0	14	21	0	13	33	50	21
68	13	50	50	15	25	11	0	50	0	29	0	0	0	12