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SEVERANCE PAY, PENSIONS, AND EFFICIENT MOBILITY

Edward P. Lazear

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LIST OF PARTICIPANTS

Rosalind Altmann	University College of London
Fischer Black	Massachusetts Institute of Technology and NBER
Alan Blinder	Princeton University and NBER
Zvi Bodie	Boston University and NBER
Jeremy Bulow	Stanford University and NBER
Martin Feldstein	Harvard University and NBER
Jack Habib	Hebrew University
David Hartman	Harvard University and NBER
Richard Hemming	Institute for Fiscal Studies
Robert Inman	University of Pennsylvania and NBER
John Kay	Institute for Fiscal Studies
Laurence Kotlikoff	Yale University and NBER
Stephen Kutner	Stanford Research Institute
Edward Lazear	University of Chicago and NBER
Charles E. McLure, Jr.	NBER
Joseph Pechman	The Brookings Institution
James Pesando	University of Toronto and NBER
Dallas Salisbury	Employee Benefit Research Institute
John Shoven	Stanford University and NBER
Lawrence Summers	Massachusetts Institute of Technology and NBER
Paul Taubman	University of Pennsylvania and NBER
Irwin Tepper	Harvard University and NBER
Susan Wachter	University of Pennsylvania
John Whalley	University of Western Ontario
David Wise	Harvard University and NBER

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Severance Pay, Pensions, and Efficient Mobility

ABSTRACT

This paper argues that pensions are used as severance pay devices in an efficient compensation scheme. The major points of the study are: (1) Severance pay, which takes the form of higher pension values for early retirement, is widespread. (2) A major reason for the existence of pensions is the desire to provide an incentive mechanism that can also function as an efficient severance pay device. It is incorrect to think of pensions merely as a tax-deferred savings account. (3) The wage rates that older workers receive exceed their marginal products. This is evidenced by the fact that employers are willing to buy them out with higher pensions if they retire early.

These conclusions are based upon examination of a data set which was generated as part of this study. That data set contains detailed information on 244 of the largest pension plans in the country, covering about 8 million workers.

Edward P. Lazear
Graduate School of Business
University of Chicago
5835 Greenwood Avenue
Chicago, IL 60637

(312) 753-4525

I. Introduction

It is often suggested that severance pay is not a common feature of labor contracts even though theory dictates its usage in a number of circumstances.[1] Sometimes in the same breath, the widespread nature of pension arrangements are noted without providing much justification for this "forced savings" which operates through the firm. This paper provides a theoretical argument and evidence from pension plans covering approximately 8.4 million workers that pension plans are incentive-based severance pay devices which bring about efficient mobility and effort in the labor market. The major points of the study are:

1.) Severance pay, which takes the form of higher pension values for early retirement, is widespread.

2.) The age-earnings profile is significantly steeper than the age-productivity profile. This is the direct implication of the firm's offer to buy workers out with higher pension benefits if they retire early.

3.) Pensions cannot be thought of simply as an asset for retirement in the same way that one thinks of a savings account. There is an important incentive-severance pay aspect to pension and this feature may be the most important reason why "forced savings" through pensions are widespread.

II. The Model

Long-term labor contracts may create problems for separation efficiency. For example, as I have argued elsewhere (Lazear 1979, 1981) the incentives generated by an upward sloping age-earnings profile often make steep profiles preferred even if productivity does not rise over the life-cycle. A steeper profile induces more effort because the worker is reluctant to shirk for fear that he may lose his job which offers future rewards that far exceed his alternatives (see Becker and Stigler (1974)). When the earnings profile deviates from the productivity profile, mobility decisions (and labor supply considerations in general) are distorted. Severance pay can eliminate much of the distortion.

The basic point is this: If wages exceed marginal product, then the firm has an incentive to buy out of the contract by paying the worker an amount to leave early. The amount that the firm is willing to pay measures the difference between the future wage commitment and future marginal product. If the firm offers that amount to the worker, the worker will accept the buyout only when his alternatives are sufficiently good--in fact, it turns out, only when his alternative use of time exceeds his value at the current firm. Figure 1 makes this clear.

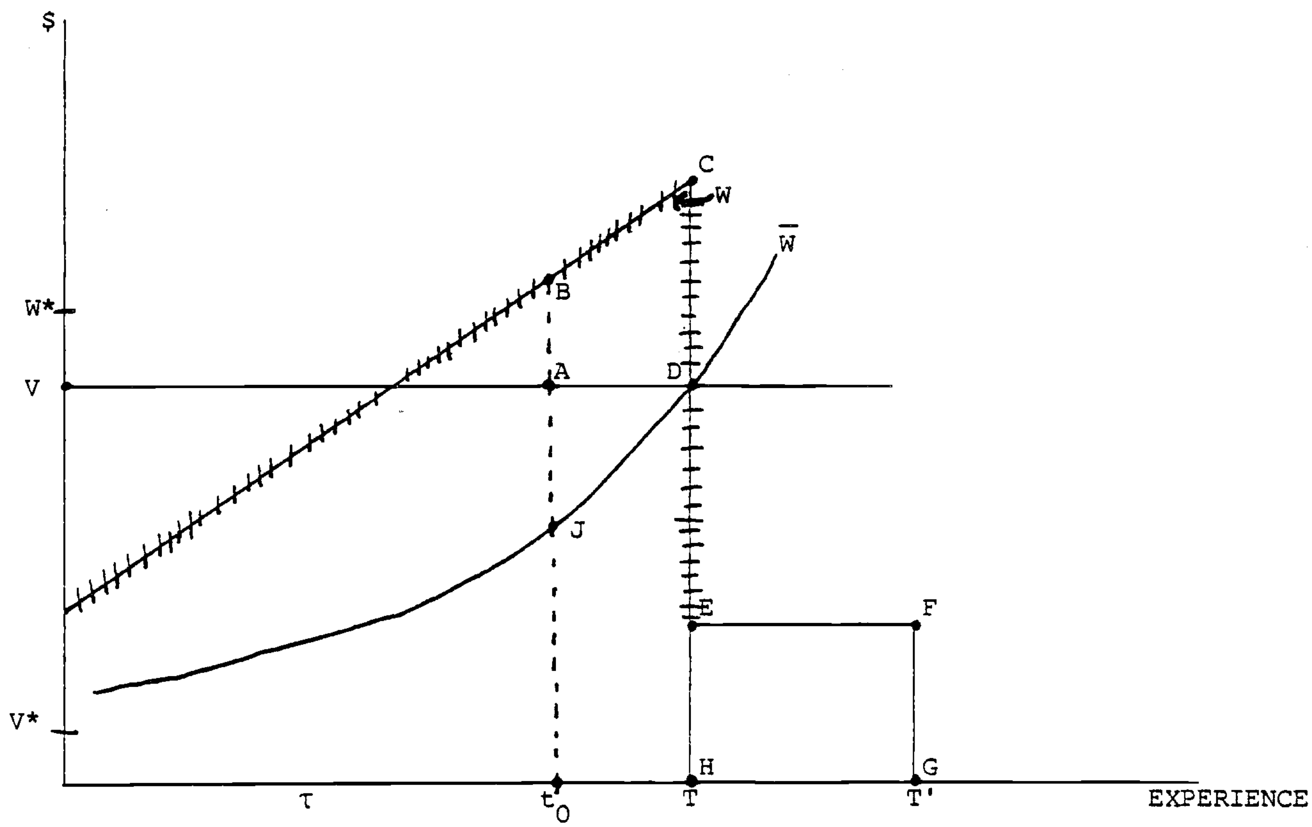

Figure 1

The worker's productivity at the current firm is V and $\overline{W}$ is the value of the alternative use of time. The date of efficient retirement, where $\overline{W} = V$, is T. The actual wage profile is W; it has the same present value as V, but is steeper and includes a pension between T and T'. It is the deviation between W and V that generates incentives and simultaneously creates the problem that severance pay reduces.

Suppose, for example, that at time t_0 a worker receives a wage offer from another firm of W^* where $V < W^* < W$. Efficiency requires that the worker leave, since there are side payments that could be made which make all parties better off if the worker moves to the new firm. However, in the absence of any side payments, the worker opts to remain since W exceeds W^* from t_0 to T.

A severance pay arrangement can bring about efficiency in this situation. Since the present value of W equals the present value of V (for a zero-profit equilibrium), the firm "owes" the worker the present value of ABCD plus EFGH, (hereafter just "ABCD" and "EFGH.") Offering the worker this amount as severance pay induces efficient mobility. What the worker receives from quitting is $(T - t_0)W^* + (ABCD) + (EFGH)$. If he stays, he receives $W(t)$ from t_0 to T plus area EFGH, or $(T - t_0)V + (ABCD) + (EFGH)$. What he earns if he quits always exceeds what he receives if he stays if and only if $W^* > V$ which is the condition for efficient mobility.

Pensions may serve as severance pay. This requires that the expected present value of the pension at t_0 be (ABCD) plus (EFGH), or in general, the expected value of the pension for retirement at t is (in time zero dollars)

$$(1) \quad P(t) = \int_t^T [\, W(\tau) - V(\tau)]e^{-r\tau}d\tau + \int_T^{T'} W(\tau)e^{-r\tau}d\tau \, .$$

It is obvious from (1) that the expected present value of the pension must first increase with t until $t = \bar{t}$ and then decline in order for pensions to act as an efficient severance pay device. This counterintuitive implication is the result of using a pension as an efficient form of severance pay. If pensions were merely a tax advantageous savings account, this pattern would not be expected.

In addition to the possibility that the worker receives an exogenous wage offer of $W^* > V$, there is also the possibility that V is unexpectedly low, as the result of an unanticipated worker illness, for example. Again, with reference to figure 1, suppose that marginal product fell to V^* at time t_0. It is efficient for the worker to quit since there is some set of side payments which could make all parties concerned better off. Awarding the employer the right to terminate a worker without cause at any time as long as the firm pays the appropriate severance pay will restore efficiency, and will not require any verification that V is in fact below $\bar{W}$. However, it will require severance pay greater than the amount described by $P(t)$ in (1).

A scheme which induces the firm to behave appropriately requires that severance pay $C(t)$ is paid when the worker is terminated "without cause." Before discussing the applicability of this approach we define:

$$(2) \quad C(t) \equiv \int_t^T [\, W(\tau) - \bar{W}(\tau) e^{-r\tau} d\tau + \int_T^{T'} W(\tau) e^{-r\tau} d\tau \ .$$

At t_0, $C(t)$ equals (JBCD) + (EFGH). This rule always induces efficient layoff behavior. The cost to the firm at time t_0 of keeping the worker net of output is $W(t)$ from t_0 to T plus area EFGH or

$$\int_{t_0}^{T} \bar{W}(\tau) e^{-r\tau} d\tau + \text{Area (JBCD)} + \text{Area (EFGH)} - \int_{t_0}^{T} V^*(\tau) e^{-r\tau} d\tau$$

The cost of terminating the worker with severance pay $C(t)$ is Area (JBCD) + Area (EFGH). It is clear that it is cheaper to lay the worker off with severance pay if and only if

$$\int_{t_0}^{T} \left(\overline{W}(\tau) - V^*(\tau) \right) e^{-r\tau} d\tau > 0$$

which is the efficiency condition.[2]

Note first that when the firm lays off the worker severance pay is higher than when the worker resigns voluntarily. This is simply the result of the difference between V and $\overline{W}$ so that the worker's gains are not equal to the firms losses. It implies, however, that as t approaches T, the difference between the benefit that the worker receives from early retirement at his election and that received when he retires with "consent" of the employer, i.e., the employer wishes him to leave, shrinks to zero (because $V - \overline{W}$ shrinks to zero).[3]

Although severance pay associated with employer-initiated separation is well-defined conceptually, it may be difficult to use in practice for two reasons:

First, termination "without cause" is not an unambiguous term. Recall that a major reason for the upward sloping age-earnings profile is that such a profile imposes large costs on workers who shirk and are terminated as the result. Workers do not receive severance pay $C(t)$ if they are fired for shirking, but they do if they are terminated "without cause." This creates a source of disagreement between worker and firm. (ERISA [1974] is the outgrowth of many such disputes.)[4]

The second reason is more compelling. Since $C(t) > P(t)$, the worker prefers that a given separation is initiated by the employer while the employer prefers that it is initiated by the worker. Thus, a worker who finds $W^* > V$ can gain by inducing the firm to terminate him. In fact, since $C(t) > P(t)$, there are even some values of $W^* < V$ for which workers prefer to be laid off. If $V > W^* > \overline{W}$, the worker would be unwilling to initiate a separation, but prefers that the employer does relative to work. This encourages shirking and other malfeasant behavior which assists in bringing it about. A similar argument can be made on the other side. The firm sometimes prefers that the worker quit and may make work conditions correspondingly miserable. Neither of these situations is efficient. The rule $C(t) = P(t)$ avoids any of these difficulties.

If severance pay arrangements are efficient, then the value of the severance pay provides us with an estimate of the difference between wages and marginal product. Stated intuitively, employers are only willing to buy out of the commitment if they lose by retaining the workers. Only when $W > V$ is the employer anxious to buy out and his anxiety increases as the difference between W and V increases. Thus, in figure 1, if the pension value of retiring at T is EFGH and at t_0 is ABCD plus EFGH, then the difference, ABCD, measures the difference between wages and marginal product between t_0 and T. Since $W(t)$ and $P(t)$ are observed, $V(t)$ can be estimated so that we can determine, at least for those near retirement years, the relationship between wages and marginal product.

Similarly, if one computes the pension benefits paid at the employer's election, one can obtain an estimate of the $\overline{W}(t)$ or reservtion wage profile. $\overline{W}(t)$ and $V(t)$ should converge at normal (or mandatory) retirement if that date is chosen efficiently.

These issues are now treated more formally. First consider pension benefits that can be received at the worker's election, even without "consent" of the employer. This corresponds to the present value of the difference between $W(t)$ and $V(t)$.

An efficient severance pay rule says that at time t, the worker will quit and take severance pay if and only if $\tilde{W}(t)$, the alternative use of time (now a random variable) exceeds $V(t)$. Utility maximization implies that a worker quits and accepts severance pay if two conditions hold: (1) the present value of severance pay plus the alternative stream exceeds the present value of the wage stream in the current firm and (2) the worker cannot do even better by delaying his retirement to some time in the future.[5]

Let us make periods and wage changes discrete. Consider period $T - 1$, i.e., one year before normal retirement. The worker retires if

$$(3) \quad \tilde{W}_{T-1} + S_{T-1} \sum_{\tau=0}^{K+1} \frac{1}{(1+r)^{\tau}} > W_{T-1} + \left(\frac{1}{1+r}\right) S_T \sum_{\tau=0}^{K} \frac{1}{(1+r)^{\tau}}$$

where $K \equiv T' - T$, S_t is the annual pension payment received from t until death at T' if the worker retires at t, $\tilde{W}_t$ is the alternative wage paid between t and $t+1$ and W_t is the wage at the current firm between t and $t+1$.

To induce efficient quitting behavior, it is necessary that the l.h.s. of (3) exceeds the r.h.s. of (3) iff $\tilde{W}_{T-1} > V_{T-1}$. If

$$P_{T-1} \equiv S_{T-1} \sum_{\tau=0}^{K+1} \frac{1}{(1+r)^{\tau}} \quad \text{and} \quad P_T \equiv S_T \sum_{\tau=0}^{K} \frac{1}{(1+r)^{\tau}} \quad \text{then}$$

choose P_T and P_{T-1} so that

$$(4) \quad P_{T-1} - \left(\frac{1}{1+r}\right) P_T = W_{T-1} - V_{T-1} .$$

Substitution of (4) into (3) yields the necessary and sufficient condition that the worker quits if

$$\tilde{W}_{T-1} + W_{T-1} - V_{T-1} > W_{T-1}$$

(5) or

$$\tilde{W}_{T-1} > V_{T-1}$$

Since this is the efficiency condition, the severance pay arrangement results in efficient turnover.

Now consider the decision at $T-2$. The worker resigns at $T-2$ if and only if two conditions hold: First, the present value of retiring at $T-2$ and receiving severance pay must exceed the present value of continuing to work until $T-1$ and retiring then, taking the $T-1$ severance pay. Second, the present value of retiring at $T-2$ with severance pay must exceed the present value of working until T and taking the normal pension. If we make the assumption that $\tilde{W}_t > V_t$ implies $\tilde{W}_{t'} > V_{t'}$ for $t' > t$ then the second condition becomes redundant (demonstrated below). Consider the first condition: A worker retires at $T-2$ rather than at $T-1$ iff

$$(6) \quad \tilde{W}_{T-2} + \frac{E_{T-2}(\tilde{W}_{T-1})}{1 + r} + S_{T-2} \sum_{\tau=0}^{K+2} \frac{1}{(1+r)^{\tau}} > W_{T-2} + \frac{E_{T-2}(\tilde{W}_{T-1})}{1 + r} + \frac{S_{T-1}}{1+r} \sum_{\tau=0}^{K+1} \frac{1}{(1+r)^{\tau}}$$

where $E_{T-1}(\tilde{W}_{T-1})$ is the expectation of the alternative wage offer at $T - 1$ given the information at $T - 2$ ($\bar{W}_t$ is then $E_0(\tilde{W}_t)$).

For efficiency, it is necessary that the l.h.s. of (6) exceed the r.h.s. of (6) iff $\tilde{W}_{T-2} < V_{T-2}$ (which, by assumption, implies $\tilde{W}_{T-1} < V_{T-1}$). An efficient pension plan sets

$$(7) \quad P_{T-2} - \frac{1}{(1+r)} P_{T-1} = W_{T-2} - V_{T-2} ,$$

or

$$(7') \quad S_{T-2} \sum_{\tau=0}^{K+2} \left(\frac{1}{1+r} \right)^{\tau} - \frac{S_{T-1}}{1+r} \sum_{\tau=0}^{K+1} \left(\frac{1}{1+r} \right)^{\tau} = W_{T-2} - V_{T-2} .$$

To see this, substitute (7) into (6). The worker opts to leave iff

$$(8) \quad \begin{aligned} &\tilde{W}_{T-2} + W_{T-2} - V_{T-2} > W_{T-2} \\ &\text{or} \\ &\text{if } \tilde{W}_{T-2} > V_{T-2} \end{aligned}$$

which is the efficiency condition.

Note also that if $\tilde{W}_{T-2} > V_{T-2}$, the worker chooses retirement at $T-2$ over retirement at T. The second condition is redundant. Since $\tilde{W}_{T-2} > V_{T-2}$ implies $\tilde{W}_{T-1} > V_{T-1}$, the efficient pension plan already insures that inequality (5) holds as well. That is, since the efficient pension at $T-1$ induced retirement at $T-1$ whenever $\tilde{W}_{T-1} > V_{T-1}$, it is clear that retirement at $T-2$ dominates retirement at T because it dominates the superior strategy, namely, retirement at $T-1$.

This provides a general statement of the efficient pension:

$$(9) \quad P_{T-i} - \frac{P_{T-i+1}}{1+r} = W_{T-i} - V_{T-i}$$

or

$$(9') \quad S_{T-i} \sum_{\tau=0}^{K+i} \left(\frac{1}{1+r} \right)^{\tau} - \frac{1}{1+r} S_{T-i+1} \sum_{\tau=0}^{K+i-1} \left(\frac{1}{1+r} \right)^{\tau} = W_{T-i} - V_{T-i}$$

so

$$(10) \quad P_{T-i} = \sum_{\tau=1}^{i} [W_{T-\tau} - V_{T-\tau}] \left(\frac{1}{1+r} \right)^{i-\tau} + \frac{P_T}{(1+r)^i} .$$

The terminal value, P_T, is exogenous to this problem. It might be thought of as the optimal pension to prevent shirking in the final period before retirement.

It is through equations (9) and (10) that we derive our results. If the wages of old workers $(t-i > \bar{t}$ in fig. 1) exceed their marginal products, then the present value of the pension falls as the age of retirement rises (eq. (9)). Similarly, eq. (9) provides us with an estimate of the difference between W and V at each point in time because P_{T-i} and P_{T-i+1} are observed.

The point of this section can be restated: The pension which acts as severance pay reduces the true wage to V when we take into account the way that the pension value falls with experience. Since the pension is not paid if the separation is punishment for too little effort, incentives are maintained while efficient turnover is produced.

Below we discuss the role of vesting in this context. But before doing that, we derive some additional formulas. Let us specify the efficient $C(t)$ path, i.e., that path that induces the employer to lay the workers off if and only if $\tilde{V} < \bar{W}$, where $\tilde{V}$ is now a random variable.

By development analogous to eq. (3)-(10) we derive the efficient employer initiated severance pay:

$$(11) \qquad C_{T-i} - \frac{C_{T-i+1}}{1+r} = W_{T-i} - \bar{W}_{T-i}$$

or

$$(12) \qquad C_{T-i} = \sum_{\tau=1}^{i} [W_{T-\tau} - \bar{W}_{T-\tau}] \left(\frac{1}{1+r} \right)^{i-\tau} + \frac{C_{\tau}}{(1+r)^{i}}$$

where $C_T = P_T$ since $\bar{W}_T = V_T$. This path induces employers to separate workers "without cause," if and only if $\tilde{V} < \tilde{W}$.

The case of postponed retirement is equivalent. In fact, normal retirement is not sacred once we allow pension benefits to vary with the date of retirement. The date of "normal retirement" is the date of modal retirement. In almost all cases that age is 65 and corresponds to the start of social security payments. The reason is that the social security earnings test causes the $\bar{W}(t)$ function to take a discrete jump upwards at age 65. Therefore, from the point of view of efficiency, most workers find that $\bar{W}(t)$ intersects $V(t)$ at T. If H is the amount of social security payment, then all of those individuals whose alternative value of time at T without social security included lies between V and $V-H$ find that there alternative use of time rises above V at T.

Except for this detail, the analysis of postponed retirement is similar. A worker should continue to work if and only if $\tilde{W}(T) > V(T)$. This is the same condition (5). The worker's choice is still reflected by (3) so all holds as above with a replacement of subscripts. If j is the number of years after "normal retirement" then retirement occurs iff:

$$(3') \qquad \tilde{W}_{T+j} + S_{T+j} \sum_{t=0}^{K-j} \left(\frac{1}{1+r} \right)^t > W_{T+j} + \frac{S_{T+j+1}}{1+r} \sum_{t=0}^{K-(j+1)} \left(\frac{1}{1+r} \right)^t .$$

Eqs. (9), (9') and (10) follow accordingly so that an estimate of $W-V$ can be obtained for those years after T as well by examining the way in which pension benefits decline in late retirement.

Let us summarize this section. Employers are willing to buy out of a long term contract if the wage rate exceeds VMP. The amount that employers are willing to pay reveals something about the difference between W and V. Pensions may act as a buyout. If the value of the pension declines with the age of retirement, this suggests that the pension plays the role of severance pay. By examining the way in which pension benefits move with age of retirement, one can infer something about the difference between W and V.

Vesting

It is useful to consider the way that vesting affects the analysis. When a worker's pension is vested, he carries with him the rights to any accrued pension benefits. Vesting creates no difficulties for worker-initiated separation since the efficiency of pensions as severance pay is based on the assumption that the worker receives the value P_t if he leaves at t. The difficulty arises in the attempt to use pensions as both severance pay device and incentive provider. If a law such as ERISA requires vesting of pensions, then a firm which previously used pensions as a reward for service well done has that tool nullified. The reaction may take a number of forms. Most extreme is that pensions are not used at all for this purpose. Instead, deferred compensation in the form of even steeper wage growth can be used. This is less desirable than wage growth with pension because it creates too little turnover and does not solve the final period problem efficiently. A less extreme adjustment is that the value of the pension can be made more highly contingent upon final salary. The firm can then reduce wage growth for shirkers which will decrease the value of the pension accordingly. Finally, the firm can opt to violate the law. If the probability of that occurring decreases in worker effort, incentives may still be maintained, although to a lesser extent.

This raises other issues. "Vesting" is not an especially meaningful term once it is recognized that the pension benefit formula can be altered. Vesting states that a worker is entitled to accrued benefit even if he leaves, but accrued benefits may be very small until the final years before retirement. There are a number of reasons: First, if the benefit formula depends upon final salary, the benefit received by a worker who leaves at age 30 may be much smaller than if he leaves at age 60 because salary grows with age, and in an inflationary economy, with time. Second, since length of service affects benefits, formulas can be specified to make accrual rates a convex function of years of service, placing a premium on long tenure. Third, early retirement restrictions normally prevent a worker from taking retirement before an age around 55. A worker who is "vested," but below that age receives a promise of benefits at 65. This is generally less valuable than the right to start receiving benefits at 55 which he enjoys if he remains with the firm until that age.[6]

A final point is that the tendency of many plans to tie benefits to final salary rather than a career average may be evidence for the incentive role of pensions. If insurance or savings were the motive, then tying pensions to permanent income is more likely to be warranted and a career average is a better proxy for permanent income than is final salary. Final salary, however, can be adjusted to reflect worker effort and hours worked. The multiplier effect on pension value may create significant incentives for workers to maintain effort and labor supply during those final years.

Inefficient Retention and Inefficient Separation

There remains the possibility that the worker will not leave the firm when it is efficient for him to do so and that he will separate when separation is inefficient. This results when both V and W are random variables simultaneously. For example, let $V > \tilde{W} > V^* > \overline{W}$. $V^* > \overline{W}$ implies that the employer will not initiate a separation. $V > \tilde{W}$ implies that a worker will not initiate a separation. $\tilde{W} > V^*$ implies that a separation is efficient. This inefficient retention can be eliminated by lowering $C(t)$ to $P(t)$. Then the employer will initiate a separation whenever $V^* < V$. The difficulty is that setting $C(t) = P(t)$ creates some additional inefficient separation at the same time. For example, if $V > V^* > \tilde{W} > \overline{W}$, a separation that would not have occurred with $C(t) > P(t)$ does when $C(t) = P(t)$, yet this separation is inefficient since $V^* > \tilde{W}$. Note that even $C(t) > P(t)$ does not eliminate all inefficient separation. Suppose $\bar{W} > V^* > \tilde{W}$. $V^* < \bar{W}$ implies that the employer terminates the worker, but this termination is inefficient since $\tilde{W} < V^*$. Analogously, inefficient quitting occurs when $V^* > \tilde{W} > V$. Since $\tilde{W} > V$, the worker quits and receives $P(t)$. This quit is inefficient since $V^* > \tilde{W}$. Elsewhere (Hall and Lazear [1982]), the tradeoff between inefficient separation and inefficient retention is analyzed in depth. These simple rules cannot, in general, eliminate all inefficiencies, and more complex rules suffer from other difficulties.

Human Capital

The theory of specific human capital, through its sharing arrangement (see Becker (1964)) implies $W < V$ for older workers. This pattern is the reverse of that shown in Figure 1. It also has different implications.

First it implies that employers prefer that employees work beyond the date at which the worker chooses to retire. Since $V > W$, the worker chooses to retire when $\bar{W}_t = W_t$ in the absence of other incentives. This occurs before $\bar{W}_t = V_t$, the condition that determines efficient date of retirement. Since $V > W$, the employer prefers that the worker continue to work so that there is no mandatory retirement.

Second, if specific human capital were important pensions would be unlikely to decline with increases in retirement age. This encourages more quitting by workers. But when specific human capital is important so that the wage is below the value of the worker to the firm, the problem is that there is already too much quitting. (In the absence of offer-matching, an outside wage offer between W and V generates a quit even though quitting is inefficient.)

Empirical Analysis

The data for this analysis were constructed using the Banker's Trust 1975 Study of Corporate Pension Plans. This book contains detailed verbal descriptions of 271 pension plans from 190 of the largest companies in the United States. These plans cover about 8.4 million workers or about 25% of all workers covered by private pension plans.

The major empirical task was to convert the verbal descriptions into machine readable data. After that was done, it was necessary to write a program which would calculate the appropriate expected present values using these data. A summary of the approach follows.

Pension benefit formulas take three basic forms. The simplest form, sometimes called the pattern plan, awards the recipient a flat dollar amount per year worked upon retirement. The more "conventional" type, calculates pension benefits from a formula which depends upon years of service and some average salary. Finally, a "defined contribution" plan awards pension benefits which vary depending upon the value of market securities. Here, each year a certain amount is put into some investment fund on the employee's behalf. The value of the pension depends upon the performance of that fund.

Given these formulas, the first task is to calculate normal retirement benefits that are available to the worker if he retires at the normal retirement age. This involves taking into account the type of plan the individual has as well as his salary and tenure.

In addition to calculating normal retirement benefits, also calculated are retirement benefits that accrue to individuals who retire from one to fifteen years before the date of normal retirement, if that was permitted, and for those who retire from one to fifteen years after the date of normal retirement, also if permitted by the conditions of the plan.

There are no individuals in this sample, per se. This data set is a description of pension plans so what is reported in this empirical section are the results of a simulation exercise. For each pension plan, I created twelve employees, having all combinations of tenure upon normal retirement of 10, 20, and 30 years and salary upon normal retirement of $9000, $15,000, $25,000 and $50,000. The analysis described below relates to these 2,928 hypothetical individuals from 244 pension plans. (Only 244 of the plans had complete and clean information.)

It is important to note that calculating retirement benefits at each age of retirement is not a straightforward task. Most plans have many restrictions on the maximum amount which can be accrued and many provide for supplemental benefits if early retirement is taken. Also, a large number of plans reduce pension benefits once social security eligibility age is reached. These restrictions and supplements are incorporated into the program. Additional restrictions have to do with vesting requirements, maximum age at which the individual begins employment, minimum numbers of years served before particular supplements are applicable, and restrictions on years during which supplements may be applied. In calculating retirement benefits, assumptions about wage growth are crucial. Since it is nominal wage growth that is relevant, I examined the CPS data from 1974 and 1976 to infer what a synthetic cohort age 55-63, in 1974, would earn as individuals 57-65 years old in 1976. As is known by most labor economists, earnings growth for older individuals is negative, not positive, and this sample was no exception to that rule. For the sample of males working "full time" in both years, average nominal wage growth during that period was -2%. For those who were full time in 1974 and full or part time in 1976, the rate was -13%. Most of this reduction in observed earnings reflects reduction in hours worked by these individuals, often as the result of illness. However, it is the annual earnings figure that is relevant for calculating pension benefits.[7] In order to be conservative, it was assumed that the wage growth rate was zero, rather than negative. My assumption tends to increase the value of normal retirement benefits relative to early retirement benefits, and so, understates the amount by which the expected present value of pension benefits declines as one postpones retirement. Additionally, the entire analysis was performed with an earnings growth rate equal to +5%. This reduced the magnitude, but not affect the direction of the results reported below.

In order to calculate present values, an assumption about interest rates must be made and a particular mortality table must be chosen. I assumed that the interest rate was 10% and I used the life tables for Americans in 1975. It is important to point out that it is not clear that this is the appropriate life table. Early retirees may have different life expectancies than normal retirees. The most obvious reason is that early retirees may retire early because they are less healthy. If so, their life expectancy would be shorter. These calculations would then overstate the amount by which pension benefits decline as retirement age is postponed.

Findings

Table 1 presents some descriptive statistics. The mean of the expected present value of pension benefits taken at normal retirement age is $51,209 for those "workers" in our sample. But the variation is tremendous. The standard deviation is $53,282 with a maximum value of $412,970 and a minimum value of $398. Part of this is due to variation in salary and tenure status. But even within each salary and tenure group, the variation in benefits across companies is enormous. Within each group the maximum value is about three times the mean, the minimum is about one-fifth of the mean, and the standard deviations go from about 30% to about 60% of the mean as salary and tenure increase.

The most important findings relate to the way that the expected present value of pension benefits vary with the date of retirement. Table 2 reports the means of expected present value of pension benefits upon retirement from 10 years before normal age to 10 years after normal age for that sample of simulated individuals who were eligible for some pension benefits in all of those situations. In Table 2, EPV-10 is the expected present value of retirement at 10 years before the normal age; EPV0 is the expected present value at normal age; and EPV+10 is the expected present value at 10 years after normal age. All other numbers correspond. The table is broken down by salary and tenure category so that the averages reflect averages across pension plans for individuals of a given type, rather than averages across all individuals. The plans are also broken down into the three basic types: pattern, or defined flat benefit plans; conventional, or defined formula benefit plans; and defined contribution plans. Table 2 contains only individuals having 20 or 30 years of tenure since those with 10 years of tenure at age of normal retirement would not be eligible for early retirement 10 years prior. For ease of inspection, Table 2 also reports the ratio of expected present value in a particular year to expected present value of pension benefits if retirement occurs at the normal age. This is listed as ERAT-10-ERAT+10 in the table.

Two important points are obvious upon inspection. First, most workers receive pensions, the expected present value of which declines as retirement is postponed. The exception to this is individuals who are on defined contribution plans. They are relatively rare, amounting to approximately 500,000 of the 8.4 million workers in the Banker's Trust sample.

This evidence suggests that firms attempt to buy old workers out of their long-term arrangements. This is consistent with the notion that pensions are used as a severance pay device to induce workers to leave early if it is efficient for them to do so. Further, most pension plans have this feature, the exception being plans of the defined contribution type.

This evidence also suggests that pensions cannot be viewed simply as a tax free savings account. That view is inconsistent with the finding that most pensions lose value as the worker works beyond a certain point even though he has withdrawn nothing from the account.[8]

Finally, using equation 9, we can estimate the difference between the worker's observed wage rate and his VMP. This is done for the 10 years preceding normal retirement age and is reported in Table ? as WVDIFF-10 to WVDIFF-1.

Note that the size of the wage VMP differential tends to increase with experience (WVDIFF15 > WVDIFF6), is reasonable in size, and varies with tenure at normal retirement.

The estimated size of the difference between wage and marginal product tends to start out negative and become positive. This reflects a wage rate which is less than marginal product during the early years of the work life and greater than marginal product in the later years.

The magnitude of the difference between wage and marginal product seems reasonable as well. For conventional plans, where the pension varies with salary level, wages exceed marginal product by about 30% in the final year before normal retirement for individuals with 30 years of tenure. For those with only twenty years of tenure, that excess is closer to 10% of final salary.

Individuals having shorter tenure at normal retirement age are workers who initiated employment with the firm more recently. Those workers are less likely to have wages which exceed their marginal products. In fact, for those workers, a significant fraction of the early years have wages below marginal product as reflected by a negative WVDIFF term. It is also true that the size of the differential varies with salary as expected. There seems to be a tendency for those with conventional pension plans, i.e., those with formula defined benefits, to be more overpaid when old than those with flat defined benefits or pattern plans. This can be explained. If higher wage workers are more likely to be doing jobs which are more difficult to monitor, using an upward age-earnings profile as an incentive mechanism is likely to be more important for that group.

To the extent that the simulated work force is representative, 92% of simulated workers had a normal age of retirement equal to 65. Furthermore, 17% of those workers could not defer retirement beyond the age of 65.

As discussed above, the way in which the value of pension benefits available with employer consent, C_t, declines with the date of retirement tells us something about the difference between the wage rate and the reservation wage. Since the reservation wage must be lower than VMP for a contract to be efficient, the ratio of the expected present value of retiring without consent, C_t, to expected present value of retiring with consent, P_t, should always be less than one, but should approach one as the individual approaches normal retirement age. Table 3 selects individuals who have valid information on benefits received with and without consent. An analysis similar to that reflected in Table 1 is performed there and the hypothesis is borne out. CERAT is defined as the ratio of expected present value of benefits received when retiring without consent to expected present value of benefits received when retiring with consent. The number following CERAT refers to the appropriate year, -10 being 10 years before the normal age of retirement and -1 being 1 year before the normal age of retirement. Here, it is universally true that the ratio is less than one so that benefits from retiring with consent exceeds those from retiring without consent and that ratio approaches one as one moves toward normal retirement. It should be pointed out that 68% of the plans do not make any distinction between separation with or without employee consent. This is probably because when a difference exists, each side tries to induce the other to initiate the separation. Also, that benefits are not much larger when retirement occurs with consent is not surprising. For retirement to be efficient at T, $V(T) = \overline{W}(T)$. Since $C(t) - P(t)$ is a measure of $V(T) - \overline{W}(T)$, this is expected to be small toward the end of the career.

Additional Results

Although somewhat removed from the main issues of this paper, it seems useful to investigate the data set further to explore some other aspects of pension plans. Since this is among the first comprehensive data sets on pension plans, it seems useful to examine the relationship between pension benefits and some characteristics of the firms, workers, and plan types. This is easily done by using the simulated data and by summarizing it in regression form. Table 4 reports some regressions performed on the same simulated data used to construct Table 1.

The results provide some interesting insight into the major pension plans in the United States. First examine column 2. Here, the expected present value of the pension taken upon normal retirement is regressed on a number of right hand variables. Each year of additional tenure upon normal retirement contributes about $2,600 to the value of the pension. Thus, an individual who intended to retire at age 65 would get about $2,600 more for beginning his job at age 44 than he would if he had begun his job at age 45. Similarly, each additional dollar of salary at the time of retirement maps into $2.87 in terms of additional pension benefits. This does not say that pensions trade for salary at a 2.87 to 1 ratio. The salary is a flow whereas the pension value is a stock. This says that each additional dollar that an individual can earn during his last few years of employment tends to bring about almost a $3 increase in pension benefits. Again, this is consistent with the interpretation that wages and pensions are an incentive generating mechanism. If harder working individuals are rewarded with higher wage rates during their final years on the job, then this also increases the value of their pension benefits multiplies the cost of shirking.

There seems to be some tendency for larger firms to have more generous pension benefits. Also formula defined benefit plans are clearly more lucrative than are flat defined benefit plans. This is true for a given salary level and it is also true that higher salaried individuals tend to have the formula rather than the flat defined benefit scheme. Defined contribution plans seem to be slightly less lucrative if the individual is to retire at the normal age and significantly less lucrative if he plans to retire early. However, defined benefit schemes are much better if the individual intends to remain on the job past the normal retirement date since the present value of those pension benefits increase with postponed retirement (cf. columns 1, 2, and 3 and note the change in sign on FORMULA). Columns 1 and 3 paint a similar picture.

In column 4, the relationship between the size of early retirement benefits and normal retirement benefits is examined. The most striking feature is that the longer is tenure at the normal retirement age, the higher is the ratio of early retirement benefits to normal retirement benefits. Firms are more anxious to buy out individuals of a given age who started many years ago than they are to buy out individuals of that same age who started more recently. This makes sense. The contract has been negotiated more recently for individuals with shorter tenure and they are less likely to be overpaid than their more experienced counterparts of the same age.

Individuals who receive defined benefits, either of the flat or formula variety, have higher early retirement benefits relative to normal retirement benefits than those who are part of a defined contribution plan. Since the expected value of pension benefits does not decline over time for defined contribution plans in the same way that it does for defined benefit plans, they are less reasonably viewed as incentive generating devices.

Conclusion

In sum, these data provide support for the view that pensions serve as an efficient severance pay device. The fact that the expected present value of pension benefits declines as the individuals postpones retirement suggests that pensions are not merely a tax-free savings account. If pensions were merely a tax-free savings account, then it is unlikely that the expected present value of the pension would decline over the individual's life time. The fact that pension benefits have a higher value upon early retirement than upon normal retirement suggests that pensions are an integral part of the compensation package. Additionally, the estimates suggest that workers receive wage rates which exceed their marginal products by about 30-35% by the time they reach retirement. This is consistent with the interpretation that an important reason for upward sloping age-earnings profile is the provision of incentives. Finally, the identity of the party who the separation affects the size of the severance pay, although this practice is not universal.

Pensions given at the employer's initiative are larger than those given when employees initiate the separation. This carries with it the implication that each party will try to induce the other side to initiate the action.

Table 1

Moments of Expected Present Value
of Normal Retirement Benefits

Group		Mean	Standard Deviation	Max	Min	N
ALL		51209	53282	412970	398	2345
Salary	Tenure					
9000	10	10624	3921	29377	1140	192
9000	20	20864	7700	58754	2281	194
9000	30	30403	11411	66055	1601	183
15000	10	16416	7008	43295	398	194
15000	20	31359	14116	82654	797	204
15000	30	47369	20118	116824	1195	186
25000	10	26125	13869	74668	1140	199
25000	20	51337	26328	142550	2281	206
25000	30	76989	39165	201437	3422	188
50000	10	50931	31338	153103	1140	205
50000	20	101462	60683	292287	2281	206
50000	30	151337	90222	412970	3422	188

TABLE 2

PRESENT VALUE OF PENSION BENEFITS

CONVENTIONAL PLANS

Variable								
SALARY	9000.000	9000.000	15000.000	15000.000	25000.000	25000.000	50000.000	50000.000
TENURE	20.000	30.000	20.000	30.000	20.000	30.000	20.000	30.000
EPV-10	21837	42283	38060	72572	66163	126734	133864	269536
EPV-9	22542	41912	39443	72267	68577	126038	139502	267370
EPV-8	23075	41394	40509	71661	70428	124837	143894	264219
EPV-7	23469	40758	41325	70815	71837	123242	147299	260316
EPV-6	23721	39972	41883	69684	72798	121179	149716	255512
EPV-5	23837	39068	42190	68319	73317	118727	151161	249951
EPV-4	23807	38031	42312	66747	73476	115930	151762	243721
EPV-3	23649	36906	42178	64981	73188	112801	151398	236838
EPV-2	23371	35673	41806	62992	72484	109296	150140	229202
EPV-1	23011	34415	41273	60933	71504	105676	148282	221366
EPV 0	21346	30687	39375	55834	69085	98797	144559	209507
EPV+1	13234	19027	24399	34675	42794	61134	89581	129107
EPV+2	12035	17104	22183	31153	38898	54857	81470	115785
EPV+3	10888	15304	20066	27869	35178	49019	73713	103408
EPV+4	9798	13635	18055	24820	31647	43609	66342	91948
EPV+5	8771	12102	16158	22012	28317	38630	59384	81395
EPV+6	7813	10672	14386	19391	25200	34005	52859	71604
EPV+7	6920	9363	12735	16993	22299	29782	46780	62675
EPV+8	6093	8170	11205	14811	19614	25945	41154	54567
EPV+9	5330	7089	9798	12836	17145	22473	35978	47239
EPV+10	4635	6112	8514	11057	14890	19348	31248	40637
ERAT-10	0.975	2.272	0.919	1.290	0.903	1.242	0.881	1.252
ERAT-9	1.015	2.228	0.960	1.295	0.944	1.243	0.925	1.247
ERAT-8	1.047	2.180	0.992	1.292	0.976	1.238	0.960	1.237
ERAT-7	1.072	2.127	1.018	1.285	1.003	1.228	0.988	1.223
ERAT-6	1.091	2.047	1.037	1.269	1.022	1.212	1.010	1.203
ERAT-5	1.103	1.953	1.050	1.248	1.035	1.191	1.024	1.180
ERAT-4	1.107	1.860	1.058	1.223	1.043	1.167	1.033	1.154
ERAT-3	1.106	1.770	1.060	1.194	1.044	1.140	1.035	1.124
ERAT-2	1.098	1.681	1.056	1.161	1.040	1.108	1.030	1.091
ERAT-1	1.086	1.596	1.046	1.126	1.030	1.074	1.022	1.056
ERAT 0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
ERAT+1	0.619	0.764	0.619	0.635	0.619	0.622	0.619	0.617
ERAT+2	0.563	0.689	0.563	0.571	0.563	0.558	0.564	0.553
ERAT+3	0.510	0.619	0.509	0.511	0.509	0.499	0.510	0.494
ERAT+4	0.459	0.553	0.459	0.455	0.458	0.443	0.460	0.439
ERAT+5	0.411	0.492	0.410	0.404	0.410	0.393	0.412	0.389
ERAT+6	0.366	0.435	0.366	0.356	0.365	0.346	0.367	0.342
ERAT+7	0.324	0.383	0.324	0.312	0.323	0.303	0.324	0.299
ERAT+8	0.286	0.335	0.285	0.272	0.284	0.264	0.286	0.260
ERAT+9	0.250	0.291	0.249	0.235	0.249	0.229	0.250	0.225
ERAT+10	0.217	0.251	0.216	0.203	0.216	0.197	0.217	0.194
WVDIFF-10	-2713	142	-533	117	-930	268	-2173	835
WVDIFF-9	-226	219	-452	257	-785	509	-1862	1336
WVDIFF-8	-183	296	-380	394	-657	744	-1588	1820
WVDIFF-7	-128	403	-286	580	-493	1058	-1240	2465
WVDIFF-6	-65	509	-173	770	-293	1384	-815	3138
WVDIFF-5	18	643	-75	976	-98	1737	-372	3968
WVDIFF-4	108	768	91	1206	196	2136	248	4701
WVDIFF-3	208	926	279	1494	529	2633	945	5736
WVDIFF-2	297	1038	440	1701	809	2991	1535	6475
WVDIFF-1	1513	3389	1725	4635	2198	6253	3385	10781
N =	48	57	54	63	54	63	54	63

TABLE 2 (continued)
PATTERN PLANS

Variable TENURE	(Pension is independent of Salary) 30	20
EPV-10	41507	20938
EPV-9	40628	21571
EPV-8	39649	22002
EPV-7	38587	22253
EPV-6	37459	22348
EPV-5	36279	22306
EPV-4	34964	22091
EPV-3	33632	21779
EPV-2	32294	21383
EPV-1	30958	20918
EPV 0	27570	18719
EPV+1	16217	11166
EPV+2	14487	10125
EPV+3	12884	9129
EPV+4	11405	8184
EPV+5	10045	7294
EPV+6	8791	6461
EPV+7	7651	5688
EPV+8	6621	4974
EPV+9	5694	4320
EPV+10	4864	3777
ERAT-10	1.441	1.072
ERAT-9	1.416	1.110
ERAT-8	1.387	1.138
ERAT-7	1.355	1.155
ERAT-6	1.320	1.164
ERAT-5	1.283	1.165
ERAT-4	1.239	1.157
ERAT-3	1.195	1.143
ERAT-2	1.150	1.125
ERAT-1	1.104	1.103
ERAT 0	1.000	1.000
ERAT+1	0.591	0.598
ERAT+2	0.528	0.543
ERAT+3	0.470	0.489
ERAT+4	0.416	0.439
ERAT+5	0.367	0.391
ERAT+6	0.321	0.347
ERAT+7	0.279	0.305
ERAT+8	0.242	0.267
ERAT+9	0.208	0.232
ERAT+10	0.178	0.203
WVDIFF-10	338	-244
WVDIFF-9	415	-182
WVDIFF-8	495	-117
WVDIFF-7	578	-48
WVDIFF-6	665	23
WVDIFF-5	816	133
WVDIFF-4	909	213
WVDIFF-3	1005	297
WVDIFF-2	1104	384
WVDIFF-1	3079	1998
N =	18	16

TABLE 2 (continued)

DEFINED CONTRIBUTION PLANS

Variable								
SALARY	9000.000	9000.000	15000.000	15000.000	25000.000	25000.000	50000.000	50000.000
TENURE	20.000	30.000	20.000	30.000	20.000	30.000	20.000	30.000
EPV-10	11446	25160	15870	35092	22655	50512	39922	89233
EPV-9	13304	27508	18480	38408	26437	55354	46703	97954
EPV-8	15291	29959	21275	41873	30495	60416	53992	107082
EPV-7	17408	32513	24256	45486	34829	65699	61788	116615
EPV-6	19655	35171	27424	49249	39438	71203	70091	126554
EPV-5	22031	37934	30777	53160	44324	76928	78901	136898
EPV-4	24240	40412	33880	56654	48819	82008	86982	146042
EPV-3	26540	42965	37115	60252	53507	87241	95416	155467
EPV-2	28490	45040	39821	63134	57382	91378	102298	162805
EPV-1	30482	47147	42581	66057	61334	95573	109314	170245
EPV 0	32514	49284	45396	69021	65361	99824	116462	177783
EPV+1	22158	33054	30938	46292	44544	66951	79369	119237
EPV+2	22194	32622	30987	45685	44615	66074	79496	117675
EPV+3	22111	32059	30871	44897	44449	64934	79200	115644
EPV+4	21909	31364	30589	43925	44042	63528	78475	113140
EPV+5	21587	30541	30140	42771	43396	61859	77324	110169
EPV+6	21149	29592	29529	41443	42515	59938	75755	106747
EPV+7	20598	28524	28759	39947	41407	57775	73781	102895
EPV+8	19939	27345	27839	38295	40082	55386	71417	98640
EPV+9	19177	26062	26775	36499	38551	52787	68692	94012
EPV+10	18321	24685	25580	34571	36829	49999	65624	89046
ERAT-10	0.353	0.510	0.353	0.510	0.353	0.510	0.353	0.510
ERAT-9	0.411	0.558	0.411	0.558	0.411	0.558	0.411	0.558
ERAT-8	0.472	0.608	0.472	0.608	0.472	0.608	0.472	0.608
ERAT-7	0.537	0.661	0.537	0.661	0.537	0.661	0.537	0.661
ERAT-6	0.607	0.715	0.607	0.715	0.607	0.715	0.607	0.715
ERAT-5	0.680	0.771	0.680	0.771	0.680	0.771	0.680	0.771
ERAT-4	0.748	0.821	0.748	0.821	0.748	0.821	0.748	0.821
ERAT-3	0.818	0.873	0.818	0.873	0.818	0.873	0.818	0.873
ERAT-2	0.877	0.914	0.877	0.914	0.877	0.914	0.877	0.914
ERAT-1	0.938	0.957	0.938	0.957	0.938	0.957	0.938	0.957
ERAT 0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
ERAT+1	0.681	0.670	0.681	0.670	0.681	0.670	0.681	0.670
ERAT+2	0.682	0.661	0.682	0.661	0.682	0.661	0.682	0.661
ERAT+3	0.680	0.650	0.680	0.650	0.680	0.650	0.680	0.650
ERAT+4	0.673	0.636	0.673	0.636	0.673	0.636	0.673	0.636
ERAT+5	0.663	0.619	0.663	0.619	0.663	0.619	0.663	0.619
ERAT+6	0.650	0.600	0.650	0.600	0.650	0.600	0.650	0.600
ERAT+7	0.633	0.578	0.633	0.578	0.633	0.578	0.633	0.578
ERAT+8	0.613	0.554	0.613	0.554	0.613	0.554	0.613	0.554
ERAT+9	0.589	0.528	0.589	0.528	0.589	0.528	0.589	0.528
ERAT+10	0.563	0.500	0.563	0.500	0.563	0.500	0.563	0.500
WVDIFF-10	-7167	-904	-1006	-1278	-1458	-1866	-2614	-3362
WVDIFF-9	-842	-1039	-1185	-1469	-1720	-2147	-3091	-3870
WVDIFF-8	-987	-1191	-1390	-1685	-2021	-2464	-3636	-4447
WVDIFF-7	-1152	-1364	-1625	-1930	-2365	-2824	-4260	-5100
WVDIFF-6	-1341	-1559	-1892	-2207	-2757	-3231	-4973	-5839
WVDIFF-5	-1371	-1539	-1927	-2169	-2791	-3154	-5017	-5677
WVDIFF-4	-1571	-1743	-2209	-2458	-3201	-3574	-5760	-6437
WVDIFF-3	-1465	-1559	-2032	-2164	-2911	-3107	-5170	-5513
WVDIFF-2	-1645	-1741	-2281	-2416	-3265	-3466	-5798	-6148
WVDIFF-1	-1847	-1943	-2558	-2694	-3661	-3864	-6497	-6852
N =	4	5	4	5	4	5	4	5

TABLE 3

RATIO OF C_t TO P_t

Pattern Plans*

SALARY TENURE	ALL 20	ALL 30
CERAT-10	0.912	0.936
CERAT-9	0.928	0.941
CERAT-8	0.934	0.946
CERAT-7	0.940	0.950
CERAT-6	0.946	0.955
CERAT-5	0.951	0.959
CERAT-4	0.956	0.963
CERAT-3	0.961	0.968
CERAT-2	0.966	0.972
CERAT-1	0.972	0.977
N =	20	23

*Benefits are independent of salary

Conventional Plans

SALARY TENURE	9000 20	9000 30	15000 20	15000 30	25000 20	25000 30	50000 20	50000 30
CERAT-10	0.789	0.772	0.815	0.793	0.856	0.838	0.879	0.899
CERAT-9	0.801	0.785	0.825	0.805	0.864	0.847	0.888	0.905
CERAT-8	0.812	0.795	0.835	0.815	0.872	0.856	0.896	0.911
CERAT-7	0.821	0.805	0.843	0.824	0.878	0.863	0.902	0.916
CERAT-6	0.829	0.813	0.850	0.833	0.884	0.870	0.908	0.920
CERAT-5	0.835	0.821	0.856	0.840	0.889	0.876	0.913	0.924
CERAT-4	0.841	0.828	0.863	0.847	0.894	0.882	0.918	0.928
CERAT-3	0.847	0.834	0.869	0.853	9.899	0.887	0.923	0.932
CERAT-2	0.851	0.839	0.873	0.859	0.901	0.892	0.924	0.935
CERAT-1	0.853	0.844	0.874	0.864	0.901	0.896	0.924	0.938
N =	68	77	71	82	72	84	76	84

Table 4

Regressions on Simulated Data

Dependent Variable	Expected Present Value of Pension Upon Retirement 10 years early	Expected Present Value of Pension Upon Normal Retirement	Expected Present Value of Pension Upon Retirement 10 years late	EPV-10/EPV0 (≡ ERAT-10)
	(1)	(2)	(3)	(4)
Independent Variables				
Intercept	-174288 (20078)	-55545 (10703)	15546 (2437)	-.395 (.69)
TENURE (upon normal retirement)	5244 (522)	2616 (295)	435 (67)	.049 (.019)
Annual Salary at time of retirement	3.17 (.17)	2.87 (.09)	0.62 (.02)	-.000006 (.000006)
Number of Employees enrolled in the particular plan	.133 (.05)	.039 (.029)	.007 (.006)	.0000009 (.0000018)
Number of plan in the firm	-1119 (5306)	946 (2835)	1274 (644)	-.215 (.182)
FLAT (Dummy = 1 if flat or pattern defined benefit plan)	-10244 (13779)	-62410 (7364)	-40663 (1672)	.954 (.474)
FORMULA (Dummy = 1 if formula or conventional defined benefit plan) (omitted group is defined contribution)	60181 (11986)	841 (6405)	-26903 (1455)	.839 (.412)
R^2	.47	.69	.70	.02

N = 612

FOOTNOTES

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[1]This issue arises in many recent papers which discuss the relationship between compensation and efficiency. See for example, Arnott and Stiglitz (1981), Azariadis (1980), Carmichael (1980), Cooper (1981), Green (1981), Green and Honkapohja (1981), Grossman and Hart (1981a, b), and Hall and Lazear (1981).

[2]This assumes that $V^*(t_0) < V(t_0)$ implies $V^*(t) = V^*(t_0)$ for $t > t_0$ and that $V^*(t_0) = V(t)$ implies $V^*(t) = V(t)$ for $t > t_0$.

[3]This is consistent with Becker, Landes, and Michael (1977) in that a separation occurs whenever it is efficient. The severance pay rule is important, however, because it induces each side to voluntarily and unilaterally separate only when it is efficient to do so. Landes' (1980) analysis of alimony relates to this issue in that alimony is severance pay and efficient alimony would make divorce "efficient." Hall and Lazear (1982) analyze the issue of efficient severance pay in depth.

[4]Yet there may be other causes for profiles which are steeper than productivity. These do not require a distinction between a termination "with cause" and one "without cause." There, any employer-initiated separation carries with it payment $C(t)$. Harris and Holmstrom (1982) and Ioannides and Pissarides (1980) argue that insurance may be the motive.

[5]That the entire remaining stream must be examined is recognized in Fields and Mitchell (1981). Bulow (1981) also points out (as my calculations implictly do) that the "true" current wage also includes the value of changing the pension as the result of working that period.

[6]Burkhauser and Quinn (1981) argue a similar point. It has been suggested that altering the benefit formula can induce "voluntary" retirement even if mandatory retirement is prohibited.

[7]One feature of the CPS data may lead to an understatement of wage growth. Since remaining on the same job is relevant to the calculation of pension benefits, I restricted by attention in 1976 to individuals who had not changed occupation or industry during the last two years. Some individuals who remained within industry and occupation may have changed jobs and their wage growth is likely to be lower than average.

[8]A more sophisticated story is consistent, however. Pensions may also serve the role of insurance. It can be argued that those who retire early are the "losers," due to poor health, for example. An arrangement which paid them more at the expense of those who retire later is consistent with the data. I have argued elsewhere (Lazear [1979]) that the insurance explanation is inconsistent with patterns of mandatory retirement across worker types.

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