Pensions and Labor Turnover in Japan

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PREFACE

This study was supported by the National Institute of Aging under Grant AG06222-02 to the RAND Corporation. In the study, an unusually rich dataset containing linked information on pension plans and labor markets was assembled to investigate the effects of wages and pension benefits on job turnover in Japanese manufacturing. Both the description of how wage and pension compensation are structured in Japan, and the research findings on the role pensions play in inducing strong job attachment among Japanese workers, should be of interest to policy makers, personnel managers, and labor economists studying issues of aging and retirement.

The study is part of a larger collaborative effort with Professor Atsushi Seike, RAND Consultant and Associate Professor, Department of Business and Commerce, Keio University, Japan. Hong Tan, the primary author, took responsibility for writing the first draft of this study.

SUMMARY

In this study, a rich dataset containing linked information on pension plans and labor markets in Japan was assembled to address several key research questions having to do with pensions and labor turnover:

- Why are job turnover rates in Japan half those found in the United States?
- To what extent are lower overall turnover rates due to greater pension coverage in Japan--over 90 percent of the male workforce--as compared to coverage rates of 50 percent in the United States?
- How much higher would job turnover rates in Japan be if industry pension coverage rates were similar to those prevailing in the United States?
- Can U.S. research findings on the relationships between labor mobility and the wage and pension benefit alternatives be replicated for the Japanese labor market?
- Given a level of total compensation, are employers able to reduce labor turnover by varying the composition of wages and pension benefits--as predicted by theory?

We addressed these questions using an analytic framework based upon implicit labor contracts theories. In this framework, pensions are viewed as a compensation instrument that employers use to reduce job turnover, induce greater investments in firm-specific training, and elicit greater worker effort. To evaluate the efficacy of these theories, we used data from several surveys conducted by the Japanese Ministry of Labor. Information on wages and turnover come from 4 cross-sections of the Wage Census--1971, 1976, 1981, and 1986. These surveys were used to create a labor market dataset where the unit of observation is the age-seniority cell in 20 manufacturing industries and 3 schooling

groups. Associated with each cell are prospective 5-year job turnover rates, calculated by following synthetic cohorts of workers across survey years. These labor market data were linked, by industry and education, to information on pension coverage and benefit formulas contained in the 1981 Survey of Severance Pay Systems. The linked data were then used to calculate present discounted values of wages and pension benefit alternatives facing potential "leavers" and "stayers".

Tabulations of the gross data revealed several stylized facts about job turnover, pension coverage, wages, and pension benefits in Japan. Like the United States, job turnover rates decline both with age and with years of seniority, as might be expected if early career job shopping is followed by strong job-attachment once a good worker-firm job match is found. More educated workers are also less likely to job change. Second, interindustry variations in pension coverage and job turnover rates appear to be negatively related--industries with low turnover rates tend to be those with the highest coverage rates, and vice versa. Third, job changers in general face sizeable wage penalties averaging about 12 percent of the wages of stayers; these wage losses rise with seniority, from about 4 percent for workers with short tenure to about 25 percent for those with over 20 years of seniority. Finally, in changing jobs workers face a potential pension loss averaging in excess of 20 percent--this despite receiving two pensions (from the current and subsequent employers) by leaving, as compared to one pension by staying until retirement. Furthermore, though the mean pension loss is relatively small (about 15 percent) for younger job changers, this figure can rise as high as 40 percent for older workers.

We estimated grouped probit models relating job turnover rates to a set of control variables, measures of pension coverage, and the discounted present value of wage and pension benefit alternatives facing workers. Reflecting the broad patterns reported above, job turnover rates decline with education, age and seniority, though at a slower pace of older and long-tenured workers. The results also suggest that job turnover rates were higher in the 1970s than in the 1980s, in large part due to the workforce reductions that followed the OPEC induced oil price

hikes in the 1970s. We found evidence consistent with the predictions of theory, and with U.S. studies of pensions and labor turnover. Higher pension coverage lowers aggregate job turnover rates, and coverage by a combined severance pay and fixed-term pension plan reduces job turnover more than a retirement scheme offering either severance pay or a fixed-term pension alone. Furthermore, job turnover rates are higher the larger are wage and pension benefit alternatives; however, job turnover rates are lower when more generous wages and pension benefits are provided by the current employer. Models estimated separately for younger and older worker samples yielded similar, though less precise, results.

How sensitive are turnover rates to changes in pension coverage and benefits? We addressed this question through simulations based on the estimated model parameters. A 50 percent reduction in pension coverage results in a more than doubling of job turnover rates in Japan. When U.S. pension coverage rates by industry are substituted, mean job turnover rates in Japanese manufacturing rise to 35.7 percent, up from the baseline turnover rate of 22.6 percent. These simulation suggests that over half of the difference in job turnover rates between the two countries is attributable simply to differences in pension coverage rates; the remaining gap may be due to differences in the structure of wages or pension benefits. Keeping coverage rates at existing levels, a 90 percent reduction in the pension benefits offered by all employers raises overall job turnover rates by 4.5 percentage points (from 22.6 percent to 27.1 percent). For younger workers under age 40, the corresponding increase in turnover rates is much larger--8 percentage points (from 21.6 to 29.6 percent). Simulations based on reductions in current job benefits alone yielded much larger increases in job turnover rates, not surprising since benefit alternatives are constrained to be unchanged in other jobs.

Finally, we evaluated the job turnover effects of wage-compensated reductions in pension benefits. Much of the rationale for the implicit labor contract views of pension plans--that they reduce job turnover, provide incentives for worker investments in firm-specific training, and

motivate workers--relies on the maintained assumption that pension plans do indeed enhance worker productivity. Our simulations indicate that holding levels of total compensation constant, job turnover rates are higher the lower is the proportion of compensation paid as pension benefits--wage-compensated reductions in benefits of 90 percent raised turnover rates by 4.2 percentage points. In other words, within limits employers can effect lower job mobility (or higher job retention) by deferring a larger fraction of total compensation as pension benefits and, correspondingly, lowering current wages paid workers.

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I. INTRODUCTION

The reputed strong job attachment of Japanese workers is the subject of considerable academic interest to labor economists, and the envy of American practitioners of industrial relations. This interest stems from the widely-held view that longterm job attachment encourages skill acquisition, and that compared to Japan, high labor turnover in the United States has contributed to relatively slower growth in labor productivity. While there is some evidence that many jobs in this country are longterm jobs (Hall, 1982), overall rates of job turnover are nonetheless considerably lower in Japan than in the United States. Comparisons of 15-year job retention rates for males in the two countries indicate that job retention rates in the United States are half as high as those in Japan (Hashimoto and Raisian, 1985). Among Japanese male workers, 65 percent of those age 20-24 with 5 or more years of tenure and 73 percent of those age 25-29 were still with their original employer 15 years later. The comparable U.S. figures were only half as high--30 and 47 percent, respectively.

To what are these country differences in job attachment due? Several, possibly related, explanations have been offered. First, Japanese employers may invest more intensively in the firm-specific (and non-transferable) skills of their workers (Becker, 1974). Evidence consistent with this specific training hypothesis is found in steeper tenure-wage profiles in Japan than in the United States (Hashimoto and Raisian, 1985; Tan, 1989). Empirically, however, this hypothesis is indistinguishable from competing incentive wage models--these do not rely on training arguments--in which steep wage profiles are used to deter shirking and to attract workers with intrinsicly lower turnover propensities (Lazear, 1979; Salop and Salop, 1976). Attributing steeper Japanese wage profiles to the greater use of incentive wage schemes is plausible only if transaction costs are relatively higher in that country than in the United States--a hypothesis for which no evidence is yet available. A third class of explanations--the subject of this

paper--is that pensions are used by employers to deter job mobility and, to the extent that they do, to induce job training and motivate workers. Since pensions are more widespread in Japan than in the United States--nearly 90 percent of Japanese males are covered by a retirement benefits scheme, as compared to pension coverage rates of just under 50 percent for Americans--lower job turnover rates in that country might also be expected.

Why do pensions reduce job turnover? Most pension plans tie retirement benefit amounts to both final year earnings and years of service in the firm. Benefits and years of service credits are also rarely portable across firms. Together, these features of pension plans produce strong incentives for workers to remain with the current employer because of the potential benefits loss associated with job change. Even without a rise in earnings over time, making benefits a function of years of seniority penalizes job changers since accumulated seniority is lost; rising earnings over time further amplify this loss because pension benefits are tied to final year wages. There is wide consensus, at least in the United States, that pensions affect worker behavior. A large body of work has documented the retirement incentives provided older workers by these benefit formulas, vesting requirements, and other plan provisions (see the references cited in Ippolito, 1986). Evidence on the effects of pensions on job turnover, though less well developed, also indicates that pensions inhibit labor turnover in the broader U.S. population (Shiller and Weiss, 1979; Mitchell, 1982; Wolf and Levy, 1984; and Allen, Clark and McDermed, 1988), and in England as well (McCormick, 1984). No comparable literature for Japan exists, however.

The objective of this study is to investigate the role of pension plans in inhibiting job turnover in Japanese manufacturing. Japanese pensions differ from those in the United States in several ways. First, benefits may come from several sources--"taishokukin" or severance pay, "nenkin" or a fixed-term pension plan, or a combination of the two schemes. In the remainder of the paper, we will collectively refer to the different retirement schemes as pensions. Second, most benefits are

not annuities, but are instead paid as a lumpsum at job separation or at mandatory retirement. Most fixed-term pension plans also provide the option of receiving benefits as a lumpsum rather than as payments spread over a fixed time-period, typically 10 years. Finally, unlike the United States in the post-ERISA period, mandatory retirement rules in Japan are common and most workers are obliged to leave the firm (typically) at age 55 or 60. These differences aside, however, benefit formulas in Japan are structured very similarly to U.S. defined benefit plans in linking benefits to final year wages and job seniority. Do pensions in Japan affect labor turnover the same way? How responsive are Japanese workers to the potential wage and pension losses associated with job change? To what extent are cross-national differences in pension coverage rates and benefits responsible for observed lower rates of job turnover in Japan than in the United States?

To answer these questions, we have assembled an unusually rich dataset for Japanese manufacturing containing information on pensions linked to aggregate labor market data by education and two-digit manufacturing industry. The labor market data come from the 1971, 1976, 1981 and 1986 Wage Census surveys ("Chingin Sensasu"). These wage censuses report, by education and industry, the number and mean monthly wages of male workers in cells cross-classified by age and seniority intervals. Five-year job turnover are calculated by tracking synthetic cohorts of workers over the four census years. From the 1981 Survey of Severance Pay ("Taishokukin Seido Chosa"), we derive estimates of industry pension coverage rates--the proportion of male workers covered by "nenkin", "taishokukin", or a combination of schemes--as well as pension benefit formulas by education and industry. Together, these data allow us to estimate for the first time in Japan models relating labor turnover rates to worker attributes, industry pension coverage rates, and the discounted present values of wages and pension benefits in current and alternative jobs.

Section II begins by outlining a conceptual framework for investigating the role of private pensions in job turnover. This is followed by a discussion of the job turnover model, and a careful

specification of the wage and pension benefit opportunities in alternative jobs. Section III describes the data sources on pensions and labor markets in Japan, and how empirical measures for the most important variables suggested by theory were developed. It also provides a broad overview of the stylized facts on job turnover, pension coverage, retirement benefits, and wages in Japan. In Section IV, the empirical results are reported. Evidence is found to support the hypothesis that pensions inhibit job turnover in Japanese manufacturing. Indeed, simulations suggest that over half of the U.S.-Japan difference in job turnover rates would be eliminated if U.S. industry coverage rates were substituted for those in Japan. Furthermore, the simulations indicate that wage-compensated reductions in benefits lead to higher job turnover. In other words, holding levels of total compensation constant, employers can affect job retention (job turnover) by varying the composition of wages and pension benefits. The main findings and their implications for public policy are summarized in Section V.

II. ANALYTIC FRAMEWORK

This section discusses our analytic framework for investigating the relationship between pensions and labor turnover. Pension plans are viewed as one of several alternative deferred compensation schemes used by employers to cement worker-firm job attachment, and to ensure that workers leave when it is optimal to do so. With this discussion as background, a job turnover model is described relating the job-change decision to wage and pension benefits available in the current and alternative jobs. The definitions of these alternative wage and pension benefit measures are carefully specified to highlight the often strong assumptions made in many empirical studies on the subject.

THE ROLE OF PENSIONS

What role do pension plans play? Some scholars have attributed the historical growth of pension plans in the United States to the incentives posed by rising corporate and personal income tax rates.[1] However, early descriptions of pension plans in the United States point to a different set of incentives--reducing job turnover, promoting efficiency, and motivating workers:

"If (pensions) prove ... effective in reducing turnover to a healthy minimum, in stabilizing the work force, in stimulating loyalty and efficiency, it is an excellent investment and an asset to the business."
(National Industrial Conference Board, 1925, page 11)

In Japan, the rise and spread of the traditional "taishokukin" or lumpsum severance pay system in the early 1930s was apparently also motivated by similar concerns, notably historically high rates of job turnover comparable to those prevailing in the United States today. While some Japanese firms set up pension plans in the 1960s and 1970s to

[1] See Ippolito (1983) for a review of the different explanations for the growth of private pension plans in the United States.

take advantage of tax deductions afforded pension plans, many did so by transferring existing "taishokukin" reserves into pension plans.

These personnel concerns are at the heart of implicit labor contract theories. These theories look at the way firms design compensation policies to reduce job turnover, promote job training, and motivate workers. In the presence of firm-specific skills, the promise of a longterm employment relationship can be used to induce optimal investments in firm-specific training benefiting both workers and employers in the form of higher wages and profits (Becker, 1974). Without such an incentive, there is excessive labor turnover and too few investments in on-the-job training. However, extending the promise of a longterm job to all workers can be costly since employers may not observe directly the innate productive characteristics of workers which are only revealed over time. Firms are also confronted with the well-known agency problem, namely, the difficulty in monitoring the work effort of employees (Becker and Stigler, 1974).

Some of these problems may be resolved by offering workers a longterm employment contract, specifying a compensation stream with years of tenure in the firm, as well as "penalties" if workers are caught shirking. Penalties could be in the form of forfeiture of a bond placed by the worker prior to employment. Alternatively, a worker's wage path in the firm could be structured so that it is lower than his productivity when he is young and higher than his productivity when he is old. In this case, the penalty for being detected shirking (and dismissed) is the loss of the "bond" implicit in the payment of initial wages less than productivity (Lazear, 1981). Yet another alternative is to use pension plans to defer compensation to the end of the work career. In this case, the penalty for early job separation is potential loss of pension benefits. Each of these schemes may be used to discourage turnover and to select, at entry, against individuals with high turnover propensities (Salop and Salop, 1976). Furthermore, worker incentives to stay with the firm grow with job tenure. This may encourage optimal investments in specific training and, to the extent that a steep wage profile solves agency problems between workers and firms, provide an added efficiency gain.

These alternative compensation schemes are illustrated in Figure 1. V(t) is the worker's productivity in the firm and R(t) his reservation wage profile. The date on which this implicit contract terminates is T. If the probability of the worker leaving the firm and the probability of the firm firing the worker were both zero, then any wage path that had a present value equal to the present value of the V(t) stream from 0 to T would be equally satisfactory to both worker and firm. However, given that the worker prefers to shirk rather than to attain output level V(t), the firm will find that wage profiles, like the one shown, W(t), will dominate paths that are either equal to V(t) or that fall over the lifecycle. Between 0 and t the worker earns less than his marginal product while between t and T he earns more. From t onward, he receives both capital and interest on the implicit bond placed between 0 and t, when he was working for less than his marginal product. For the pure bonding case, the worker gets a wage equal to his productivity profile V(t). However, the worker pays a bond B on joining the firm, which he gets back with accumulated interest, B*, when he leaves.

Pension plans have elements of both the pure bonding and incentive wage schemes. The deferral of pension benefits (say B*) to the end of the implicit contract operates like the pure bonding case. Like the incentive wage scheme, pension formulas based on seniority and final wages create an "effective" wage rate W(t), of wages plus accumulated benefits, that grows rapidly with years of job seniority. To make this point more explicit, consider a simple defined benefit pension in which retirement benefits are proportional to years of service (S) multiplied by final salary W(S). Workers leaving at $S < T$, the ex ante retirement date, receives as of the deferred retirement date T, a benefit equal to $K.S.W(S)e^{-r(T-S)}$, where K is a constant pension generosity factor and benefits are discounted from T to S at interest rate r. If the worker is thinking about staying one more year, the marginal pension benefit is

$$K.e^{-r(T-S)}[W(S)(1+rS) + W'(S).S]$$

Note that this accrued benefit is growing over time even though the

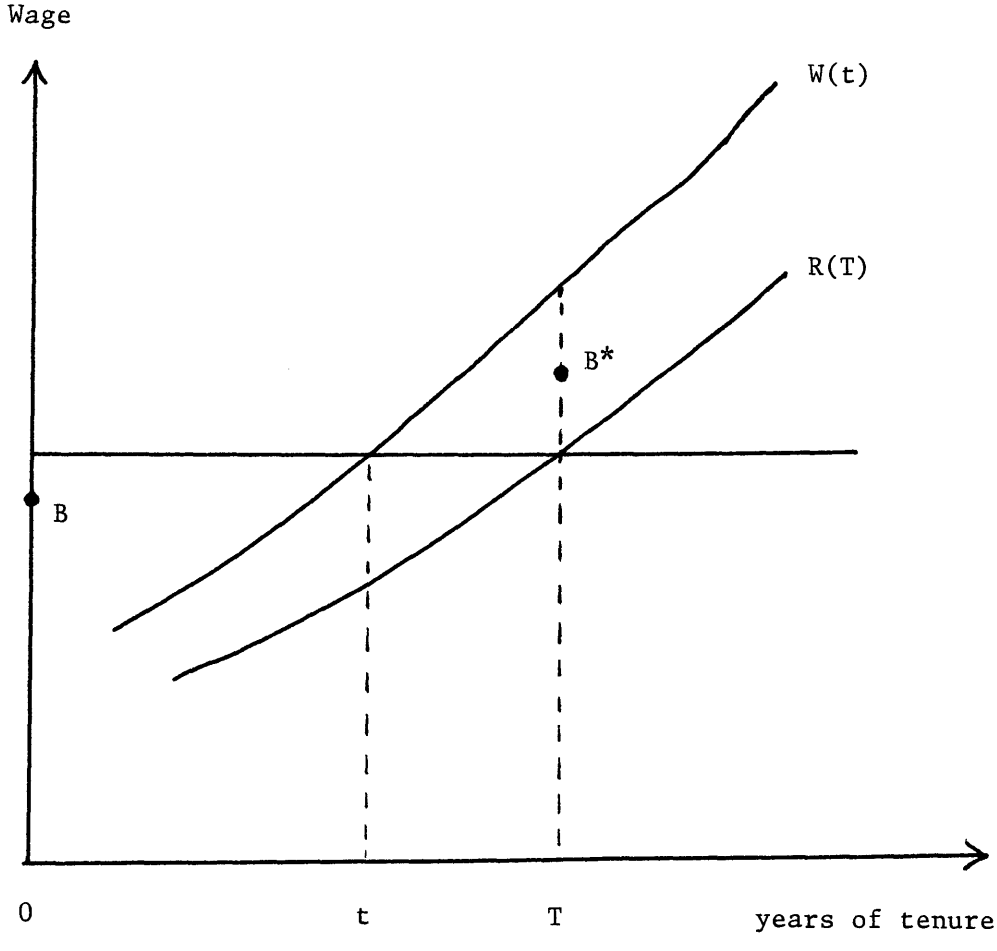

Fig. 1--INCENTIVE EFFECTS OF ALTERNATIVE COMPENSATION SCHEMES

worker's wage may be flat over his career (W'(S)=0). If nominal wages grow over the life-cycle, the effect of the pension plan is to accentuate the rate of growth of total compensation. In other words, the wage incentive effects of a steeply rising wage profile can be achieved just as well by using a defined benefit plan.

Pension plans may actually be a superior instrument for helping solve the agency problem. First, they do not have the tax consequences of a rising wage profile. If two workers have the same pre-tax present value of wages, the one with the flatter wage profile will have the lower post-tax wage. Since accrued benefits are not taxed, the firm can effect the same efficiency gains without increasing the worker's tax burden by deferring compensation in a pension plan. Second, unlike wage incentive schemes, pensions have the added feature of encouraging job separation (or retirement) when it is optimal to do so. If the shadow value of a worker's time exceeds his marginal product in the firm, a pure wage incentive scheme could deter what otherwise is optimal job change because his wage exceeds the shadow value of his time. For example, in the earlier figure, the shadow price function may rise after the worker has been with the firm for a while, say past t. This would make some other retirement date optimal, ex post, and yet the worker finds it not to his advantage to leave since his wage exceeds the shadow price function.

The firm's pension plan provisions can provide an "early out" option that avoids this form of nonoptimal stickiness.[2] Mandatory retirement provisions, which usually accompany pension plans, ensure that workers retire at the age when the present value of compensation (wages plus accrued pension benefits) exceeds their productivity (Lazear, 1979). Other pension plan provisions selectively provide workers with financial incentives to leave prior to normal retirement

[2] Lazear (1983) has developed these arguments further and has tested them using Bankers Trust pension survey data. He finds that early retirement provisions have the feature of granting actuarially greater benefits to early retirees. While this clearly violates the view that pensions are meant to make workers adhere to their firms, it may be explicable in light of the role of pensions as severance pay.

age. These include early retirement, with smaller than actuarially fair reductions in benefits, as well as higher pension benefit schedules for employer-initiated separations as opposed to worker-initiated quits. Selective use of these plan provisions allow employers to obtain the desired workforce structure and "retire" less productive workers without violating the implicit labor contract.

To summarize, employers confronted with problems of high job turnover, inadequate firm-specific training, and shirking will have incentives to defer part of worker compensation as pension benefits. A study of why different employers may vary in their incentives to use pension plans is beyond the scope of this paper.[3] However, the employers that perceive these as important personnel issues will be more motivated to introduce pension plans or, having a pension, to increase the fraction of wage compensation paid as retirement benefits. They do so if the marginal returns to increasing pension benefits--lower labor mobility, increased job training, and greater worker motivation--outweigh the costs of the additional pension outlays.

This is illustrated in Figure 2 which depicts alternative isoprofit lines and a representative worker's indifference curve, both drawn in wage-pension space (Smith and Ehrenberg, 1983). When pensions have a neutral impact on productivity, the isoprofit line (OO') has unitary slope. In this case, the employer is indifferent between alternative wage-pension mixes, and the resulting compensation package is solely determined by workers' indifference curves. When pension plans reduce worker productivity (NN'), the pension-wage tradeoff is greater than one and employers have few incentives either to offer a pension plan, or to continue it if one was in place. Only when pension plans enhance worker productivity (PP') is the pension-wage tradeoff less than unity. In

[3] A companion study by Tan and Seike (1987) discusses alternative hypotheses for why pension coverage and plan provisions may vary across employers. Preliminary evidence from Japan is presented, suggesting that firm size (small firms have a greater likelihood of exit), the cyclical variability in demand for an industry's output (high costs of hoarding excess labor in depressed periods), and technology-driven differences in skill-specificity (high-technology firms invest more heavily in their workers specific training) are important determinants of pension plans.

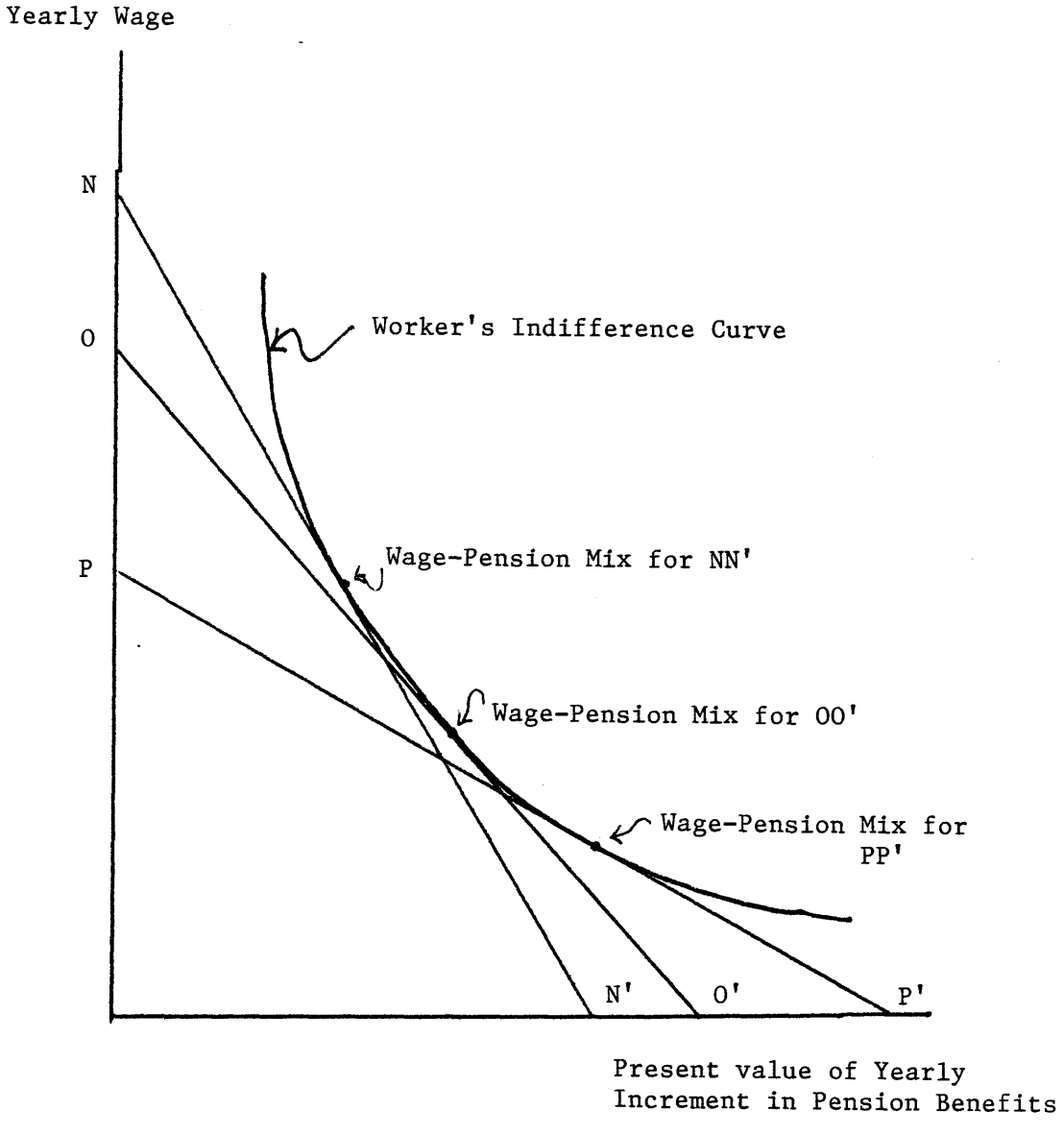

Fig. 2--WAGE AND PENSION BENEFITS TRADEOFF

this case, the labor market clears with a compensation package weighted more heavily towards pension benefits.

This last result suggests an indirect test for the economic rationale of pension plans. Holding constant total compensation, job turnover rates should be sensitive to the fraction of compensation received as pension benefits; indeed, job turnover rates (and shirking if agency issues are important) are predicted to decline if pensions have the productivity enhancing effect postulated by implicit labor contract theories. The specification of this test is elaborated on in the job turnover model to be discussed below.

PENSIONS AND LABOR TURNOVER

Consider the following model of job turnover in which the decision to change jobs depends only upon the discounted values of compensation in the current firm and that available in alternative jobs. For simplicity, we assume that pension coverage is universal (the empirical analyses control for pension coverage). If the most important components of compensation include the anticipated streams of wage payments, PVW, and the anticipated streams of pension benefits, PVP, the underlying quit function Y_i can be expressed as:

$$Y_i = f(PVW\text{-}L_i, PVW\text{-}S_i, PVP\text{-}L_i, PVP\text{-}S_i) \qquad (1)$$

where the suffixes S and L refer to the current job and to alternative opportunities (including retirement). We do not observe Y_i, only an indicator variable y_i for whether or not a worker separated from the current employer. Theory suggests that:

$$y_i = 1 \text{ if } PVW\text{-}L_i + PVP\text{-}L_i > PVW\text{-}S_i + PVP\text{-}S_i \qquad (2)$$

$$= 0 \text{ otherwise}$$

The individual quits if current and future compensation alternatives (both wages and pension benefits) are greater elsewhere; otherwise, he remains with the current employer.

Most economists are in agreement about the broad features of this basic job turnover model, but not necessarily about its precise empirical specification. For computational convenience and, sometimes because of data limitations, a number of simplifying assumptions are often made. For example, Schiller and Weiss (1979) assume that the worker's wage alternatives depend upon the average earnings of like-aged workers in manufacturing in the same geographic area. This wage, which averages over the underlying seniority distribution prevailing elsewhere, is unlikely to be a good measure of the wage alternatives facing potential job changers who stand to loose all accumulated seniority and, potentially, the wage increments associated with seniority as well. No attempt is made to measure the pension benefits in alternative jobs. In Allen, Clark and McDermed (1988), workers leaving the current employer are assumed to find another job with an identical pension plan, and experience the same wage growth path as before in the new firm. These are strong assumptions, as we will demonstrate below.

Consider the wage alternatives facing potential leavers (PVW-L) and stayers (PVW-S) employed at time t in a firm in industry k, where k=1 to K. If retirement age is assumed (for simplicity) to be 55, then the alternative discounted present value of wages at time t+1 for workers age a with b years of seniority in the current firm are:

$$PVW\text{-}S_{abk} = \Sigma^{i}\Sigma^{j}\, W[a+i,b+j]_{k}.1/(1+r)^{i} \qquad (3)$$

$$PVW\text{-}L_{abk} = \Sigma^{K}n(k).\Sigma^{i}\Sigma^{j}\, W[a+i,j]_{k}.1/(1+r)^{i} \qquad (4)$$

where r = real discount rate

$W[a,b]$ = annual wage of a worker age a and tenure b

i = 1 to (55-a)

j = 1 to (55-a) if stayer

= 0 to (55-a-1) if leaver

k = industry 1 to K

n(k) = industry k's share of the total number of workers age a+1 with 0 years of seniority.

This specification of alternative wages relaxes many of the strong assumptions noted above.

First, wages and wage growth are functions of both age (experience) and years of seniority, and the structure of earnings is free to vary across industries. There is ample empirical evidence in the human capital earnings literature to support this description of the wage distribution (for example, see Mincer and Jovanovic, 1981). Studies that assume away these empirical distributions miss important disincentives to turnover posed by such a wage structure, as becomes apparent below.

Second, as a comparison of (3) and (4) makes clear, job turnover at time t is associated with the loss of accumulated seniority in the current job; in the next job (at time t+1), he begins to accumulate seniority again from 0. By age 55, stayers will have accumulated (b+55-a) years of seniority as compared to a maximum of (55-a-1) years for leavers. If there are added wage effects over and above the returns to age or work experience (for example, see Chapman and Tan, 1979), this loss of accumulated previous seniority can result in a substantial wage loss, especially if long seniority has been accumulated in the current firm.

Finally, the alternative wage is the expected value of the wage streams received elsewhere by workers with the same attributes. This is simply the average of the discounted wages of like-aged job changers (those with 0 years of seniority), weighted by their employment probabilities in each job (industry). In (4), these weights are approximated by industry shares of the total number of new hires age a+1 with 0 years of seniority. How likely are leavers to get new jobs with the same wage growth path? Two factors mitigate against such a possibility: presence of firm-specific training and the costs associated with hiring and screening new entrants. Given the fixity of these

costs, employers will prefer to hire younger workers so that these fixed costs are amortized over a longer tenure in the firm (Hutchens, 1987). The "identical wage growth" assumption is particularly untenable for long-tenured older workers--few would freely choose to quit because of low wage alternatives elsewhere, which is consistent with age- and seniority-related declines in job turnover documented in the literature.

Using the previous notation, the present values of pension benefits PVP for leavers (L) and stayers (S) can also be expressed as:

$$PVP\text{-}S_{abk} = (P[b+55-a].W[55,b+55-a])_k.1/(1+r)^i \qquad (5)$$

$$PVP\text{-}L_{abk} = (P[b].W[a,b])_k \qquad (6)$$

$$+ \Sigma^K n(k).(P[55-a-1].W[55,55-a-1])_k.1/(1+r)^i$$

where P[b] is the seniority-related pension multiplier used to compute pension benefits. For a worker age a with b years of seniority, the lumpsum value of benefits taken at time t is P[b]xW[a,b].

Equations (5) and (6) indicate that stayers (S) only receive pension benefits from the current employer while leavers (L) receive benefits from both the current and subsequent employers. As before, both are assumed to retire at age 55. At that retirement age, stayers receive a lumpsum benefit equal to the product of his final wage W[55,b+55-a] and pension multiple P[b+55-a]. Leavers at time t receive two benefit amounts: first, a lumpsum severance payment from the current employer--the first term of equation (6)--and second, the weighted average pension benefit received by similar-aged job leavers at age 55 in other jobs. As before, weights are approximated by industry shares of the total number of similar-age recent job changers (those with 0 seniority). All benefits are discounted at interest rate r back to time t--the leave-stay decision point.

The loss of accumulated seniority b on the current job has two effects on the retirement benefits that workers receive. First, even if leavers join firms with identical pension formulas and remain on the same wage growth path as before, the sum of the two benefit amounts is always lower that the single pension they would get by staying. This may be illustrated by a simple example. Suppose a worker earns $100 at 10 years of tenure and $200 at 20 years, with corresponding pension multiples of 10 and 20 times earnings. The single pension of $4000 that he gets by staying ($200x20) always exceeds the two pensions totalling $3000 that he gets by leaving ($100x10 and $200x20). Second, wage loss from job change amplifies the loss of pension benefits since a lower multiple P[55-a-1] is multiplied by a lower final wage W[55,55-a-1]. Together, these wage and benefits losses provide strong incentives for older long-tenured workers not to quit. These turnover disincentives, however, are likely to be less pronounced for younger workers, given the small pension multiples at low levels of seniority and heavy discounting of future benefits.

To summarize, what are the predictions of theory about the job turnover effects of alternative wages and pension benefits? Assuming a probit model specification, we can express the basic job turnover model as (7), and differentiating yields:

$$\text{Prob}(y_i=1) = \beta_1 \text{PVW-L}_i + \beta_2 \text{PVW-S}_i + \beta_3 \text{PVP-L}_i + \beta_4 \text{PVP-S}_i + u_i$$

$$= \Phi(\beta' X_i) + u_i \qquad (7)$$

and

$$\partial y_i / \partial \text{PVW-L}_i = \phi(y_i)\beta_1 > 0 \qquad (7\text{-}1)$$

$$\partial y_i / \partial \text{PVW-S}_i = \phi(y_i)\beta_2 < 0 \qquad (7\text{-}2)$$

$$\partial y_i / \partial \text{PVP-L}_i = \phi(y_i)\beta_3 > 0 \qquad (7\text{-}3)$$

$$\partial y_i / \partial \text{PVP-S}_i = \phi(y_i)\beta_4 < 0 \qquad (7\text{-}4)$$

where $\Phi(.)$ and $\phi(.)$ are the distribution and density functions of the standard normal, and u_i is assumed to have mean 0 and variance 1. Equations (7-1) to (7-4) are the standard predictions of theory, namely, that the likelihood of job turnover increases the higher are wage and pension benefit alternatives, and falls the more generous are wage and pension benefits offered by the current employer. Together, these equations allow us to address a number of key questions.

First, what are the effects of a reduction in pension benefits on job turnover in the labor market? Most empirical studies have focused on equation (7-4), interpreting $\phi(y_i)\beta_4$ as the job turnover effects of eliminating pension benefits in the current job. While strictly true for the individual worker, this result is conditioned on existing levels of pension benefits in all other jobs. As such, it cannot simply be extrapolated to the larger labor market since changes in one firm's pension benefits alters the distribution of expected benefits facing all potential job changers. Thus, getting at the labor market effects of an overall reduction in the level of pension benefits requires additional information on how job turnover is affected by alternative benefit levels, namely, $\phi(y_i)\beta_3$ in (7-3). Incorporating the effects of reduced pension benefits in all other jobs narrows pension benefit diffentials among jobs and, as such, might be expected to lower the overall likelihood of job turnover as well.

A second question is can firms actually influence job turnover rates by varying the composition, but not levels, of total compensation? In the earlier overview of the role of pension plans, we discussed alternative theories about how deferred compensation schemes may be used to lower job turnover, induce more firm-specific training, and motivate workers (dissuade shirking). Evidence that deferred wage schemes enhance worker productivity, so that the returns to a dollar deferred as pension benefits are larger than a dollar spent today as wage compensation, would go a long way towards explaining employer incentives to set up pension plans. Equation (7) permits an indirect test for the presence of these productivity-augmenting effects (and thus for the economic rationale of pension plans), using job turnover as a proxy

measure of productivity. In principle, given a constant level of total wage and pension compensation (PVW-S+PVP-S=TC) in the current job, we can simulate the predicted turnover effects of wage-compensated reductions in pension benefits. That is,

$$\partial y_i / \partial \text{PVP-S}_i \mid \text{TC} = \phi(y_i)\beta_4 \mid \text{TC} <, =, \text{ or } > 0 \qquad (7\text{-}5)$$

where only the composition of wages and deferred pension benefit varies. Equation (7-5) may be less than, equal to, or greater than 0, depending upon whether a larger fraction of total compensation in pension benefits reduces, has a neutral effect on, or increases job turnover. This test, it should be noted, does not directly address the issue of the relative efficacy of pension plans and wage-incentive schemes in which tenure-wage profiles are "tilted" to make them steeper (Lazear, 1979 and 1981). Here, the productivity-augmenting effects of deferred pension benefits are implicitly compared to that of any pure wage compensation scheme of equal discounted present value.

III. DATA AND OVERVIEW

In this section, we discuss the data and how empirical counterparts for the most important theoretical variables were created. Many of these variables--especially those pertaining to pension plans--are the first estimates of their kind in Japan. As such, this section serves as both a discussion of variables and a broad overview of the stylized facts on job turnover, pension plan coverage, retirement benefits, and wages in the Japanese labor market.

LABOR TURNOVER

Our information on turnover and wages comes from four cross-sections of the Ministry of Labor's annual Wage Census--1971, 1976, 1981, and 1986. The Wage Census provides aggregate tabular information on workers and monthly wages by two-digit industry and four schooling categories. For this study, we focus on the sample of male regular workers in 20 two-digit manufacturing industries and three schooling groups--graduates of junior high, high school, and college--for study. Within each industry-schooling category, tables cross-classified by age and years of seniority intervals report sample sizes and mean wages for each age-tenure cell. Most age and tenure categories are in 5 year intervals or, alternatively, in intervals that readily aggregate to 5 years. Other categories--those that stretch into 10 years intervals or vary by survey year--are not so readily dealt with. A bivariate interpolation procedure was developed to estimate numbers of workers and wages for a common set of 5-year age and tenure intervals (see Peterson, Carson and Tan, 1988).[1] This resulted in 8 age (20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, and 55-59) and 6 tenure (0-4, 5-9, 10-14, 15-19, 20-24, 25-29) categories.

[1] Univariate interpolation is sometimes used to create (say) a wage series by single years of age from age-interval census data. Our data are more complex--wages are reported by age intervals cross-classified by years of seniority intervals. As such, we used a surface-fitting algorithm to generate this bivariate interpolation of wages by single years of age and tenure.

Using these 5-year age and tenure interval data, synthetic cohorts of workers can be tracked over the four census years to calculate 5-year job turnover rates.[2] To see this, consider the 1971 sample of N[t] high school graduates in (say) the steel industry who are age 20-24 with 0-4 years of seniority in the current firm. Five years later (in 1976), survivors of this cohort should be age 25-29 and have 5-9 years of job tenure with the same employer. The number of "stayers", N[t+5], is approximated (with some error) by the number of high school graduates with these latter age-tenure attributes working in the steel industry in 1976. Those changing jobs sometime over this interval ("leavers") begin again with 0-4 years of seniority, either in the same industry or elsewhere in the economy. The 5-year prospective turnover rate is simply calculated as $1-(N[t+5]/N[t])$.[3] Turnover rates were calculated in this fashion for each industry, education, and age-tenure cell, and for each pair of cross-sections: 1971-1976, 1976-1981, and 1981-1986. The final dataset of 4761 cells excludes the age interval 55-59, the 25-29 years of seniority interval, and the 1986 cross-section--they are used in calculating turnover rates but are themselves undefined.

Table 1 summarizes these calculations by displaying prospective 5-year job turnover rates by age and years of seniority. These are weighted means across industry, education, and years. The table shows that labor turnover rates generally decline with age, but begin to rise again for 40-44 year olds as they turn 45-49. Turnover rates rise dramatically for those age 50-54 (more than doubling for the long-tenured in this age group), in large part because over the next 5 years many reach mandatory retirement between ages 55 and 60. With few exceptions, recent job changers (0-4 years of tenure) of all ages are more likely than others in their same age cohort to experience a subsequent job separation over the next 5 years. Job turnover rates for

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[2] Note that this obviates the need for several strong (probably untenable) "stationarity" assumptions for calculating turnover (or retention) from one cross-section of age-tenure data. See Hall (1982).

[3] In several cells, N[t+5] exceeded N[t] because of sampling and measurement error. These cases tended to be concentrated in age-tenure combinations with small cell sizes, and were dropped from the sample.

Table 1

5-YEAR PROSPECTIVE JOB TURNOVER RATES BY AGE AND JOB TENURE

(percent)

	Years of Job Tenure at t					
Age at t	0-4	5-9	10-14	15-19	20-24	Average
20-24	31.48	25.54				29.79
25-29	29.67	19.11	15.03			22.01
30-34	29.21	19.54	13.91	13.66		18.34
35-39	28.82	21.05	15.51	10.46	17.11	17.47
40-44	29.43	24.82	19.98	12.61	16.52	19.84
45-49	33.63	26.83	22.14	17.17	18.62	23.79
50-54	45.34	41.60	39.34	41.11	45.66	42.80
Total	31.09	22.37	16.98	14.36	20.46	22.63

Source: Chingin Census, weighted average of 1971-76, 1976-81, and 1981-86 5-year turnover rates in manufacturing.

those who survive, however, are considerably lower. These patterns of job turnover are broadly similar to those reported for the United States (for example, see Allen, Clark, and McDermed, 1988), as are the overall lower turnover rates for more educated workers. 5-year job turnover rates by level of schooling attainment are 26.7, 20.3, and 17.9 percent for graduates of junior high, high school, and college, respectively.

PENSION COVERAGE

The data on pension coverage and benefits in Japanese manufacturing come from the Ministry of Labor's 1981 Survey of Severance Pay Systems ("Taishokukin Seido Chosa"). This survey, of approximately 6000 firms with over 30 employees, elicited a wide range of information regarding their severance payments systems, including industry, firm size, age of mandatory retirement, type of pension system--lumpsum severance pay ("taishoku ichijikin"), fixed-term pension plan ("nenkin"), or some

combination thereof--age and/or tenure restrictions governing receipt of pension benefits, and both wage and pension benefits for representative workers at different levels of job tenure (this last set of variables is discussed in greater detail below).

This survey was used to estimate the fraction of male regular workers in each industry covered by each type of retirement benefits system. Survey weights were first used to adjust for the oversampling of large firms which invariably have a pension plan. A second round of adjustments were made to control for firm-size differences in the number of workers across industries, the fraction of the workforce that is male, and the ratio of "regular" and temporary workers. In contrast to their regular counterparts, temporary workers are employed on a short-term basis without entitlements to any fringe or pension benefits even if such benefits are available to regular workers. These latter corrections were based on information developed from the 1981 Survey of Pension Receipts ("Taishoku Ichijikin Jittai Chosa").

Table 2 presents coverage rates by 2-digit manufacturing industry for each type of pension, as well as the fraction of the male regular workforce not covered by any retirement system. We distinguish between types of coverage because pension benefit generosity varies--on average, combined schemes (favoured by larger firms) tend to be more generous than either single pension type; of the latter, firms with only lumpsum severance pay tend to have more generous benefits than firms relying only on a fixed-term pension plan. Overall, it is clear that a very high fraction of male workers--well over 90 percent--are covered by some kind of pension plan. This may be contrasted to pension coverage rates in the United States of about 50 percent (Kotlikoff and Smith, 1984). Secondly, the fraction of the male workforce without pension coverage varies considerably across industries--from a high of almost 20 percent in the apparel industry to under 1 percent in the chemicals and petroleum industries. Finally, there are inter-industry differences in coverage by type of retirment scheme. Coverage by a combined scheme is highest (over 45 percent) in chemicals, petroleum, rubber and plastics, electrical machinery and transportation equipment--industries are dominated by large firms.

Table 2

RETIREMENT BENEFITS COVERAGE BY MANUFACTURING INDUSTRY

Manufacturing Industry	Type of Pension Coverage				Mean 5-year Turnover Rate
	P+SP	SP	P	None	
Food Products	32.0	38.3	18.8	10.8	25.6
Textiles Products	43.1	34.1	12 1	10.7	32.0
Apparel	22.0	38.4	19.6	19.9	35.8
Wood Products	28.8	47.0	13.5	10.5	34.2
Furniture	27.4	40.3	24.8	7.3	33.7
Pulp and Paper	42.7	41.2	13.9	1.9	22.9
Publishing	37.7	39.3	14.3	8.5	24.0
Chemicals	59.6	25.2	14.2	.8	17.5
Petroleum	51.7	31.6	16.3	.2	18.0
Rubber and Plastics	59.2	18.5	15.5	6.5	19.9
Leather Goods	42.1	27.6	16.2	14.0	31.2
Stone and Clay	33.0	48.4	15.1	3.4	24.6
Iron and Steel Products	38.8	49.8	10.0	1.2	17.4
Nonferrous Metals	67.1	20.6	10.9	1.1	17.6
Metal Products	29.4	41.8	23.1	5.4	23.3
Machinery	38.7	35.1	23.4	2.6	22.2
Electrical Machinery	48.1	27.3	15.8	8.6	19.3
Transport Equipment	49.4	33.6	15.0	1.8	19.3
Precision Instrument	36.9	28.7	25.6	8.6	22.0
Miscell. Manufacturing	38.4	38.8	13.9	8.7	28.2

Source: Coverage figures computed from the 1981 Taishokukin Seido Chosa (Survey of Severance Pay); labor turnover rates are weighted means from the Chingin Census, various years.
Note: P = Pension Plan, SP = Severance Pay System

The final column of Table 2 displays the corresponding 5-year job turnover rate for each industry. Like coverage rates, job turnover rates exhibit considerable variability across industries--ranging from a low of about 17.5 percent in chemicals, iron and steel, and non-ferrous metals to in excess of 30 percent in textiles, apparel, wood products, furniture, and leather goods. More to the point for this study, there exists a strong negative relationship between gross job turnover rates

and pension coverage rates. The same industries with low job turnover rates are the ones with the highest levels of pension coverage; conversely, industries with high job turnover exhibit the lowest pension coverage rates.

WAGES AND PENSION BENEFITS

We now turn to the estimation of alternative wages and pension benefits facing potential leavers and stayers. These variables are derived from monthly wage data reported in the Wage Census, and from information on pension benefit formulas contained in the 1981 Survey of Severance Pay Systems. Wages and pensions are calculated as the present value at time t of compensation streams cumulated from t+1 to age 55, the assumed age of mandatory retirement. A real discount rate of 3 percent is used, and all present value estimates are expressed in inflation-adjusted 1980 yen.

Wages of Leavers and Stayers

To predict wages of leavers and stayers, we estimated simple wage models separately for each industry and education category.[4] Wages, in 1980 1,000 yen, were regressed on quaratic specifications of age and tenure using the mid-interval age and tenure means as regressors. From the estimated parameters, real wages can be predicted for any age and

[4] Several assumptions are implicit in these calculations. First, for simplicity, we assume that the job leaver finds a job in manufacturing rather than in other sectors of the economy. Second, we assume that job changers are reemployed without an intervening spell of unemployment. This simplifies calculations, but probably overstates the wage gain (understates the wage loss) from job change if the probability of unemployment and unemployment duration rises with age. Finally, leavers are assumed to remain in the next job until age 55. They may turnover again in t+2 if the subsequent job turns out to be a poor match, but that decision (at t+1) is independent of the prior job turnover decision at time t.

tenure combination. These include the industry- and education-specific wage stream of stayers who continue working with the current employer from time t+1 to age 55. For leavers, the alternative wage is the weighted average wage streams of recent job changers with 0 years of tenure in t+1 who are assumed to stay with the subsequent employer until age 55. These weights, which correspond to the expected probabilities of reemployment in other manufacturing jobs, are proxied by industry shares of the total number of similar-age and educated workers in manufacturing with 0-4 years tenure at time t. These alternative wage streams are then discounted back to time t using a 3 percent real rate of interest.

Job turnover at time t is associated with loss of accumulated seniority in the current job. In the next period, leavers begin accumulating seniority again from 0. If there are added wage effects over and above the returns to age or work experience (see discussion in Section II), this loss of accumulated previous seniority can result in a substantial wage loss, especially at higher levels of job tenure. This latter point is demonstrated in Table 3, which presents the mean discounted present values of wages of leavers and stayers.

Panels A and B of Table 3 display these discounted wages (in 1980 million yen) by age and years of job tenure for leavers and stayers, respectively. On average, leavers can expect to get 45.4 million yen in retirement benefits (about $185,000 at current exchange rates) from staying, as compared to 51.1 million yen (about $208,000) from changing jobs, for a wage loss of 5.7 million yen (about $23,000). Panel C expresses the wages of leavers as a proportion of stayers' wages. At every age level, the mean discounted wages facing leavers are always lower than those of stayers. These discounted wage losses increase, on average, from about 4 percent for job leavers with 0-4 years of seniority, to about 25 percent for those with long job tenure in excess of 20 years. Thus, while some gain from job turnover, Japanese workers in general face sizeable wage penalties from job change. This potential wage loss, though often recognized, is seldom explicitly incorporated in extant empirical research on pensions and labor turnover.

Table 3

PRESENT VALUE OF WAGES TO AGE 55 OF LEAVERS AND STAYERS

Age at t	Years of Job Tenure at t					
	0-4	5-9	10-14	15-19	20-24	Average
A. Leavers	52.3	48.8	43.6	36.7	28.6	45.4
20-24	64.3	57.6				62.4
25-29	65.2	58.6	52.4			59.7
30-34	49.4	56.4	51.2	45.7		51.5
35-39	39.1	40.3	46.0	42.0	37.8	41.7
40-44	29.1	29.3	30.5	34.9	31.8	31.4
45-49	18.8	18.8	19.0	20.1	22.6	20.0
50-54	8.2	8.1	8.3	8.5	8.7	8.3
B. Stayers	54.4	53.6	51.8	46.4	38.1	51.1
20-24	66.9	60.5				65.1
25-29	67.7	64.9	61.8			65.2
30-34	51.3	62.7	61.3	57.8		59.2
35-39	40.6	44.7	54.4	53.3	50.5	49.6
40-44	30.2	32.6	36.1	43.8	42.6	38.0
45-49	19.6	20.8	22.5	25.2	29.8	23.8
50-54	8.5	8.9	9.6	10.4	11.2	9.6
C. Leavers/ Stayers	.961	.909	.842	.792	.751	.881
20-24	.960	.951				.957
25-29	.962	.902	.848			.912
30-34	.962	.898	.835	.792		.870
35-39	.962	.899	.842	.786	.749	.844
40-44	.962	.899	.842	.794	.745	.836
45-49	.962	.899	.844	.795	.754	.850
50-54	.967	.910	.859	.814	.772	.873

Note: (1) Present values of wages in millions of 1980 Yen, calculated using a 3 percent discount rate.
(2) See text for a discussion of how wages are forecast for leavers and stayers.
(3) Alternative wage stream predicated on remaining in next job until age 55.

Pension Benefits of Leavers and Stayers

The pension benefit formulas used to calculate pension loss associated with job change come from the 1981 Survey of Severance Pay Systems. In addition to firm size, industry, and type of retirement system (lumpsum severance pay, fixed-term pension plan, or some combination thereof), the survey elicited information on the firm's monthly wages and retirement benefits for "model" workers with different levels of schooling attainment. A "model" worker is a hypothetical employee hired directly upon schooling completion, who remains with the firm until mandatory retirement age. For each group of workers, the survey reports contracted monthly wage and the amount of severance payments at 10, 15, 20, 25, and 30 years of job tenure, as well as at mandatory retirement age. If there is a pension plan, either in combination with or as a substitute for the lumpsum severance pay system, the firm also reports the discounted present value of pension benefits at job separation (discount rates used are unfortunately not reported).

Thus, for each firm, we know what retirement benefits are as a multiple of contracted monthly wages. Based on these data, we calculated mean pension formulas (averaging across types of retirement benefits) by years of seniority for each industry and schooling group, using sampling weights to account for interindustry differences in the size distribution of firms. We also incorporated information on pension multiples by school attainment for lower levels of seniority (3 and 5 years of job tenure), using the Central Labor Board's 1981 Survey of Severance Pay, Mandatory Retirement, and Pensions ("Taishokukin, Teinen Sei, Oyobi Nenkin Jijyo Chosa"). Firms represented in this latter survey are large (over 1000 employees). This may lead to some overstatement of the pension benefits available to the average short-tenured worker, but we believe that the biases are small given low pension multiples--2 to 3.4 times monthly wage. Next, separately for each industry and schooling group, we regress pension multiples on a quadratic specification of seniority. The estimated model parameters are used to predict alternative pension benefits for leavers and stayers

at time t.[5]

Stayers only receive pension benefits from the current employer while leavers receive benefits (in most cases) from both the current and subsequent employer. Stayers are assumed to retire from the current job at age 55, at which time he receives a lumpsum benefit equal to the product of his industry and education-specific wage at age 55 and pension multiple of the seniority level attained at that age. Leavers receive two amounts--first, the product of his current monthly wage and pension multiple at his level of seniority; and second, the weighted average of pension benefits received by similar-aged job changers in the future at age 55. As before (see the previous wage calculations), the relevant weights are industry shares of the total number of similar-age and educated workers changing jobs in manufacturing. Like wages, benefits are discounted to time t using a 3 percent real interest rate.

Some leavers may receive less than two pensions in this 5-year interval because of vesting requirements in the current and alternative jobs. Vesting is the requirement that a minimum number of years of seniority (age requirements are sometimes used as well for fixed-term pensions) be attained to get a lumpsum severance payment or a pension from the employer. In the 1981 Survey of Severance Pay, the modal vesting period for severance pay is 3 years (in case of quits), and around 10 years for fixed-term pensions. We incorporate the effects of vesting in a crude, albeit realistic, fashion. Given the aggregate nature of our data, we simply assume that a minimum of 5 years of seniority is required to for vesting. This means that all stayers in our data receive a pension; over the next five years, they all attain seniority of 5-9 years. For leavers, we make the following added assumptions:

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[5] It is noteworthy that for the vast majority of cases, pension multiples appear to be a linear function of years of tenure (parameter values for the squared-tenure term are by and large equal to 0). In other words, like U.S. pension formulas, benefit amounts in Japan are calculated by multiplying final year wages by years of tenure and a constant generosity factor (which may vary across firms).

(1) Age < 50 years with 0-4 years of seniority: Leavers receive benefits in the second job but have insufficient tenure to become vested on the current job.

(2) Age 50-54 years with seniority > 4 years: Leavers receive benefits from the current job, but will have insufficient prospective tenure in the next job at age 55 to become vested for a second pension.

(3) Age 50-54 years with 0-4 years of seniority: Leavers get no pensions because insufficient tenure (current and prospective) is accumulated in either job to become vested at age 55.[6]

Table 4 reports the present value of pension benefits for leavers (Panel A) and stayers (Panel B) by age and seniority. Recall that most leavers not contrained by vesting requirements receive two pensions--from the current and subsequent employers. Nonetheless, the sum of these two pensions is always lower than the single pension received by stayers. On average, workers who leave receive two pensions totaling 3.47 million yen (about $14,000 at current exchange rates) as compared to a single pension worth 4.49 million yen (about $18,000) for those who stay--a mean pension loss in excess of 20 percent. As we noted earlier, there are two reasons for this pension loss--first, final wages at age 55 are lower than those received by stayers (because of loss of previous seniority), and second, a lower pension multiple is used in the next job because fewer years of service credits are gotten in the time remaining to age 55.

Panel C shows most clearly the magnitude of these pension losses at various age and seniority levels. Compared to stayers, pension loss from job change rises with age to a (local) peak of about 23 percent at age 40-44 before declining. It rises again for leavers age 50-54 who will not have acquired enough seniority to become vested in the

[6] This is obviously true only in the 5-year interval in which they are observed. Older workers with 0-4 years of seniority in t are recent job changers, and may have received pension benefits from a previous job prior to entering our sample.

Table 4

PRESENT VALUE OF PENSION BENEFITS OF LEAVERS AND STAYERS

Age at t	Years of Job Tenure at t					
	0-4	5-9	10-14	15-19	20-24	Average
A. Leavers	2.71	3.11	3.56	4.38	5.54	3.47
20-24	3.62	3.58				3.61
25-29	3.54	3.77	3.93			3.72
30-34	2.35	3.56	4.05	4.61		3.68
35-39	1.66	2.50	3.77	4.70	5.64	3.71
40-44	1.07	1.85	2.77	4.48	5.75	3.48
45-49	.59	1.35	2.17	3.53	5.64	2.74
50-54	.00	.73	1.53	2.72	4.34	1.71
B. Stayers	3.33	4.10	4.93	5.76	6.66	4.49
20-24	4.29	4.43				4.33
25-29	4.28	4.99	5.07			4.75
30-34	2.92	4.86	5.70	5.70		4.94
35-39	2.17	3.33	5.46	6.36	6.48	4.94
40-44	1.51	2.48	3.84	6.15	7.12	4.59
45-49	.93	1.72	2.83	4.44	6.86	3.46
50-54	.49	1.05	2.00	3.31	5.01	2.21
C. Leavers/ Stayers	.784	.780	.750	.789	.857	.783
20-24	.862	.838				.855
25-29	.844	.778	.804			.807
30-34	.819	.759	.734	.840		.774
35-39	.781	.770	.717	.765	.901	.774
40-44	.723	.763	.739	.756	.831	.768
45-49	.655	.797	.779	.809	.844	.777
50-54	.000	.699	.768	.826	.871	.590

Note: (1) Present values of severance payments in millions of 1980 Yen, calculated using a 3 percent discount rate.
(2) See text for a discussion of how severance payments were calculated for leavers and stayers.
(3) For leavers, severance payments include benefits from both the current and next job, except when minimum seniority requirements are not met in either job.

subsequent job. For a given age group, pension loss varies by seniority in a non-linear fashion--usually peaking at 10-14 years of job tenure, with relatively smaller pension losses at very low and very high levels of seniority. This non-linear tenure pattern reflects the combined (and not readily disentangled) influences of vesting, pension multiples, relative wages, and discounting.

IV. EMPIRICAL RESULTS

In this section, we report the empirical results of estimating models relating job turnover in Japanese manufacturing to pension coverage and the alternative wages and benefits facing leavers and stayers. Several model specifications were estimated using maximum likelihood grouped probit methods. In one set of regressions, we start with a simple model and sequentially add measures representing coverage and compensation alternatives. In a second set of regressions, we estimate models separately for young and older workers to compare the relative turnover effects of pensions and wages on different age groups. Estimated model parameters are then used to simulate the job turnover effects of changing pension coverage rates and benefit amounts for each of these samples.

EMPIRICAL MODEL

We estimate job turnover models using grouped probit maximum likelihood methods. In our data, the unit of observation X_i is the age-seniority cell in 20 manufacturing industries and 3 levels of schooling attainment, pooled over three census years--1971, 1976, and 1986--for a total sample size of 4671 observations. Associated with each X_i cell are n_i workers, m_i change jobs over the next five years and $n_i - m_i$ remain with the current employer. The empirical job change probability for X_i, $p_i = m_i/n_i$, follows the normit:

$$G(p_i) = \Phi^{-1}(p_i) = \beta' X_i + u_i$$

and $$\partial G(p_i)/\partial X_{ik} = \phi(p_i)\beta_k$$

where Φ and ϕ are the distribution and density functions of the standard normal, respectively, and u_i are assumed to be distributed with mean zero and variance of one. The partial derivatives of $G(p_i)$ with respect to the k'th component of vector X are $\phi(p_i)\beta_k$. These vary non-linearly

over the sample, and job turnover effects must be simulated for alternative values of X_i.

In addition to job turnover, pension coverage, wages and benefits, the models also control for a number of other factors. See Table 5. These include indicator variables for schooling attainment (college graduates ommited), census years (1981 ommited), and years of seniority in the current job (20-24 years of seniority excluded). Age is represented by a quadratic specification, and by an indicator variable for workers age 50-55. Many in this age group will be observed to leave the firm on reaching mandatory retirement age between ages 55 and 60. We also include variables to control for the size distribution of firms--the proportions of large and medium size firms (over 1000 and 100-999 employees, respectively) in the industry, with small firms (30-99 employees) as the ommited group. Larger firms, which have more generous retirment benefits and higher pay, are presumably also more likely to attract higher quality workers with low turnover propensities (see Hashimoto and Raisian, 1985). Finally, contemporaneous mean monthly wages (in logarithmic form) are used as a control for wage levels prevailing in the current job.

PARAMETER ESTIMATES

Table 6 reports the parameter estimates of a simple job turnover model with and without measures of pension coverage. Before turning to the turnover effects of coverage, we note that job turnover levels in 1971-1976 and 1976-1981 are significantly higher than levels prevailing in the 1981-1986 period. These were periods of severe workforce retrenchments in Japan, brought on by the first and second OPEC oil-price shocks of 1974 and 1978; in contrast, the most recent period was one of expansionary growth and overall job turnover rates were correspondingly lower. Job turnover rates in Japan are lower for the more highly educated, and they decline with age and seniority though at a slower pace for older and long-tenured workers. These age-tenure patterns of job change are consistent with job shopping in the early work career, with strong job attachment developing once a good worker-

Table 5

VARIABLE DEFINITIONS AND MEANS

Variable Definitions	Variable Mean
5-Year Turnover Rate	.2267
Year 1971 indicator	.3288
Year 1976 indicator	.3339
Year 1981 indicator [omitted]	n.a.
JHS Graduate (8 years schooling)	.4194
HS Graduate (12 years schooling)	.4279
College Graduate [omitted]	n.a.
Age	34.03
Age-squared	232.83
Age 50 plus	.0525
Seniority 0-4 years	.3029
Seniority 5-9 years	.2654
Seniority 10-14 years	.2077
Seniority 14-19 years	.1353
Seniority 20-24 years [omitted]	n.a.
Large firms (proportion of firms >1000 workers)	.0310
Medium firms (proportion of firms 100-999 workers)	.3059
Small firms [omitted]	n.a.
Log monthly wage in current job (1980 thousand yen)	5.134
Coverage: PEN+LS (both pension and severance pay)	.4250
Coverage: LS (severance pay only)	.3553
Coverage: PEN (pension only)	.1646
Present Value of Wages (3 % real discount rate)	
PVW Leavers (log 1980 thousand yen)	10.597
PVW Stayers (log 1980 thousand yen)	10.727
Present Value of Pensions (3 % real discount rate)	
PVP Leavers (log 1980 thousand yen)	7.956
PVP Stayers (log 1980 thousand yen)	8.277
Relative Compensation (Stayers vs Leavers)	
PVW Stayers/Leavers	.13022
PVP Stayers/Leavers	.32099

Table 6

PARAMETER ESTIMATES OF A SIMPLE LABOR TURNOVER MODEL

Explanatory Variables	(1) Coef.	(1) S.E.	(2) Coef.	(2) S.E.
Constant	-3.170 **	(.905)	-1.716	(.958)
Year 1971	.286 **	(.046)	.311 **	(.047)
Year 1976	.091 *	(.038)	.091 *	(.039)
JHS Graduate	.477 **	(.076)	.528 **	(.077)
HS Graduate	.222 **	(.061)	.252 **	(.062)
Age	-.134 **	(.024)	-.145 **	(.024)
Age-squared	.001 **	(.000)	.002 **	(.000)
Age 50 plus	.339 **	(.103)	.335 **	(.103)
Seniority 0-4 years	.647 **	(.099)	.689 **	(.100)
Seiority 5-9 years	.317 **	(.082)	.347 **	(.083)
Seniority 10-14 years	.079	(.073)	.099	(.074)
Seniority 14-19 years	-.118	(.072)	-.109	(.072)
Large firms (%)	-4.322 **	(1.963)	.640	(2.534)
Medium firms (%)	-.535	(.642)	-1.352	(.818)
Log(monthly wage)	.856 **	(.205)	.995 **	(.209)
Coverage: PEN+LS			-2.118 **	(.485)
Coverage: LS			-2.117 **	(.467)
Coverage: PEN			-1.744 **	(.591)
L-likelihood	-4403.49		-4392.53	

Note: Asymtotic standard errors are reported in parentheses.
** denotes statistical significance at the 1 percent level.
* denotes statistical significance at the 5 percent level.
PEN = covered by pension plan
LS = covered by lumpsum severance pay

firm match is found. For the oldest workers (age 50-54), turnover rates actually increase again, in large part reflecting the attainment of mandatory retirement age. Turnover rates are usually lower in industries dominated by large firms because, as noted earlier, compensation tends to be more generous in larger firms. Finally, wage

levels in the current job are positively related to job turnover rates. This counter-intuitive result may be due to the presence of some unobserved variable(s), positively correlated both with wage levels and with job turnover rates.[1] One source of correlation may be a higher layoff probability in high-wage jobs, as may have occured in industries severely affected by the oil-shocks, such as steel, aluminium, and shipbuilding.

The second specification in Table 7 demonstrates that coverage has large inhibiting effects on labor turnover. We noted earlier that benefits available from a combined retirement scheme are usually larger than those provided by firms having just one system; furthermore, a severance pay system tends to be more generous than one providing only fixed-term pension benefits. This ranking of benefits by generosity is reflected in lower turnover rates when pension coverage is of the combined benefits type (-2.11) than when coverage is by fixed-term pensions alone (-1.74). Estimated coverage parameters are statistically significant at the 1 percent level; furthermore, the null hypothesis that the three coverage parameters are jointly equal to zero is rejected (F=7.31). Note that firm size effects become statistically insignificant with the inclusion of coverage measures, not surprising since they are highly correlated with firm size.

Table 7 reports the parameter estimates for an augmented model that includes alternative wages and pension benefits, both expressed in logarithmic form.[2] The estimated signs of both wage coefficients in specification (3) are consistent with the predictions of theory. Other things equal, job turnover rates are higher the larger are the present value of wage alternatives; the discounted wages of stayers have an equal and opposite effect on job turnover rates. Both wage parameters are estimated quite precisely, and are significant at the 5 percent level. Discounted pension benefits for leavers and stayers also have

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[1] A similar positive turnover effect of current wages was found by Allen, Clark, and McDermed (1988) using the National Longitudinal Survey of Mature Men.

[2] Absolute yen specifications were tried as well, but the model fit was not as good as the logarithmic specification.

Table 7

PARAMETER ESTIMATES OF A LABOR TURNOVER MODEL WITH PENSIONS

Explanatory Variables	(3) Coef.		(3) S.E.	(4) Coef.		(4) S.E.
Constant	-1.339		(1.842)	-1.748		(.960)
Year 1971	.314	**	(.048)	.310	**	(.047)
Year 1976	.092	*	(.039)	.093	*	(.039)
JHS Graduate	.475	**	(.116)	.515	**	(.078)
HS Graduate	.245	**	(.085)	.272	**	(.063)
Age	-.131	**	(.026)	-.128	**	(.025)
Age-squared	.002	**	(.000)	.002	**	(.000)
Age 50 plus	.423	**	(.130)	.421	**	(.109)
Seniority 0-4 years	.319		(.177)	.359	*	(.160)
Seiority 5-9 years	.049		(.140)	.081		(.127)
Seniority 10-14 years	-.082		(.104)	-.059		(.095)
Seniority 14-19 years	-.196	*	(.081)	-.185	*	(.078)
Large firms (%)	.104		(2.611)	.423		(2.536)
Medium firms (%)	-.865		(.896)	-1.047		(.823)
Log(monthly wage)	.996	**	(.233)	.965	**	(.209)
Coverage: PEN+LS	-1.915	**	(.573)	-1.952	**	(.487)
Coverage: LS	-1.719	**	(.588)	-1.762	**	(.480)
Coverage: PEN	-1.668	**	(.648)	-1.707	**	(.591)
PV-W Leavers	1.422	*	(.560)	--		--
PV-W Stayers	-1.423	*	(.607)	--		--
PV-P Leavers	.067	*	(.027)	--		--
PV-P Stayers	-.128		(.135)	--		--
PV-W Stayers/Leavers	--		--	-1.542	**	(.506)
PV-P Stayers/Leavers	--		--	-.059	*	(.024)
L-likelihood	4386.59			4386.73		

Note: Asymtotic standard errors are reported in parentheses.
** denotes statistical significance at the 1 percent level.
* denotes statistical significance at the 5 percent level.
PV-W = logarithm of the present value of cumulated wages
PV-P = logarithm of the present value of cumulated pensions and lumpsum severance pay

the correct signs predicted by theory--turnover rates are higher the larger are benefits available in other manufacturing jobs, while turnover rates decline with the generosity of benefits in the current job. However, only the alternative pension benefits have a statistically significant on job turnover at the 5 percent level. Specification (4) in Table 7 summarizes these results by including measures of wage and pension loss, expressed in log difference form (stayers relative to leavers). Estimated parameters of the wage and pension loss variables are both negative, confirming that job turnover rates are responsive to potential wage and pension losses from job change.

Do pension coverage and wage and benefit alternatives have different effects on the job turnover propensities of younger and older workers? The U.S. evidence on age-differences in the turnover effects is at best mixed (see Schiller and Weiss, 1979). To test for the presence of age-specific effects, specification (3) was estimated separately for samples age 20-39 and 40-54. Estimated parameters of key variables are reported in Table 8 for the two age groups. The direction of effects of the coverage and alternative wage and benefit variables all have the correct signs. However, the precision of these estimates vary for the two groups--pension coverage is statistically significant at the 5 percent level for the younger workers sample, as are alternative wages for the older workers sample. In neither sample are statistically significant turnover effects of pension benefits found.

SIMULATIONS

How sensitive are observed labor turnover rates to changes in pension coverage and retirement benefits available in alternative jobs? Given the underlying model, proportionate changes in the regressors can have non-linear effects on the dependent variable. As such, we evaluate the predicted job turnover effects of percentage reductions in the observed values of pension variables, ranging from 10 percent to 90 percent.

Table 8

LABOR TURNOVER EFFECTS OF COVERAGE, WAGES AND PENSIONS BY AGE

Explanatory Variables	Age < 40 Years Turnover=.2156		Age >= 40 Years Turnover=.2466	
	Coef.	S.E.	Coef.	S.E.
Coverage: PEN+LS	-2.007 *	(.901)	-1.089	(.744)
Coverage: LS	-1.878 *	(.931)	-.856	(.766)
Coverage: PEN	-1.648	(1.006)	-1.261	(.849)
PV-W Leavers	1.138	(1.052)	1.365 *	(.603)
PV-W Stayers	-1.107	(1.142)	-1.367 *	(.678)
PV-P Leavers	.190	(.458)	.047	(.025)
PV-P Stayers	-.306	(.276)	-.094	(.206)
Log Likelihood	-2008.6153		-2465.7951	

Note: Asymtotic standard errors are reported in parentheses.
* denotes statistical significance at the 5 percent level.
PV-W = logarithm of the present value of cumulated wages
PV-P = logarithm of the present value of cumulated pensions and lumpsum severance pay

We simulate changes in (1) pension coverage, (2) generosity of pension benefits, and (3) wage-compensated reductions in pension benefits. First, we lower overall pension coverage rates, with percent reductions distributed across the three types of retirement schemes in proportion to their share of total coverage. Second, holding wages and coverage rates constant, we vary the discounted present value of pension benefits available first in the current firm alone, and then in all manufacturing jobs. As we shall see below, these alternative simulations have quite different labor turnover effects (and interpretations). Finally, to see if the wage-benefits composition of total compensation matters, we evaluate the turnover effects of varying wage-compensated reductions in pension benefits, holding total discounted present values constant. Simulations were conducted for the entire sample (A), and separately for young (Y) and older (O) samples of workers.

Panel A of Table 9 reports the resulting labor turnover rates from sequentially larger reductions in pension coverage. From the baseline figure of 22.6 percent for the whole sample (A), turnover rates increase by 5 percentage points (to 27.6 percent) for a 10 percent reduction in coverage rates, and more than doubles (to 51.5 percent) when coverage rates are cut in half. Similar reductions in coverage rates raise labor turnover rates more for the younger worker (Y) sample (from 21.6 to 52.5 percent) than for older worker (O) sample (from 25.5 to 42.1 percent).

How high would turnover rates in Japanese manufacturing be if industry coverage rates were similar to those prevailing in the United States? We address this question by substituting into our simulations U.S. pension coverage rates by industry, as reported in Kotlikoff and Smith (1984). With U.S. manufacturing coverage rates, mean labor turnover rates in Japan rise to 35.7 percent, up from 22.6 percent. We had noted in the introductory section that U.S. job turnover rates are twice as high as those in Japan. Thus, these simulations suggest that over half of the differences in U.S.-Japan labor turnover rates are attributable simply to differences in pension coverage rates. Part of the remaining gap may be the result of cross-national differences in early career job shopping, pension benefits, steeper wage profiles in Japan, as well as other societal norms and institutional factors.

Panel B of Table 9 reports the results of reducing pension benefits while keep coverage rates at existing levels. Two sets of results are considered--one in which only benefits in the current job are varied, the other in which benefits are reduced in all jobs including the current one. In the first set of simulations, turnover rates for the entire sample (A) rise by 2.7 percentage points (22.6 to 25.3 percent) when current job benefits are halved, and rise by 9.5 percentage points when benefits are reduced by 90 percent. Reductions in current job benefits have more pronounced job turnover effects for younger (Y) than older workers (O). In fact, a 90 percent reduction in current benefits more than doubles turnover rates among the young worker sample (21.6 to 45.3 percent), but raises older worker turnover rates by less than half again (from 25.5 to 32.4 percent). The latter turnover rates predicted

Table 9

SIMULATED EFFECTS OF CHANGES IN COVERAGE AND BENEFITS

Simulated Change in Variables	Resulting Labor Turnover Rate					
	0%	10%	30%	50%	70%	90%
A. Benefits Unchanged						
Reduce PEN+LS coverage (A)	22.6	27.6	39.0	51.5	--	--
Reduce PEN+LS coverage (Y)	21.6	26.8	39.0	52.5	--	--
Reduce PEN+LS coverage (O)	25.5	28.5	35.0	42.1	--	--
B. Coverage Unchanged						
Reduce PEN+LS: current job (A)	22.6	23.0	24.0	25.3	27.4	32.1
Reduce PEN+LS: current job (Y)	21.6	22.5	24.7	27.9	33.1	45.3
Reduce PEN+LS: current job (O)	25.5	25.8	26.5	27.5	29.0	32.4
Reduce PEN+LS: both jobs (A)	22.6	22.8	23.3	23.9	24.9	27.1
Reduce PEN+LS: both jobs (Y)	21.6	21.9	22.7	23.8	25.6	29.6
Reduce PEN+LS: both jobs (O)	25.5	25.6	26.0	26.5	27.2	28.8
C. Total Compensation Unchanged						
Reduce PEN+LS: current job (A)	22.6	22.6	22.8	23.4	24.7	28.4
Reduce PEN+LS: current job (Y)	21.6	22.2	24.0	26.6	31.1	42.4
Reduce PEN+LS: current job (O)	25.5	25.2	24.8	24.7	25.1	27.3
Reduce PEN+LS: both jobs (A)	22.6	22.8	23.2	23.8	24.7	26.8
Reduce PEN+LS: both jobs (Y)	21.6	21.9	22.7	23.8	25.5	29.5
Reduce PEN+LS: both jobs (O)	25.5	25.6	25.9	26.3	27.0	28.6

Note: (A) All workers, specification (3) in Table 7.
(Y) Workers age 20-39, Table 8.
(O) Workers age 40-54, Table 8.

for the two age groups should be interpreted with caution, given the imprecision of the benefit parameters estimated.

These simulations, which are typical of most U.S. studies (for example, Allen, Clark, and McDermed, 1988), make little sense in aggregate models such as ours. Changes in current job benefits, if extended to the macro case, must by definition alter the distribution of expected benefits facing all other potential job changes in the labor

market. This point highlights a potential shortcoming in many existing micro studies. Predicted job turnover effects reported in micro studies implicitly condition on benefits being held constant in all other jobs; as such, they cannot be extrapolated to the labor market at large (this would tend to overstate aggregate turnover effects). Incorporating the effects of reduced benefits in all other jobs narrows pension benefit diffentials among jobs, and lowers the overall likelihood of job turnover as well. The second set of simulations--in which both current and alternative pension benefits are reduced--yield much smaller increases in job turnover. For the total sample (A), labor turnover rates are only predicted to rise 4.5 percentage points (from 22.6 to 27.1 percent) when benefits in all jobs are reduced by 90 percent. The corresponding increases in turnover rates are 8 percentage points for younger workers and 3.3 percentage points for older workers.

Panel C shows the turnover effects of wage-compensated reductions in benefits--benefit reductions are offset by equal increases in the present value of wages. These simulations are based on the view that pension benefits are a form of deferred compensation--workers "pay" for benefits through reduced wage compensation. These simulations therefore allow us to ask a crucial question: holding constant total compensation, is job retention (and labor turnover) affected by the composition of wages and pension benefits? The answer appears to be a resounding yes. Consider the second set of predicted job turnover rates from wage-compensated benefit reductions in both the current and alternative jobs. For the whole sample (A), a 90 percent reduction in benefits results in an increase in job turnover rates of 4.2 percentage points (from 22.6 to 26.8 percent), holding levels of total compensation constant. With the caveats noted above, similar conclusions may be drawn for both younger (Y) and older (O) samples--a 90 percent reduction in wage-compensated benefits gives rise to increases in job turnover rates of 7.9 and 3.1 percentage points, respectively. These simulations provide the first empirical support for the hypothesis that job turnover rates are sensitive to the proportion of total compensation received as deferred pension benefits.

V. SUMMARY AND CONCLUSIONS

We have assembled a rich source of Japanese labor market data linked with pension information to investigate the role of pension plans in labor turnover and job retention. We have sought to answer questions on why job turnover rates in Japan are twice as low as those found in the United States, whether Japanese workers respond to wage and pension incentives in ways consistent with those documented for American workers in the literature, and finally, if employers can influence job mobility by varying the wage-pension benefits composition of total compensation, as suggested by implicit labor contract views of pension plans. In this section, we summarize the main findings and discuss their implications for public policy regarding pension plans.

Why are job turnover rates so low in Japan? One reason surely lies in the high proportion of the male workforce covered by pensions--over 90 percent--as compared to just under 50 percent in the U.S. Testimony to the potential job mobility-inhibiting effects of pensions was found in a strong negative relationship between industry pension coverage and job turnover rates. Industries with low job turnover are those with high pension coverage rates--chemicals, petroleum, rubber and plastics, electrical machinery and transportation equipment. Industries with high job turnover rates--textiles, apparel, leather goods, wood products and furniture--typically have the lowest coverage rates in manufacturing. These interindustry variations in job turnover and pension coverage (by different types of benefit schemes) allowed us to estimate the effects of pension coverage on job turnover, holding everything else constant. We were thus able to ask the counterfactual question: What would Japanese job turnover rates be like if U.S. industry coverage rates prevailed? Our simulations suggested that mean job turnover rates in Japan would rise to 35.7 percent, up from the 22.6 percent observed in the sample. Thus, since U.S. turnover rates are twice those of Japan (see Hashimoto and Raisian, 1985), this result suggested that over half of the U.S.-Japan difference in job turnover rates is attributable

simply to differences in pension coverage rates. Part of the remaining gap is probably due to cross-national differences in wage and pension benefit structures, and to societal norms and institutions.

How similar are the results to those reported in the U.S. literature on pensions and labor turnover? Descriptive tabulations of the data suggested that Japanese workers are responsive to economic incentives posed by the structure of wages and pension benefits. Like the United States, turnover rates are lower for more educated workers, and decline both with age and years of seniority in ways consistent with early career job-shopping followed by strong job attachment once a good worker-firm job match is found. The disincentives to job change can be quite substantial, especially for older, long-tenured workers. Using a real discount rate of 3 percent, we estimated that the potential wage loss (in present value terms) is about 4 percent for workers with short tenure and 25 percent for those with over 20 years of seniority. The potential pension loss from job change is even larger in relative, though not absolute yen, terms. The mean pension loss of changing jobs exceeds 20 percent. Though small for younger, low-tenured job changers (about 15 percent), this figure can rise to as high as 40 percent for older workers over age 50.

Formal econometric estimation of these relationships yielded evidence consistent with the predictions of theory, and with other studies of pensions and labor turnover in the U.S. In addition to the pension coverage effects already noted above, the results suggested that job turnover rates are higher the larger are wage and pension benefit alternatives. However, turnover rates are lower when wage and pension benefits in the current firm are more generous. Keeping coverage rates at existing levels, a 50 percent reduction in pension benefits offered by the current employer raises overall job turnover rates by about 2.7 percentage points (from the baseline of 22.6 percent to 25.3 percent). A 90 percent reduction in benefits raises turnover rates by 9.5 percentage points for the sample as a whole. Though tentative (because parameter estimates by age group are less precisely estimated), this virtual elimination of pension benefits more than doubles job turnover rates among the younger sample of workers!

These results, however, are of limited value if the issue is how benefit reductions would affect overall job turnover rates in the labor market. To address this issue, turnover effects should be evaluated for benefit reductions both in the current firm and in all alternative jobs as well; otherwise, job turnover effects are overstated by constraining benefit alternatives to be unchanged, and thus exagerating pension differentials across jobs. The simulations yielded smaller predicted increases in job turnover rates when overall benefit levels were reduced. A 90 percent reduction in all benefits raised turnover rates by 4.5 percentage points for the sample as a whole; for the younger sample of workers under age 40, the corresponding increase was now 8 percentage points (from 21.6 to 29.6 percent).

Finally, we evaluated the job turnover effects of wage-compensated reductions in pension benefits. Much of the rationale for the implicit labor contract views of pension plans--that they reduce job turnover, provide incentives for worker investments in firm-specific training, and motivate workers--relies on the maintained assumption that pension plans do indeed enhance worker productivity. Our simulations indicated that holding constant levels of total compensation, job turnover--an indicator of productivity--is higher the lower is the proportion of compensation paid as pension benefits. In other words, within limits employers can effect lower job mobility (higher job retention) by deferring a larger fraction of wage compensation as pension benefits.

These findings for Japan have implications for several recent pension plan initiatives in the United States.[1] Some proposals--requiring lumpsum distributions of vested benefits to terminated workers--should have little impact on the incidence of job changing among members of defined benefit pension plans. The proposed changes would, in effect, convert defined benefit plans into a lumpsum severance payments system not unlike the Japanese "taishokukin" system, or Lazear's model of how employers use pensions as severance pay (1981). Whether or not workers benefit from these proposals will depend

[1] See Clark and McDermed (1988) for a discussion of these recent proposals and their potential labor market effects.

critically upon their ability to "beat the market" in investments of lumpsum distributions in (say) Individual Retirement Accounts (IRAs).

Other pension proposals may have less neutral effects. Some have sought to offset the effects of inflation by proposing that vested benefits be tied to the projected earnings of working plan participants, rather than to earnings at job separation. Recall that part of the deterrent effect of pensions derives from the calculation of benefits based on nominal wages. In addition, effective in 1989, Congress has mandated lowering pension vesting requirements from 10 years to 5-year 100 percent vesting, or 50 percent vesting after 3 years of service. If the implicit labor contract views of pensions are correct, these latter initiatives would (1) shift the burden of higher pension costs to employers and to those workers who stay, and (2) limit the ability of employers to shape the age distribution of their workforce.

In implementing these pension proposals, policymakers should pay greater attention to the tradeoffs between the objectives of ensuring adequate retirement income for the aged on one hand, and the efficient operation of the labor market on the other. Proposals to limit losses in pension wealth and, thus, to increase worker mobility (when it is optimal) are desirable societal objectives. However, consideration should also be given to the question of why pension plans exist in the first place. If pension plans are instruments that employers use to reduce job turnover, to motivate workers, and to increase worker training, legislation that seeks to increase labor mobility and make pension plans more portable may ultimately work to the detriment of firms, and the workers that they were designed to benefit. The labor market component of this equation is highlighted by the Japanese findings that we have reported here, and by policy concerns that low U.S. productivity growth may be due to high labor turnover and inadequate worker training in this country.

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