A QUANTITATIVE ANALYSIS OF INDIVIDUAL EARNINGS

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Introduction:

Statement of The Problem

The seniority wage is one of the key descriptive terms of Japanese employment practices. The principle of the seniority wage is that a worker joins the enterprise at a relatively low starting rate, related to age or seniority and educational standard, which rises gradually until retirement age. A rough correspondence between efficiency and age or seniority is assumed. As worker's status is closely associated with his seniority, the firm's work force organization is called nenko joretsu (ranking by years of service). As wage is also closely associated with his seniority, it is called the nenko (seniority) wage.

This practice of remuneration is often misinterpreted. The subject of this study is to analyse the determinants of the individual earnings.

According to human capital theory (Mincer 1962; Becker 1964), investment in the training of an employee increases its future productivity. If the market value of the employee reflects its future productivity, investment reduces its earnings during the training but increases them at later stages. Thus, its earnings profile will become steeper than that of an untrained workers.[1] Further, Becker (1964) classified the types of training into two categories, "general" and "specific," and elaborated the relationships between the types of

training and the earnings profiles.[2]

According to Becker, the firm bears the cost of specific train-
ing because this type of training is useful only within it. As a
result, the firm will make efforts to retain the trained workers at
least untill the firm collects returns from the investment. These
employer efforts may reduce layoffs and quits of the workers with
specific training.[3] The earnings profile of the workers with spe-
cific training may deviate from their productivity and become flatter
than their productivity profiles when the firm does not fully compen-
sate their service knowing that firm-specific skill does not help them
move to their firms.[4]

An early attempt to apply human capital theory to the analysis
of Japanese wages shows that the theory was relevant to the age-
earnings profiles (Sano and Nakamura 1970).[5] Stoikov (1973) argues
that, in contrast to the predictions from the nenko theory of wages,
previous work experience is quite important and substitutable, to a
great extent, for length of service.[6] Comparing the earnings pro-
files between the U.S. and Japan, Kuratani (1973) and Shimada (1981)
conclude that the firm specific experience is more important in
determining Japanese earnmings profiles than U.S.[7]

Hashimoto (1979) discusses that the magnitude of bonus payments
relative to earnings increases in association with increased profita-
bility of investment in on-the-job training, formal schooling, age and
other relevant variables.[8] The study clarifies the point that
Japanese wages contain flexible portions.

The basic drawback of all of these empirical studies is in the
operational variables by which they measure human capital. They

a-priori regard length of service as a proxy for specific human capital. Evidently, not all portions of the length of service are firm-specific. The degree of firm-specificity of work experience may vary from job to job. Moreover, the length of service with all previous employers is usually regarded as "general training," and that with the current employer as "firm-specific." If a worker leaves the current firm in the future, the work experience will be reclassified as "general." Therefore, the distinction between the two types of training is more or less arbitrary. In addition, a worker may have been out of work prior to current employment. This non-investing period cannot be distinguished from the investing one in the data used for all the above cited wage studies.[9]

The implicit assumption underlying the earnings function in these studies is that earnings are the same for all individuals with the same measurable human capital. Even if their human capital are the same, however, performance may vary from person to person depending upon differences in, among others, economic motivation, and responses to personnel administration or other organizational climates. Therefore, earnings can vary among workers who are endowed with the same stock of human capital. Influences of organizational variables upon the performance of individual workers with equivalent human capital and their different responses to the same economic incentive are ignored by the above-mentioned studies.[10] It is clear that further empirical investigations are in order.

An Analytical Framework

In this study, employment relationship is regarded as an eco-
nomic transaction which involves an implicit contract between a firm
and its workers.[11]   In labor markets where labor is heterogeneous, a
firm may not readily be able to ascertain a worker's productive
performance in advance of employment. This uncertainty and variabi-
lity of productive performance will rule out an auction market for
labor.[12]   In addition, when the labor markets is not perfect, as
actual labor markets are imperfect, labor mobility is associated with
some costs, and the firm enjoys some freedom at setting wages and
employment strategies. The firm will try to reduce employment insta-
bility in order to maximize the present value of expected profit, if
the risk-reducing policy is the least costly way.[13]   If workers at
the same time are risk averse, i.e., they prefer stable income and job
security,[14] interaction between employer strategy and worker prefe-
rences will result in sticky wages and stable employement. Labor
services are not auctioned off in spot markets but rented for a
"reasonable" period of time in terms mutually expected implicitly.

Economic rationale for implicit contract of employment has been
discussed, but on what basis will the duration of employment, wage
schedules and other transaction costs associated with utilizing the
internal work force be decided? Or, why are different contractual
arrangements made when actors are under a similar economic
environment? Mathematical formulations capture transaction cost
phenomena, but they seem to place too much enphasis on risk sharing
arrangements.[15]   Transaction cost approaches to implicit employment

contracts seem to yield straight forward testable hypotheses, even though a consensus on transaction costs may be lacking.[16]

In a labor market for contracs with a risk-sharing arrangement, employment relations involve two transactions; a firm rents property rights of labor service from its employees, and offers them, in return, insurance of employment security. Contracts, therefore, includes an employment schedule and an payment schedule adjusted by an implicit insurance policy. Transaction costs may include expenses associated with negotiation and enforcement of the contract, for example, costs of bringing agents together, acquiring information about the terms of exchange, drawing and enforcing contracts, and foregone products due to spoilage during the arrangements of transactions. An employer as a profit maximizer will try to minimize transaction costs associated with recruitment, screening and monitoring, in addition to labor costs associated with training and rewarding, other things being equal.

In order to achieve this goal at a given time, the employer will carefully screen job applicants and try to identify and hire those who are likely to welcome its employment and wage policies. It will also establish training programs in such a way that minimizes the training costs. Further, it will remunerate its employees in response to their long-term contribution.[17]
In the following sections, elements of a firm's cost-minimizing behavior with respect to wage payments will be analyzed on the basis of above mentioned framework of economic organization. A hypothesis which will be tested concerns firm's reward systems: Economic variables representing individual employees' human capital will be respon-

sive to variations in individual earnings. Coefficients of the explanatory variables will show a positive sign and be statistically significant to the extent that employers are economically rational.

The Model and The Data

The compressed earnings function of the following form will be estimated:

$$\ln Y = \beta_0 + \beta_1 (EDUC) + \beta_2 (LOS) + \beta_3 (EXP) + \beta_4 (EVAL) + \beta_5 (EXP^2)$$
$$+ \beta_6 (2 \cdot LOS \cdot EXP + LOS^2) + e \qquad\qquad (1)$$

where

Y = earnings of the individual employees,

EDUC = years of formal schooling,

LOS = length of service with the current employer (in years),

EXP = work experience elsewhere (in years), and

EVAL = merit rating points under the current employer.

The basic form of this function is developed by Kuratani (1973) on the basis of his theoretical considerations in the sharing of costs and returns associated with training investment behavior.

The first three independent variables are commonly used in an earnings function; years of formal schooling (EDUC) and previous work experience transferred to the current employer (EXP) are the indices for general training, and length of service with the current firm (LOS) is for specific training.[18] The expected sign of the coefficients, β_1, β_2, and β_3 are positive, but β_5 and β_6 are negative. The value of β_2 is expected to be greater than β_3.

The variable EVAL is an invention introduced here in order to

analyze individual workers' responses to wage incentives which comprise a portion of assessment rates in the job-skill component. Workers with identical investment in formal schooling and post school training may respond to wage incentives in different ways as a result of individual differences in responses to work setting or to personnel administration, and in morale. The variable captures residuals of conventional earnings function which contain such human capital variables as schooling and work experience alone. The effect of this variable is assumed to be linear and independent of the other variables.

The data for this variable are obtained from individual workers' merit rating points on the assumption that the firm's merit ratings correctly represent performance of the workers. All male employees, both blue-collar and white-collar workers, are evaluated twice a year under the merit rating scheme. The better one's performance is, the higher is his score. Therefore, the sign of the coefficient β_4 should be positive.

A question to be explained is whether or not the variable, EVAL, is statistically significant, i.e., whether the addition of this variable to the earnings function is relevant to the variations in the earnings. If it is statistically significant, one may conclude that the variations in the individual earnings are explained by, in addition to human capital stock, the variable which explicitly measures different responses of the employees with equivalent human capital to incentive earnings.

The dependent variables are the monthly basic salaries or the annual earnings of the individual employees.[19] The variables are in

units of natural log. As bonus payments contain greater proportions of incentive rates than monthly basic earnings do, the value of the coefficient β_4 in annual earnings function should be greater than in monthly salaries function. Analyses of both monthly salaries and annual earnings will clarify this point.

The analysis will be limited to a Japanese firm in the basic steel industry which has a long history of nenko employment practices. An establishment (which shall stay annonymous and shall be called Establishment Alpha hereafter) of a firm engaged in basic steel production is studied.

Equation (1) will be applied to the male white-collar workers and the male blue-collar workers. The variables EDUC and EVAL are dropped in the case of the female white-collar workers, because 99 percent of them are high school graduates and their merit rating points are not available.

Ordinary least square regressions are used on the cross-section observations of the 1,135 individual employees for the male white-collar workers, 5,278 for the male blue-collar workers, and 279 for the female white-collar workers. They constitute the entire work force of Establishment Alpha. Well-behaved residuals are assumed.

The Results

The regression results on the male white-collar workers are shown in Tables 1 and 2. Table 1 contains the results on monthly basic salaries and Table 2 annual earnings.

The results are similar between the monthly salaries and the

annual earnings. All the estimated coefficients are highly
significant,[20] and the variations in individual earnings are accounted
for by the combination of the human capital variables and the merit
ratings. The signs of the coefficients meet the expected signs; the
variable of formal schooling (EDUC), length of service (LOS), previous
work experience (EXP), and merit rating (EVAL) are positive. The
quadratic terms are negative, which means that work experience
elsewhere is not rewarding if it is too long [21] and that the marginal
rates of return to firm-specific work experience diminishes as one's

TABLE 1

REGRESSIONS ON MONTHLY BASIC SALARIES
MALE WHITE-COLLAR WORKERS

	1	2	3	4	5
CONSTANT	11.50638	10.91456	10.61542	10.42325	10.50697
EDUC	0.04904 (0.00323)	0.06314 (0.00148)	0.07911 (0.00122)	0.08265 (0.00115)	0.07758 (0.00119)
LOS		0.03896 (0.00059)	0.03994 (0.00044)	0.06191 (0.00126)	0.05981 (0.00122)
EXP			0.02813 (0.00093)	0.05425 (0.00219)	0.05110 (0.00211)
EVAL					0.01328 (0.00122)
EXP^2				−0.00074 (0.00009)	−0.00066 (0.00009)
LOS^2 + $2 \cdot LOS \cdot EXP$				−0.00063 (0.00003)	−0.00064 (0.00003)
R^2	0.16923	0.82802	0.90525	0.92734	0.93427

NOTE: The number of observation is 1135 individual employees. Standard errors are in parentheses.

The independent variables are,
EDUC; years of formal schooling,
LOS; length of service with the current employer,
EXP; years of work experience elsewhere, and
EVAL; performance ratings.

Salaries in natural log.

TABLE 2

REGRESSIONS ON ANNUAL EARNINGS
MALE WHITE-COLLAR WORKERS

	1	2	3	4	5
CONSTANT	14.41257	13.74220	13.40021	13.15678	13.28937
EDUC	0.05478 (0.00370)	0.07075 (0.00178)	0.08900 (0.00152)	0.09378 (0.00144)	0.08574 (0.00144)
LOS		0.04413 (0.00071)	0.04525 (0.00055)	0.07202 (0.00158)	0.06868 (0.00148)
EXP			0.03216 (0.00115)	0.06592 (0.00274)	0.06095 (0.00255)
EVAL					0.02103 (0.00148)
EXP^2				-0.00101 (0.00012)	-0.00088 (0.00011)
$LOS^2 +$ $2 \cdot LOS \cdot EXP$				-0.00076 (0.00004)	-0.00078 (0.00004)
R^2	0.16184	0.80978	0.88716	0.91279	0.92610

NOTE: See the note to Table 1.

length of service increases.[22]

Formal schooling alone accounts for 17 percent of the variations
in the monthly basic salaries and for 16 percent in the case of annual
earnings.[23] Formal schooling and length of service together explains
the majority of the variations in individual earnings; 83 percent in
the case of monthly salaries, and 81 percent in the case of annual
earnings. The sharp increase in the explanatory power is credited to
the latter variable, i.e., LOS, although the increase in the earnings
due to a unit increase in LOS are less than those which are due to an
increase in EDUC.[24]

Equations (3) through (5) show that work experience with the
current firm (LOS) is more rewarding than work experience elsewhere
(EXP) both in the case of the monthly salaries and the annual
earnings. This means that firm-specific experience is more valuable
than general experience. Monthly salaries reach the peak at forty-six
years of service and annual earnings at forty-four years of service.[25]
As the mandatory retirement age is fifty-five, workers' earnings keep
rising until retirement.

The annual earnings of new employees with college education are
greater than those of employees who have accumulated four years of
length of service after completing high school education. The diffe-
rence, however, does not make up the costs associated with college
education.[26] This is to say, investment in higher education is
rewarded to a limited extent.

The inclusion of the variable, merit rating (EVAL), increases
the explained variation of the earnings by .00693 (.8 percent) for the
monthly salaries (Equation 4 vs. Equation 5 in Table 1) and by .01331

(1.5 percent) for the annual earnings (Equation 4 vs. Equation 5 in Table 2). One-point increase in merit rating contributes to 1.3 percent increase in the monthly salaries and to 2.1 percent increase in the annual earnings. Omission of this variable biases upwards the effects of investment in education and postschool training. The higher sensitivity of the annual earnings than the monthly salaries suggests that the firm maintain flexibility in wage costs by adjusting bonus payments in response to individual worker's performance.

Table 3 and Table 4 contain the regression results for the blue-collar workers. Table 3 has to do with monthly basic salaries and Table 4 annual earnings.

The results on the monthly salaries and the annual earnings are similar. All the coefficients are significant, and the variations in the earnings are well explained by the sets of the human capital variables and the merit rating. The sign of the coefficients are as expected. The earnings profile are concave downward with respect to length of service or previous work experience, reflecting diminishing marginal returns to training. Monthly salaries peak at fifty-one years of service and annual earnings at forty-four.[27] Their earnings, therefore, continue to rise until retirement.

Firm-specific work experience is more important than previous work experience as a determinant of the individual earnings. These two types of work experience, however, are more important than completely general training like formal schooling. These results, therefore, show that the most important determinant of the blue-collar earnings is firm-specific work experience as a series of on-the-job

TABLE 3

REGRESSIONS ON MONTHLY BASIC SALARIES
MALE BLUE-COLLAR WORKERS

	1	2	3
CONSTANT	11.53166	11.49943	11.47686
EDUC	0.00622 (0.00066)	0.00627 (0.00062)	0.00616 (0.00058)
LOS	0.03279 (0.00014)	0.04068 (0.00032)	0.03674 (0.00034)
EXP	0.00965 (0.00019)	0.01475 (0.00044)	0.01691 (0.00043)
EVAL			0.01721 (0.00069)
EXP^2		-0.00014 (0.00003)	-0.00020 (0.00003)
LOS^2 + $2 \cdot LOS \cdot EXP$		-0.00027 (0.00001)	-0.00036 (0.00001)
R^2	0.93108	0.94008	0.94635

NOTE: The number of observations is 5278 individual employees. Standard erros are in parentheses.

See the note to Table 1.

training organized to promote the workers on the skill ladder step by step.

The inclusion of the variable, EVAL, increases the explained variations in the individual earnings by .00627 (.7 percent) for the monthly basic salaries and by .00949 (1.0 percent) for the annual earnings. One-point increase in merit rating increases the monthly

TABLE 4

REGRESSIONS ON ANNUAL EARNINGS
MALE BLUE-COLLAR WORKERS

	1	2	3
CONSTANT	14.36389	14.32389	14.13904
EDUC	0.00659 (0.00081)	0.00662 (0.00076)	0.00647 (0.00071)
LOS	0.03638 (0.00017)	0.04630 (0.00040)	0.04088 (0.00042)
EXP	0.01060 (0.00024)	0.01684 (0.00055)	0.01980 (0.00052)
EVAL			0.02369 (0.00003)
EXP^2		-0.00017 (0.00003)	-0.00025 (0.00003)
$LOS^2 +$ $2 \cdot LOS \cdot EXP$		-0.00034 (0.00001)	-0.00046 (0.00001)
R^2	0.91527	0.92654	0.93603

NOTE: See the note to Table 1.
The number of ofservation is 5278.

salaries by 1.7 percent and the annual earnings by 2.4 percent. The influence of this variable, EVAL, appears to be greater on the annual earnings than on the monthly.

Table 5 presents the results on the monthly basic salaries of the female white-collar workers, and Table 6 on their annual earnings. The coefficient for the sum of the quadratic term of length of service and interaction term of work experience elsewhere and length of service is not statistically significant, but all the other

coefficients are significant and have expected signs in both monthly and annual earnings. The explanatory power of the independent variables is high.

The length of service alone explains 85 percent of the variations in the monthly salaries and 60 percent of the variations in the annual earnings. The increment of monthly salaries due to a one-year increase in length of service (LOS) is greater than that due to a one-year increase in work experience elsewhere transferred to the

TABLE 5

REGRESSIONS ON MONTHLY BASIC SALARIES
FEMALE WHITE-COLLAR WORKERS

	1	2	3	4
CONSTANT	11.37553	11.35509	11.35349	11.35361
LOS	0.04449 (0.00111)	0.04166 (0.00076)	0.04169 (0.00076)	0.03590 (0.00325)
EXP		0.03102 (0.00168)	0.03513 (0.00267)	0.03778 (0.00302)
EXP^2			-0.00165 (0.00083)	-0.00328 (0.00122)
LOS^2 + 2·LOS·EXP				0.00112 (0.00061)
R^2	0.85281	0.93413	0.93506	0.93548

NOTE: The number of observations is 279 individual employees. The 99 percent of them are senior high school graduates. Standard errors are in parentheses.

TABLE 6

REGRESSIONS ON ANNUAL EARNINGS
FEMALE WHITE-COLLAR WORKERS

	1	2	3	4
CONSTANT	14.22509	14.17852	14.16132	14.16125
LOS	0.05710 (0.00282)	0.05066 (0.00215)	0.05098 (0.00193)	0.05410 (0.00834)
EXP		0.07067 (0.00476)	0.11480 (0.00680)	0.11337 (0.00775)
EXP^2			-0.01773 (0.00213)	-0.01685 (0.00312)
$LOS^2 +$ $2 \cdot LOS \cdot EXP$				-0.00060 (0.00156)
R^2	0.59625	0.77540	0.82068	0.82078

NOTE: See the note to Table 5.

current employer (EXP) (Equation 2 or 3 in Table 5). An increase in work experience affects the annual earnings much more greatly than an increase in length of service does. The percentage increment in the explained variance by experience elsewhere (EXP) is about 30 percent for the annual earnings and 10 percent for the monthly salaries (Equation 2 vs. Equation 1 in Table 5 or Table 6). The larger sensitivity of the annual earnings than the monthly salaries to experience elsewhere (EXP) means that general human capital is rewarded by higher earnings in the case of female employees. This is not true with male employees as mentioned before.

The elasticity of annual earnings with respect to transferred

experience (EXP) is greater than that of monthly earnings.[28]   Because

major difference between the monthly basic salaries and the annual

earnings is due to the bonus payments, general work experience seems

to be highly valued as a basis for female employees' bonus payments.

The above results point to considerable similarities in determi-

nants of the earnings profiles across different types of labor force;

the human capital variables are powerful explanatory variables for

variations in indivisual earnings for each major grouping of workers,

male blue-collar, male white-collar, or female white-collar workers.

But the same amount of education is not rewarded the same way between

males and females. This means that the employees are differentiated

to a great extent according to sex and that the rules of wage determi-

nation have been well established, subject to the status and sex

differentiation, and well implemented.

To recapitulate importance of the explanatory variables, firm-

specific experience (LOS) is a significant variable in explaining the

variations in the earnings of any category of the workers.[29]   On the

other hand, as a determinant of the earnings of the white-collar

workers, general training by formal schooling for male workers and by

previous work experience for female workers perform better in sta-

tistical explanation than firm-specific skill.

In order to clarify the influence of differences in individual

upon earnings, the bonus-monthly salary ratios (B/M) are regressed on

merit rating and length of service.[30]   Bonus payments related to the

length of service are negotiated between the firm and the union.

Determinants of the bonus payments include individual merit rating and

group incentive rating. The employer adjusts portions of bonus

payments according to these variables.[31]   The higher these ratings,
the greater the bonus payments, and therefore, the higher the (B/M)
ratio is.

The explanatory variables of the ratios are workers' merit
rating score and length of service. The merit rating score has a
direct bearing on bonus payments because, according to the bonus
payments rule, the score is linked to both of the determinants. The
variable, length of service, is an explanatory variable because longer
work experience with the current employer will result in greater
familiarization with work and greater skill accumulation, which may
enable a worker to obtain higher merit rating score.

The regression results are listed below:

(1) $(B/M)_w = .4194^* + .0499^* (EVAL)$ $\bar{R}^2 = .5981$

(2) $(B/M)_b = .2788^* + .0036^* (LOS)$ $\bar{R}^2 = .2432$

(3) $(B/M)_w = .6389^* (EVAL) + .3028^* (LOS)$ $\bar{R}^2 = .6714$

(4) $(B/M)_b = .3071^* (EVAL) + .3719^* (LOS)$ $\bar{R}^2 = .4398$

where (B/M) is the ratios of the annual bonus payments to the monthly
total salaries, and the subscript w stands for the white-collar
workers and b for the blue-collar workers. All the coefficients are
significant at the 1 percent level (the asterisk sign * indicates the
significance level of 1 percent).

Equations (1) and (2) show that, for male white-collar workers,
the variables that explain the largest portion of variations in
bonus-earnings ratios (B/M) is merit rating (EVAL), and for male
blue-collar workers, length of service (LOS). This result indicates
that individual performance is more important for white-collar and

group performance for blue-collar. The importance of group perform-

ance seems to be attributable to the production system which requires

team work.

Equations (3) and (4) show the standardized regression results.

An increase by one deviation in merit rating (EVAL) increases the

bonus ratio by .64 for the white-collar workers and by .31 for the

blue-collar workers. A similar increase in length of service (LOS)

increases the bonus ratio by .30 for the white-collar workers and

by .37 for the blue-collar workers. The merit rating play a greater

role in determining the bonus-earnings ratios (as measured) of the

white-collar workers.[32] It is clear that the bonus-earnings ratios

for white-collar and blue-collar are explained by the two variables

and that the relative importance of the variables differs subject to

the category of the workers, i.e., white-collar of blue-collar.

Conclusion

This study is about the determinants of individual earnings.

The Mincer-type earnings functions are estimated to clarify to what

extent the human capital variables and a new motivational variable are

relevant to individual earnings.

The human capital variables in this study are in two categories

of indices, i.e., one captures 'general' human capital endowments and

the other 'firm-specific' human capital. 'General' human capital

contains two variables, years of formal schooling (EDUC), and years of

work experience elsewhere (EXP). 'Firm-specific' human capital con-

tains a variable, length of service with the current employer (LOS).

These human capital variables are often used by studies in earnings, but do not depict differences in the performance of workers with identical investments in schooling and postschool training.

A new variable introduced here is designed to capture different responses of individual workers with identical human capital to wage incentives as a result of differences in morale, and in perception of the work setting or of the firm's personnel administration. The operational data for this variable are merit rating scores (EVAL) of the male employees. It is assumed that the firm's rating data cor- rectly represent differences of individuals and that EVAL is indepen- dent from other explanatory variables.

The data were obtained from the records on the individual employees at Establishment Alpha of a Japanese iron and steel firm. Ordinary least square regressions are run on the inter-personal data of the monthly salaries in 1977 and the annual earnings for April 1976 - March 1977.

The regression results of the earnings function clearly indicate that the human capital variables as a whole are relevant to the study of variations in the individual earnings of structured groups of workers, male blue-collar, male white-collar, and female white- collar. This supports the hypothesis that the earnings of the firm are decide on an economically rational basis.

Firm-specific work experience (LOS) among the independent varia- bles is the most relevant variable to the explanation of the earnings of all the three categories of workers as mentioned above. The firm places high values on specific human capital.

As a determinant of the white-collar earnings, general training

is also important when the other variables are kept constant, i.e.,
investment in formal schooling (EDUC) for male white-collar, and
investment in general work experience (EXP) for female white-collar
workers.

For male earnings, merit rating (EVAL), which is a new variable
used in this study for the first time, is found to be more relevant to
the annual earnings than to the monthly salaries. This is because the
firm rewards better employees by paying larger bonuses. The firm
reserves flexible portions in the wage payments by adjusting bonuses
which, on the average, amount to about a third of annual earnings.
Omission of merit rating (EVAL) biases upwards the effects of the
conventional human capital variables on individual earnings. Individ-
ual employees with similar human capital do respond in different ways
to wage incentives.

The bonus-monthly salary ratios (B/M) are regressed on merit
rating (EVAL) and length of service (LOS) in order to analyze the
effects of individual performance and firm-specific skills. The
results are that the bonus-salary ratios are explained by these
variables, and that individual performance more strongly influence the
bonus-salary ratios of the white-collar workers than those of the
blue-collar workers, and that These findings appear to show that job
competition among white-collar is severer than among blue-collar, and
that the firm differentiates these two types of work force in its
compensation schemes.

The findings clearly show that the firm differentiates its work
force into three groups and perpetuates their sub-markets within its
internal labor market. Earnings are determined on the basis of the

similar variables across the groups but with different weights; the conventional human capital variables are important determinants and the motivational variable captures essential portions of the residuals. The sub-markets for male white-collar and male blue-collar workers are interrelated with each other by the firm's formal classification examinations for which employees with certain years of service are eligible to apply and switch their career tracks. In contrast, male and female sub markets are independent of each other.

FOOTNOTES

1 Jacob Mincer, "On-the-job Training: Costs, Returns , and Some Implications," Journal of Political Economy 70 (5), Part 2, Supplement (October 1962):66-72.   Becker, Human Capital, pp. 7-29.   Gary S. Becker, Human Capital, (New York: National Bureau of Economic Research, 1964)

2 General training is defined as the training which is useful in many firms beside those firms that provide the training (Ibid, p. 11).   Specific trainig is defined as the training which increases the trainee's productivity only within the firm that provide the training and has no effect on productivity of the trainee in other firms (Ibid, p. 18).

3 Oi (1962) regarded the trained work force as a quasi-fixed factor of production, but it did not distinguish the different types of training which might have different impacts on the degree of fixity.   Walter Y. Oi, "Labor as a Quasi-Fixed Factor," Journal of Political Economy 70 (December 1962):538-555.

Pencavel (1972) and Parsons (1972) applied the concept of specific human capital to their analyses of labor turnover (and wage determination).   However, the operational variables for the specific human capital do not distinguish specific from general human capital. John H. Pencavel, "Wages, Specific Training, and Labor Turnover in the U.S. Manufacturing Industries," International Economic Review 13 (February 1972):53-64.   Donald O. Parsons, "Specific Human Capital: An Application to Quit Rates and Layoff Rates," Journal of Political Economy 80 (November/December 1972):1120-1143.   Idem, "Models of Labor Market Turnover: A Theoretical and Empirical Survey," in Research in Labor Economics, vol. 1, ed. Ronald G. Ehrenberg (Greenwich: JAI Press, 1977), pp. 185-223.

4 Becker, Human Capital, pp. 20-21.

5 Yoko Sano and Atsushi Nakamura, "Wage Differentials and Education: Age-Wage Profiles in Japanese Manufacturing Industry," The Fifth Far Eastern Meeting of the Econometric Society (June 1970), p. 15.

6 Vladimir Stoikov, "The Structure of Earnings in Japanese Manufacturing Industries: A Human-Capital Approach," Journal of Political Economy 81, Part 1, (March/April 1973):340-355.

Stoikov (1973b) concludes that wage differentials which had been ascribed to differences in firm-sizes were explained almost exclusively by differences in human capital.   This conclusion is based on the result of the AID analyses outcome of which migth be subject to spliting criteria of the branching process.   In fact, the size variables used in the regression analyses were positive and significant (the Models 1 and 2), which clearly shows the existence of the positive size effect.   Idem, "Size of Firm, Worker Earnings, and Human Capital: The Case of Japan," Industrial and Labor Relations Review 26 (July 1973):1095-1103.

7 Kuratani, "A Theory of Training, Earnings, and Employment,"
p. 48. Shimada, Earnings Structure and Human Investment, p. 81.
    Masatoshi Kuratani, "A Theory of Training, Earnings, and
Employment: An Application to Japan," (Ph.D. Dissertation, Columbia
University, 1973). Haruo Shimada, Earnings Structure and Human
Investment: A Comparison Between the United States and Japan, (Tokyo:
Kogakusha, 1981).
    The importance of length of service in Japanese monthly wages
(including the fraction of the annual bonus payments) was also
observed by Tachibanaki (1975). Toshiaki Tachibanaki, "Wage Determi-
nation in Japanese Manufacturing Industries--Structural Change and
Wage Differentials," International Economic Review 16 (October
1975):562-586.

    8 Masanori Hashimoto, "Bonus Payments, On-the-job Training, and
Lifetime Employment in Japan," Journal of Political Economy 87
(October 1979):1086-1140.

    9 Mincer (1974) recognizes the needs for better operational
variables that indicate post-school investment activity, and referred
to the importance of investigating work history of individuals. This
is because it is not the time spent on a job but investment activity
which generate earnings. Jacob Mincer, Schooling, Experience, and
Earnings (New York: Columbia University Press, 1974), p. 143.

    10 Alchian and Demsetz (1972) discussed the subject of the team
production. But studies of organizational behavior (Wakabayashi,
1980, for example) have shown that interaction among workers with the
same human capital resulted in significantly different outcomes, and
suggested that outputs would not be a simple summation of the members'
productivity. Armen A. Alchian and Harold Demsetz, "Production,
Information Costs, and Economic Organization," American Economic
Review 62 (December 1972):777-795. Mitsuru Wakabayashi, Management
Career progress in a Japanese Organization (Ann Arbor: UMI Research
Press, 1980), Chapter 9.

    11 The following discussion on employment as an implicit contract
is benefited from the Economics Workshop at the University of Hong
Kong, in addition to Baily (1974), Azariadis (1975), and Okun(1981).
Martin N. Baily, "Wages and Employment under Uncertain Demand," Review
of Economic Studies 41 (January 1974), pp. 37-50. Costas Azariadis,
"Implicit Contracts and Unempoyment Equilibria," Journal of Political
Economy 83 (December 1975) pp. 1183-1202. Arthur M. Okun, Prices and
Quantities: A Macroeconomic Analysis (Oxford: Basil Blackwell, 1981),
pp. 62-67, and pp. 81-92.

    12 Okun, Price and Quantities, pp. 62-63.

    13 Williamson et al., (1975) and Williamson (1975) discussed a
theoretical possibility that the utilization of internal labor markets
could be less costly than using external labor markets when market
failure exists. Oliver E. Williamson, Michael Wachter, and Jeffery E.
Harris, "Understanding the Employment Relations: The Analysis of

Idiosyncratic Exchange," Bell Journal of Economics 6 (Spring 1975):250-277. Oliver Williamson, Markets and Hierarchies: Analysis and Antitrust Implications (New York: Free Press, 1975), Chapter 4.

14 Japanese labor unions have been making efforts to achieve these objectives. Taishiro Shirai and Haruo Shimada, "Japan," in Labor in the Twentieth Century, ed. John T. Dunlop and Walter Galenson (New York: Academic Press, 1978), pp. 259-262.

Doeringer (1974) summarizes that the most significant effect of collective bargaining is "upon the organization of work, the stability and security of employment." Peter B. Doeringer, "Low paid workers, Labor Market Dualism, and Industrial Relations," OECD, Wage Determination (Paris: OECD, 1974), pp. 34-35.

15 David Mayers and Richard Thaler, "Sticky Wages and Implicit Contracts: A Transactional Approach," Economic Inquiry 17 (October 1979), p. 559.

16 Oliver E. Williamson, "Transaction-Cost Economics: Governance of Contractual Relations," Journal of Law and Economics 22 (October 1979), pp. 233-234.

17 Ibid, pp. 254-258. Okun, Price and Quantities, pp.62-77, and pp. 81-92.

18 Age is not used because skill levels are more closely related to length of service than to age (see Chapter III for the source), and because earnings appear to be more closely correlated with length of service than with age (Sano 1977, Mincer 1974, Hanusheck and Quigley 1978).

Yoko Sano, "Seniority-Based Wages in Japan--Survey," Japanese Economic Studies 5 (Spring 1977):48-65. Jacob Mincer, Schooling, Experience, and Earnings, p. 47. Eric A. Hanusheck and John M. Quigley, "Implicit Investment Profiles and Intertemporal Adjustment of Relative Wages," American Economic Review 68 (March 1978):67-69.

19 Monthly basic salaries are the "wage rate" per month. All the employees of the firm, regardless of their job, are paid by the month. There is no such distinction as wages and salaries in this firm. The working days are twenty-five days a month. The working hours on weekdays are eight hours a day. The monthly basic salaries do not contain any overtime allowances. Therefore, an adjustment of the earnings by working hours is not necessary. The data are the salaries of a specific month in 1977.

The annual earnings are the sum of the annual bonuses in 1976 and the total monthly salaries multiplied by twelve. The term corresponds to the Japanese fiscal year April 1976 - March 1977.

20 This is partly due to the large sample size.

21 Differentiating Equation (4) in Table 2 by (EXP), we get

$$\frac{\partial (lnY)}{\partial (EXP)} = .6592 - 2(.00101)(EXP) - 2(.00076)(LOS).$$

This shows that the marginal rate of return to work experience elsewhere is decreasing.

22 The quadratic term of length of service contains the interaction term between LOS and EXP in Equations (4) and (5). An estimation excluding the interaction term yields a similar result reported in Tables 1 and 2; the coefficient of LOS^2 is negative and significant at the 1 percent level.

23 These values of R^2 are greater than Mincer's findings on the U.S. case, although the samples are not adequate for a strict comparison. Jacob Mincer, Schooling, Experience, and Earnings, p. 92.
The coefficient, EDUC, has greater value than Kuratani's estimation on returns to formal schooling. This may partly because the observation in this text is limited to a large-size firm, which implies that investment in schooling is more rewarding if one finds a job in a large firm than in a smaller firm. Kuratani, "A theory of Training," pp. 61-62.

24 The results of Shimada's cross-section analysis on the wage rates of the male workers in Japanese manufacturing industry also show that the coefficient of formal schooling is greater than that of length of service or work experience elsewhere. Shimada, Earnings Structure and Human Investment, Chapter IV.

25 Calculated from Equation (5) in Tables 1 and 2. The U.S. experience-earnings profiles appear to rise steeper at the initial stage, then level off and peak at around forty years of service (Mincer 1974, pp. 67-69. Shimada 1981). In contrast, Japanese profiles keep rising at decreasing rates until retirement.

26 The annual earnings of a new employee with college education amount to 3,423.00 dollars and that of high school graduate with four years of service is 3,099.74 dollars (Equation 4 in Table 2).

27 Calculated from Equation (3) in Tables 3 and 4.

28 The elasticity,

$$\frac{\partial (Y)}{\partial EXP} \Big/ \frac{Y}{EXP}$$

for monthly and annual earnings of the female workers with three years of service are, with one year work experience elsewhere (EXP), .0029 and .0067, and with three year EXP, .0078 and .0340, respectively. Calculated from Equation (3) in Tables 5 and 6.

29 The explained variance by LOS alone amounts to 61 percent in the case of the white-collar monthly salaries, 62 percent in its annual earnings, 84 percent in the case of blue-collar monthly salaries, and 88 percent on its annual earnings.

30 Hashimoto (1979) analyzes bonus-earnings ratios in relation to conventional human capital variables. It does not, therefore, clarify differences in the ratios among workers with identical human capital.

31 "The Bonus Payments Rules," (Establishment Alpha, 1976).

32 A reason why the two variables explain the variations in blue-collar bonus ratios less than those in white-collar is that the blue e-collar bonuses are linked to physical productivity of the establishment as a whole. This productivity is partly conditioned by product markets which are exogeneous to the specification of Equation (4).

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