93-F-10

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Acknowledgment: This is a revised version of the paper presented at the Hakone Conference, March 17-19, 1993, Hakone, Japan and at the International Workshop, "Europe, Japan and the United States: Technological Progress and Financial Structure" Turin, Italy, April 1-3, 1993. The authors are grateful to D. Anthony, Giorgio Brunello, Michio Morishima, Kiyohiko Nishimura, Isao Ohashi and other participants of the conferences for helpful discussions and criticisms. The authors are also grateful to Clint Cummins, Yuji Genda, Naoto Kunitomo, Paul Ryan, Kei Takeuchi and William Dickens, in particular, for helpful comments and suggestions during the various stages of our research. Financial supports from the Ministry of Education and the Labour Research Center are gratefully acknowledged.

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1. Introduction

The duality of the labour market, one primary and the other, secondary, has now become a commonly accepted notion among economists.

The primary market is characterized by the existence of much learning and training on the job and by that of well-established rules and practices in the hosting organization concerning employment adjustment and wage formation. The secondary market, on the other hand, is associated with little learning on the job (often "dead end" jobs) and the workers are exposed more directly to the flimsiness of the market conditions. In terms of income distribution workers who belong to the former receive high rates of return on both schooling and experience and generally tend to receive high pay, while workers in the latter tend to receive low pay with little increment on either schooling or experience.

An additional proposition that is not necessarily accepted by all is that such differences in the patterns of pay as described above cannot be explained away by the principle of equalizing difference. The dual labour market hypothesis, as it is called, posits that the primary sector jobs are rationed.

Such theoretical issues aside, well-developed primary labour markets

with stable employment practices exemplarily found in large-scale manufacturing firms have been regarded by many economists as one, if not the most, major source of high productivity and competitiveness of the Japanese manufacturing industry. Series of energetic field interviews conducted by Koike and others have certainly contributed to our understanding of the working of the primary labour markets and the nature of skills accumulated in Japanese firms, the blue-collar workshops, in particular. Although limited in scope and depth, small scale manufacturing firms are also found to be developing qualitatively similar learning environment as large-scale firms (Koike [1981]). Furthermore, the flexibility of horizontal information flow between large-scale assembly firms and small-scale parts suppliers, thus establishing a network of primary labour markets, is pointed out as an additional source of productive efficiency in Japan (Asanuma [1989], Aoki [1988]).

The strength of primary labour markets in Japan is said to have attested by the fact that when log-earnings functions are estimated the tenure (i.e., internal experience) variable consistently attains a large positive coefficient in contrast to that of the general experience variable (Shimada [1981], Hashimoto-Raisian [1985]).

Hesitation remains on the part of some researchers including ourselves to accept such a feature as representative of the Japanese labour market. In the first place, despite the often made calls to the effect that the dual economic structure (with exploitation of the small by the large) has already ceased to exist in Japan there remains large and undiminished wage differentials between firms of different sizes and those between men and women. In the second place, no one has yet measured the actual scale of the primary sector vis-à-vis that of the secondary sector in the context of the Japanese labour market. It is the very purpose of this paper to fill this particular

gap in the existing literature.

More concretely, this paper examines if the duality of the supposed kind actually exists in the Japanese labour market and simultaneously measures the extent to which workers spread over the two sectors. It also answers to the question of where primary and secondary workers are found and whether or not there has been a change over time in the composition of workers between the two sectors.

The methodology employed here is that of the switching regression developed by Goldfeld=Quandt [1976] and successfully applied by Dickens=Lang [1985], [1987] to the same issue in the context of the U. S. labour market. Our study not only confirms the existence of the supposed duality but also shows the pervasiveness with which the secondary sector covers the entire Japanese labour market. Moreover, secondary jobs are not compensated for by earnings over time nor by non-pecuniary advantage such as short working hours. This feature is confirmed by a formal test of rationing. Finally, there appears to be a tendency for the secondary sector to expand over time.

This paper is organized as follows. Section 2 briefly explains the basic methodological apparatus. Section 3 explains the nature and coverage of the data we use. Section 4 discusses the specification and presents the basic results of the switching regression model. The characteristics of the primary and secondary sectors as reavealed from the data and the factors governing the assignment of workers between the two sectors are discussed. Section 5 examines the possibility that assignment of workers between the two sectors are governed by voluntary choice on their part. It shows that there, in fact, exists an involuntary queue of workers to the primary labour market. Section 6 examines the composition of workers between the two sectors and the changes thereof during the period of 1980-1990. Section 7 then turns to

discuss the levels of wage and work hours for each sector, confirming that the conditions of employment in the primary and secondary sectors are not in the relationship of equalizing difference. Section 8 discusses further the characteristics of the secondary sector and the significance of firm-size wage differentials found by our model. Section 9 concludes by summarizing the findings and discussing the qualifications of our analysis.

2. The Basic Methodological Framework

While postulating the existence of duality in the labour market is one thing, testing it empirically is quite a different matter. In fact, the dual labour market hypothesis has originally been derived inductively through a series of detailed field studies focusing on workers of particular firms or localities (Ujihara [1954], Doeringer=Piore [1971], Piore[1973]).

A breakthrough at formal statistical testing was achieved by Dickens= Lang [1985][1987], applying the methodology of a switching regression model with unknown regimes to the U. S. micro-data.

The basic idea of this methodology is as follows. The labour market is supposed potentially to have two sectors with different earnings functions, and attachment of each worker to one sector or another is controlled by a certain structure called a switch. The switch consists of both observable characteristics of an individual as well as his or her work place and unobservable or random elements that are uncorrelated with the observables. Starting with a micro-data set on individual earnings one then sees if the explanatory power is significantly enhanced by actually allowing for the existence of two separate earnings functions and endogenously allocating individuals to each sector, as compared with the case that allows for only a single earnings function to govern all workers.

More formally, let X be a vector of observable explanatory variables for log-earnings and let Z be a vector of the observable explanatory variables of the switch equation. Error terms on the earnings functions are denoted as ε_p and ε_s while that of the switch is denoted as ε_c. The two earnings functions and the switch equation are written as

$$\ln W_i = X_i\beta_p + \varepsilon_{pi} \qquad (1)$$

$$\ln W_i = X_i\beta_s + \varepsilon_{si} \qquad (2)$$

$$y_i^* = Z_i\gamma + \varepsilon_{ci} \qquad (3),$$

where ln W expresses log earnings, y^* represents a latent variable associated with the switch. The subscripts p and s correspond to the supposed primary and secondary sectors, respectively, and the subscript i stands for each individual. Our supposition is that $y_i^* > 0$ corresponds to the fact that the individual i belongs to the primary sector, in which case the earnings function (1) applies, while $y_i^* \leq 0$ corresponds to the fact that the individual belongs to the secondary sector. In the latter case the earnings function (2) holds. The vectors X and Z are assumed to be the exogenous. The error terms are assumed to be independent across different individuals and are assumed to be jointly normal with zero means. (The variance of ε_{ci} is set to unity as a form of normalization.)

Given the samples on observable variables $(\ln W_i, X_i, Z_i)$ an iterative maximum likelihood procedure is employed to estimate the parameters β_p, β_s, γ, σ_p^2, σ_s^2 and the covariances between the error terms σ_{pc} (for ε_{pi} and ε_{ci}) and σ_{sc} (for ε_{si} and ε_{ci}). The intuitive account of this procedure is that, in each iterative phase of the estimation, a probabilistic assignment of each individual to the respective sector is made (i.e., it is implied by the assumed coefficients), and using these probabilities as weights the expected value of the residuals of the two earnings functions are calculated, whose

sum over individuals is then minimized. Only under the special circumstance that β_p and β_s, on the one hand, and σ_p^2 and σ_s^2, on the other, become equal will the switch equation become meaningless and our model is collapsed to the ordinary least squares model. The major hypothesis testing involves whether there exist statistically significant differences between those parameters[1].

The strong merit of this approach is that one does not have to impose any prior classification of individuals in estimating the character of two sectors. The appropriateness of the supposition of two sectors vis-à-vis a single sector is judged by the data. The same methodology is employed below in understanding the structure of the Japanese labour market.

As hinted previously only a probabilistic inference can be made concerning the sector to which each worker belongs. More formally, the probability refers to the posterior probability of a worker with observation $\{\ln W_i^o, X_i^o, Z_i^o\}$ belonging to the primary sector, which is defined, using the Bayes theorem, as

$$\text{Posterior Probability of Worker i being in the Primary Sector} = \frac{\Pr\{\varepsilon_{pi} = \ln W_i^o - X_i^o\hat{\beta}_p \text{ and } \varepsilon_{ci} > -Z_i^o\hat{\gamma}\}}{\Pr\{\ln W_i = \ln W_i^o\}} \quad (4)$$

where $\hat{}$ indicates the estimated value of the coefficient. It also follows that

$$\text{Posterior Probability of Worker i being in the Secondary Sector} = 1 - \text{Posterior Probability of Worker i being in the Primary Sector.}$$

This estimated posterior probability measure is extensively used in the classification of workers into the primary and secondary sectors and in the measurment of the overall scale of the two sectors.

3. Data

The Micro-data tape of the Basic Survey on the Structure of Wages

(usually abbreviated as the Wage Census) conducted by the Ministry of Labour during the months of June of 1980 and 1990 is used with a special permission from the Ministry of Labour and the Management and Coordination Agency. In view of the extreme size of the samples (about 1.4 million individuals in each year) a weighted random resampling (to reflect the original sample weights) was conducted to arrive at roughly 15,000 samples for each year.

Our data refers to ordinary employees in private firms employing 10 or more regular employees. The employees may include managers on regular payroll and having regular task assignments but with no representative rights. We have subsequently excluded workers with monthly regular work hours less than 60 hours and also excluded part-time workers. The latter category of workers was unwillingly excluded because no record of schooling was given for them in the 1990 data[2)].

The workers are further classified into blue-collar(production) and white-collar (non-production) workers for the three single-digit industries, mining, construction and manufacturing. No such classification is available for other industries. Supervisory personells on the shop floor (such as foremen) and engineers are classified as white-collar workers.

A natural question that may occur to the reader would be how large a population of Japanese workers does the Wage Census cover, and it may be worthwhile to settle this issue at the outset. Table 1 is prepared from figures collected in the published tables of the Employment Status Survey (Bureau of Statistics) 1982 and 1987. This table gives, for each sex, the composition of the total working population in terms of size and form of the work place. Although there are some intricate definitional differences (in contrast to the Wage Census) with respect to such employment categories as regular and part-time work and also the firm size variable in the Employ-

ment Status Survey is probably subject to reporting errors on the part of respondents, unadjusted figures given in this table may still be adequate for the purpose of obtaining a rough idea.

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Table 1
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In the table the categories of workers covered by the Wage Census are surrounded by a thick bracket. In 1987 such categories amounted to 55.6% of the male working population and 33.2% of the female working population. When male and female workers are combined the coverage becomes 46.7% of the entire working force. The smallness of these figures emanates from the fact that workers in very small work places having less than 10 regular employees constitute roughly one-third for men and a little less than half for women. An additional source comes from the widely noted fact of the large and rapidly increasing proportion of women working in part-time jobs.

Returning to the Wage Census data, Tables 2 and 3 give the summary characteristics of our samples[3]. In the table tenure in the firm refers to the number of years worked in the current firm while external experience is defined as {age - 6 - schooling years - tenure in the firm}. The well-known M-shaped curve of the labor participation rate of women implies that this variable does not necessarily represent full-fledged labor market experience for them. As expected the average years of tenure are considerably lower for women in contrast to men, but during the course of the past decade years of tenure have been on the increase in return for a matching decrease in external experience. Another notable feature of the changes over the past decade is an increase in the level of schooling as indicated by the composition of workers with respective educational attainments.

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Table 2
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Table 3 also summarizes the average hours of work per month and various alternative measures of pay. Hourly total wage, which is chosen as the main dependent variable of our analysis, is defined as the sum of monthly regular earnings, monthly extra earnings and one-twelfth of the annual bonus payment divided by monthly total work hours. Two points are worth noting.

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Table 3
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First, there exists a significant pay differential between men and women. In terms of average hourly pay it amounts to about 60%, while in terms of monthly earnings the difference is somewhat larger. Younger age on average and smaller average years of tenure in the firm for women as compared with men provide some part of the explanation behind such a large difference, but as will be seen in a moment there are other sources of explanation. Furthermore, the difference appears to be undiminished over the past decade.

Second, in terms of Gini ratios the degree of wage dispersion is much larger in terms of total earnings as compared with regular earnings. This is an expected result. The dispersion is much larger for hourly wage rates than monthly earnings (for both regular and total categories), the implication being that workers tend to compensate a smaller hourly pay by working longer hours. Furthermore, in terms of every category of pay there appears to have been a mild increase in the dispersion over the past decade.

4. Specification and the Result of the Switching Regression Model

Turning to the actual specification of the model the main assumption that is maintained throughout this and the following two sections is that the two earnings functions (if they exist) that define the characteristics of duality remain identical over the decade 1980-1990 except possibly for changes in the constant term to reflect productivity increases. Such an assumption facilitates a reasonable form of normalization when we evaluate the changes in the composition of workers over the decade between the putative dual segments. This implies that we pool the samples of 1980 and 1990 together in the estimation process.

The vector of explanatory variables X and the vector of switching equation Z are chosen as follows:

X = (Const., Metro3, Large, Small, Female, Ed, Exp, Fexp, Tenure, Ftenure, Exp^2, $Fexp^2$, $Tenure^2$, $Ftenure^2$, Yr90)

Z= (Const., Metro3, Large, Small, Female, Ed, Age60)

where

Const. ..... constant term,

Metro3 ..... dummy variable (1=yes and 0=no, hereafter the same) to represent if the work place is located inside the three major metropolitan areas, Tokyo, Nagoya and Osaka,

Large ..... dummy variable to represent if the firm employs 1000 or more regular employees,

Small ..... dummy variable to represent if the firm employs less than 100 (i.e., 10-99) regular employees,

Female..... female dummy

Ed ..... number of schooling years (junior high school=9, high school =12, junior college=14, college and above= 16),

Exp ..... number of external experience defined as age - schooling years - 6 - tenure in the firm,

Exp^2, FExp, $FExp^2$ ..... Exp squared, cross product term of Female and Exp, and that of Female and Exp squared, respectively,

Tenure ..... number of years of tenure in the current firm,

Tenure^2, Ftenure, Ftenure^2 ..... Tenure squared, cross product term of Female and Tenure, and that of Female and Tenure squared, respectively,

Age60 ..... dummy variable to represent if the worker's age is above 60,

Yr90 ..... annual dummy for 1990.

Note that the base of dummy variables in the two earnings functions resides in a male worker employed in a medium size firm (with 100- 999 regular employees) outside the three major metropolitan areas.

Our choice of variables Z for the switching equation implies that allocation of individuals between the two sectors is assumed to be determined prior to any labour market experience. The work experience itself is assumed not to affect this allocation except possibly for alteration by old age, as represented by Age60. Despite the rise in the level of social security benefits over the last two decades still much of the Japanese elderly men seek to find the so-called "second work life" even after the mandatory retirement age. There is then a good possibility that their attachment to a particular sector is discontinued at the time of the mandatory age (which is concentrated at around age 60).[4] Other comments follow regarding our specification.

First, firm size variables (Large, Small) enter into both the earnings functions and the switching equation, the latter purporting to represent any difference in employment opportunity directly or indirectly caused by firm size. The oft-cited lack of financial as well as human resources to facilitate worker training on the part of small firms is an important source of the indirect effect of firm size. (Another possible interpretation is noted in Section 8.)

Second, the variable Female in the switching equation evaluates the

effect of femaleness itself on the employment opportunity of female workers that are independent of educational background. Cross terms of Female and both kinds of experience variables appearing in the earnings equations measure how differently experience variables operate among different sexes.

The pooled regression results, both the OLS and switching regression estimates are presented in Table 4. It may at once be noted that the coefficient estimates are almost all very precise.

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Table 4
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The OLS estimates reproduces the features that are by now quite familiar to economists who have studied the Japanese labour market. Schooling has a fairly high rate of return (8.1%) and internal experience (tenure) is more highly rewarded than external experience for men (5.5% for the former and 2.4% for the latter, each evaluated at zero experience). External experience is heavily discounted for women. For workers with the same sex, geographic area, education and experience there remains 30.9% difference between large and small firms in terms of hourly total wage. There also remains 11.6% disadvantage on the part of women that cannot be accounted for by the variables we have included.

While the OLS estimate itself has a fairly high R^2 of .65, further improvement in the value of log-likelihood is astounding once we allow for dual regimes. In fact, the null hypothesis of a single regime is decisively rejected by the likelihood ratio test.

Are the characteristics of the estimated dual regimes conformable to what have been envisaged in the dual labour market hypothesis? The answer seems to be almost a resounding yes. The only anomaly is the existence of a non-negligible positive rate of return to tenure in what is interpreted as

the secondary sector. As is apparent from the coefficient estimates of the earnings functions, one of the dual regimes termed the primary sector pays a rate of return of 9.0% on education, 3.8% on external experience and 7.7% on tenure (the latter two evaluated at zero experience) for male workers, while the other regime termed the secondary sector pays a rate of return of only 0.8% on education, 1.1% on external experience and 4.0% on tenure (the latter two evaluated at zero experience) again for male workers.[6] The rates of return on both kinds of experience differ significantly between men and women.

The nature of wage increment for each sex in each regime can well be illustrated by the wage manifolds in Figures 1(A) and 1(B) that are drawn on the basis of our estimates. The primary sector is seen to be characterized by a rather steep manifold while the secondary sector is characterized by a relatively flat manifold. (In drawing these manifolds variables other than tenure and external experience are set to their sample mean values or mean compositions calculated for each sex over the pooled data). The wage manifold of the primary sector on the part of women is a flatter one in both directions as compared with that for men. The marginal rate of return for tenure tapers off much more quickly than men and that for external experience is only just a little more than negligible. The manifold of the secondary sector is almost completely flat, with rewards for external experience even falling a little first and then rise again. In any case the vertical distance between the manifolds of the primary and secondary sectors is thus far less than that for men.

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Figure 1(A,B)
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These figures make it clear that the two regimes are very different both

for men and for women and that the customary characterization of wage increment based on OLS estimates which we confirmed above may be over-simplified and even quite misleading as the description of the Japanese labour market.

Several observations concerning the result of estimation are in order. First, Metro3 is statistically significant only for the secondary sector. The hourly wage rate in this sector is about 11% higher in three major metropolitan areas than elsewhere. The secondary sector is thus interpreted to be more compartmentalized geographically than the primary sector.

Second, the firm size difference is diminished as compared with the OLS estimate, and perhaps more substantively, that for the primary sector is much larger than that for the secondary sector.

Third, just like Metro3 the female dummy variable is statistically significant only for the secondary sector. The estimated differential against men in the same sector comes to 24.5%[7]. Because the wage manifold in the secondary sector is completely flat for women, while that for men rises somewhat as tenure is accumulated, the wage gap between men and women increases with age in the this sector. In the primary sector the female dummy is not significantly different from zero. This implies that in this sector there is no difference in the wage rate between men and women at the initial stage of employment, yet the difference continues to expand even when women accumulate tenure in the firm.

Fourth, there has been about 14% autonomous increase in the wage rate over the decade for both the primary and the secondary sectors which may be attributed to an overall productivity increase.

Now for the switching equation. A coefficient of the switching equation

measures the direct impact of a unit increase in the right-hand variable on the tendency to belong to the primary sector. The cumulated normal density curve translates such an impact into an increment in probability terms. Because of high non-linearity involved especially in the upper and lower tails, the same additional impact does not add much in the form of probability increase for workers who are already in advantaged positions. The same is true for a negative impact in the case of workers who are already in quite disadvantaged positions. The impact does translate into probability terms almost linearly for workers in an intermediate range.

With these remarks in mind the coefficients of the switching equation are discussed in turn. Overall there has been a decrease in the tendency to belong to the primary sector. This is apparent from the change in the constant term. The decline has occurred for workers of all firm sizes, areas, and education.

Second, the gap between large and small firms has diminished slightly (.247-.192=.056), and also the gap has shifted from that between medium and small firms to large and middle firms. In other words, the primary sector has come to be relatively more concentrated in large firms; small and medium firms are more and more bunched together than previously.

Third, education is clearly an important factor, and there is an indication (though statistically only marginally significant) that it is somewhat becoming increasingly so. The differential impact between high school and college is 1.18(=.295x4) for 1980 and 1.28(=(.295+.0238)x4) for 1990, and it has expanded. Increased importance can naturally be traced to the popularization of higher education. The paradox, however, is that getting more education is necessary but not sufficient in obtaining employment in the primary sector (Thurow [1975]), which is why the the differential has not

increased visibly.

Fourth, the disadvantage that female workers had in obtaining employment opportunity in the primary sector independent of education and other variables, as measured by the coefficient of female dummy(-.174 in 1980) has disappeared in 1990. It remains to be seen if this feature is not just an accident due to business cycle factors. (We have already noted, however, that there yet exists substantial wage differences between men and women in the primary sector.)

Fifth and finally, the severe disadvantage that the elderly workers had to undergo (as measured by the coefficient of Age60) has been slightly diminished.

5. A Formal Test of Rationing

An important assumption associated with the switching equation above is that individuals are rationed with regard to the primary job. One can argue, however, that individuals are voluntarily choosing at the start of their occupational career which type of employment opportunity they would take. Individuals are then considered to make a choice by comparing the present value of the lifetime earnings stream expected to arise from each type of job with a possible allowance for taste concerning the nature of employment. By assuming that the current earnings functions of each job type preside over in future and that individuals remain employed in the same job type once the choice is made, one arrives at certain cross-equation constraints on the coefficients of the switching equation, which can then be tested against the data. This is the basic idea behind Dickens-Lang's test of rationing.

Following Dickens-Lang and modifying a little to take account of the presence of female workers in the sample the same test of rationing is replicated below for our data. (The samples are limited to those of 1980.)

Suppose a simpler version of the earnings functions characterized by the vector of explanatory variables

X = (Const., Metro3, Female, Ed, Ex, Fex)

where Ex and Fex are newly defined variables

Ex ..... number of post-school experience (i,e., the sum of external experience and years tenure in the current firm)

Fex .....the cross product of female and Ex,

and other variables are as defined previously. The experience variables for men and women are introduced separately to reflect the fact that experience may mean quite a different thing between them.

With the assumption of a common expected growth rate of the wage rate, g, and a common discount rate, δ, the expected present value of income generated by consecutive employment in each job type j is expressed by

$$PVj = \frac{\exp\{\beta_{jo} + \beta_{j1}\cdot Metro3 + \beta_{j2}\cdot Female + \beta_{j3}\cdot Ed + \varepsilon_j\}}{\delta - g - \beta_{j4} - \beta_{j5}\cdot Female} \qquad (j = p, s)$$

where ε_j, as before, is a random component specific to each worker. (The subscript i is omitted for brevity.) The hypothesis of voluntary choice is then expressed by the criterion

$$\frac{PV_p}{PV_s} \begin{cases} > \\ = C \\ < \end{cases} \Leftrightarrow \begin{cases} \text{primary} \\ \text{indifferent} \\ \text{secondary} \end{cases}$$

where C is a positive constant representing the compensating differential factor between the two types of employment. A voluntary choice of the primary job is then effected if

$$(\beta_{p1} - \beta_{s1}) Metro3 + (\beta_{p3} - \beta_{s3}) Ed + \varepsilon_p - \varepsilon_s + C' > 0$$

where

$$C' = (\beta_{p2} - \beta_{s2}) Female - \ln \frac{\delta - g - \beta_{p4} - \beta_{p5}\cdot Female}{\delta - g - \beta_{s4} - \beta_{s5}\cdot Female} - \ln C.$$

By supposing that ln C can be additively decomposed into a deterministic part and a random error term ε_c' that is uncorrelated with X (to reflect individual differences in tastes, etc.) C′ can summarily be rewritten as

$$C' = c_0 + c_1 \text{ Female} + \varepsilon_c'.$$

The voluntary choice hypothesis is now completed by a switching equation of the form

$$y^* = c_0 + (\beta_{p1} - \beta_{s1}) \text{ Metro3} + c_1 \text{ Female} + (\beta_{p3} - \beta_{s3}) \text{ Ed} + \varepsilon_c \qquad (3')$$

where

$$\varepsilon_c = \varepsilon_p - \varepsilon_s + \varepsilon_c'.$$

This replaces (3). Notice the cross-equation constraints on the coefficients of Metro3 and Ed implied by the hypothesis. The test involves whether these constraints are accepted by the data.

Table 5 presents the results of switching regressions, one with the constraints in question and the other without the constraints. Twice the difference in the log-likelihood between the two versions comes to

$$-2 \times (-7105.9 + 6659.6) = 893.6$$

whereas the degree of freedom increased is 1[8]. Since the 1% critical value of the chi-square distribution for 1 degree of freedom is 6.63, the null hypothesis of voluntary choice is overwhelmingly rejected. In other words the data confirms the presence of involuntary rationing of the primary jobs.

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Table 5
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6. The Scale of the Primary and Secondary Sectors in the Japanese Labour Market

Having delineated the characteristics of the dual structure and the

switch governing allocation of workers, the next question is how large each sector is. The answer will be told in terms of the posterior probability of belonging to the primary sector (defined by (4)) that each worker posesses given the observations on the dependent and explanatory variables.

Figure 2 shows the distribution of this probability density over the entire sample of workers, men and women taken separately. The horizontal axis is divided into decile brackets, the left-most bracket being 0-10%, and the right-most bracket being 91-100%. For men, a bimodal feature with thick densities in both the lowest and the highest deciles, is clearly observed. Also, as expected from the previous discussion, the density of the lowest decile has indeed increased significantly over the decade.

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Figure 2
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The corresponding figure for women lacks the bimodal feature observed for men, and both for 1980 and 1990 the thickest density is located at the lowest decile. In fact, the lowest decile alone includes 30 percent of female workers in the sample. We also notice, however, the emergence of a thick density at the highest decile of the distribution in 1990. This is due to the easing of access on the part of women to primary sector jobs. Whether or not this develops further into a bimodal shape similar to men's will be answered in the future.

Dickens=Lang [1987] has suggested to employ this posterior probability measure in classifying workers into the primary or the secondary status. There should not be much opposition to calling the worker in the highest decile primary and calling the worker in the lowest decile secondary. One may, however, be a little more lenient in expanding each list by including workers in sufficiently upper deciles in the group of the primary and includ-

ing workers in sufficiently lower deciles in that of the secondary. The question of how much one would regard it as "sufficient" is admittedly arbitrary, and here we follow the practice of Dickens and Lang. Namely, define the workers with the posterior probability above 70% as the 'primary' group and define those with the posterior probability below 30% as the 'secondary' group. This leaves workers with intermediate probability levels (i.e., 30-70%) with an ambiguous status (called the 'ambiguous' group), that is, neither clearly primary nor clearly secondary. Obviously, such a classification is meaningful only when the proportion of workers with the ambiguous status is kept relatively small.

6. The Scale of the Primary and Secondary Sectors in the Japanese Labour Market

The composition of workers for each sex who, in terms of the foregoing criterion, belong to the 'primary' and 'secondary' groups are presented in Table 6. While this table is entirely a one-way classification table, additional insight would be obtained by calculating the size of each group when workers are classified by sex, age, education and firm size simultaneously. For such a purpose obviously a larger sample base is required. We have thus expanded the size of the samples to ten times (again taking account of the original sample weights) and extrapolated our coefficient estimates to apply to the enlarged sample set.[9] The result is the figures in parentheses of Table 7, prepared separately for men and women. For each age group - firm size - education category the members of workers who belong to the 'primary' group and the 'secondary' group, and the total number of workers in the category including the 'ambiguous' group are listed in a vertical order as ratios over the respective age group total. (Thus in

each column the 3 x 4 figures designatd as "total" add up to 100 per cent.)

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Tables 6, 7
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Several comments are in order. First, as expected by our coefficient estimates there is a clear association between levels of schooling and the composition of workers in question. For both men and women college graduates remain most likely to belong to the primary sector while junior-high school graduates are most likely to belong to the secondary sector. In between these two groups, i.e., for high school and junior college workers, there has been much decline over the decade in the proportion of those belonging to the primary sector.

Second, among age groups the proportion of workers in the 'primary' group continues to decline from the 30's while that in the 'secondary' group rises rapidly. One notable feature is the existence of an opposite movement over the decade between young men and women aged 15-24 in terms of the proportion of the 'primary' group. For women it has increased slightly while for men it has declined.

Third, geographically, Kanto (including the city of Tokyo) and Kinki (including the cities of Osaka and Kobe) are found to contain more primary jobs than elsewhere.

Fourth, industry-wise, finance, utility, and the real estate industries are the ones in which the primary sector dominates the secondary sector. For these industries nearly half of the workers belong to the 'primary' group, whereas the 'secondary' group constitutes only 10-20%. On the other hand, blue-collar dominated mining, construction and manufacturing industries are predominantly secondary. In fact, the 'primary' group constitutes only a quarter among men and less than 10 percent among women[10].

Fifth, further decomposition of workers into blue collar and white collar jobs in construction and manufacturing industries shows clearly that the greater part of blue-collar workers in both industries falls into the secondary sector. The proportion of the 'primary' group is nil among women, less than 10% among men. Even among white-collar workers secondary jobs seem to dominate among women. An important change that has occurred over the decade in the manufacturing industry is that the primary sector has diminished its size and the secondary sector has expanded both for blue-collar and white-collar jobs. Thus what has been pointed out as economy-wide tendency holds for the manufacturing industry, in particular.

Sixth and finally, the composition of workers among different firm sizes is somewhat as expected. Men and women alike, roughly half of the workers in large firms (1000+ regular employees) belong to the 'primary' group while 15% belong to the 'secondary' group. Within this firm size there is some improvement among women over the decade in their access to the primary sector. On the other hand, in small firms (with 10-99 regular employees) the proportion of workers in the 'primary' group is roughly 10% while that of the 'secondary' group amounts to around 70%. Moreover, men in small firms have experienced some increase in terms of the proportion of those belonging to the secondary sector. The middle size firms (with 100-999 regular employees), in turn, occupy an intermediate position with definite disadvantages among women. As noted earlier, there is an indication that the workers in this firm size group are shifting from the primary to secondary jobs.

Various sources of decline in the 'primary' group and expansion of the 'secondary' group in the foregoing statements are actually confirmed by a more formal decomposition analysis that also takes account of the changes in the categorical weight of the population.

7. Earnings Differentials between the Primary and Secondary Sectors

Although the primary sector appears to accompany an involuntary queue of workers it seems worthwhile to examine more concretely the nature of this queue. In what way are the workers in the secondary sector disadvantaged vis-à-vis those in the primary sector? By employing the ex-post classification of workers introduced previously comparison of wage rates and other working conditions between the two sectorial groups can be made.

The first object of comparison is the life-time wage profiles between the two sectors. Note that the wage manifolds in Figure 1 are drawn with an artificial control of the constant term. Hence the circumstance that the flat manifold of the secondary segment has actually a rather high absolute level of pay relative to the intial pay level in the primary segment is not a priori ruled out. This, in effect, is a point emphasized by Ryan [1981]. The fact that this is not the case is shown by the formal test described in Section 5.

In fact, Figure 3 illustrates, for men and women separately, the profiles of median hourly total wage rates over the cross-section of age groups. It clealy shows that the flatness of the profiles of the 'secondary' group is not (on average) compensated for by higher absolute levels of pay.

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Figure 3
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A more detailed comparison of wage rates over the breakdown of age, education and firm size classes are presented in Table 7 based on the set of expanded samples explained previously. The upper numerals (without parentheses) in each cell give the percentage ratio of the average hourly total wage for that

particular group over that for the whole male highschool graduates aged 24 and below employed in large firms (with 1,000+ employees) taken as the basis of reference. (It is 1,185 yen in 1980 and 1,325 yen in 1990, both measured in terms of 1990 consumer price.) This table again confirms that, except for the group of male highshool graduates (in all firm size classes) in age 24 and below where a reverse feature is observed, the wage rate for the 'primary' group keeps a definite advantage over that of the 'secondary' group. The relative advantage keeps rising until the early 50's in age where the ratio of the 'primary' over the 'secondary' wage rates (wherever entries for both 'primary' and 'secondary' groups are present) becomes roughly 2.5 times, both for men and women and both for 1980 and 1990. Incidentally one may identify this ratio of 2.5 to provide a rough magnitude of the average wage rate differentials for mature workers between "good" jobs and "poor" jobs when sex, education and firm size are controlled for. It is important also to note that the dispersion of the wage rates among individuals is much wider within the 'primary' group than the 'secondary' group. Table 7 also shows that both education and firm size adds a moderate degree of wage differential within the 'primary' and the 'secondary' groups, and that there exists a sizeable wage differential between men and women of age above 35 for most of the exactly matching cells.

The second object of comparison between the two sectors is the length of work hours which may be regarded as one chief source of non-pecuniary compensation. Thus one may suspect that higher levels of pay in the primary sector may be offset by the severity of long working hours in that sector.

The fact that such an offsetting does not operate is shown by Figure 4. It compares, for men and women separately, the distribution of total work hours per month between the two sectorial groups. For each pair of graphs

the upper one refers to the 'primary' group while the lower one refers to the 'secondary' group. While there exists a significant degree of overlap between the distributions of the two groups, that for the 'primary' group is always located to the left of that for the 'secondary' group. Such a feature seems to have become pronounced in 1990. The implication is that the low wage rates of the secondary sector are not compensated for by shorter working hours. Such a conclusion is consistent with the property noted in Table 3 that the Gini ratio of total monthly earnings is less than that of hourly total wage rate.

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Figure 4
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8. Further Interpretations

The first set of remarks concern the significance of the secondary sector. We have already seen that, although wages are low in this sector, wages can rise moderately in accordance with accumulation of tenure. The marginal rate of return on tenure for this sector lies around 4% (at zero experience) which is quite comparable with the rate of return on general working experience for the primary sector in the U. S. (Dickens=Lang [1987]). A natural interpretation is that such an increment in the secondary job wages reflects the presence of firm specific learning at a moderate pace. At least it is difficult to maintain that secondary jobs in Japan are mere dead-end jobs. On the other hand, what distinguishes the secondary job most from the primary job is the unresponsiveness of pay with respect to accumulation of external experience. Moreover, for women, external experience is more a detriment than a blessing. To use Becker's words, learning in the primary job contains a general as well as a firm specific component, while the secondary job contains no general component.

Given such circumstances, there naturally occurs an incentive on the part of workers to stay longer in the same firm. Such motivation may not necessarily be fulfilled either voluntarily or involuntarily, as shown by continual renewal of workers for the 'secondary' group (Figure 5). Reflecting the more or less buffer character of secondary jobs (in comparison with primary jobs) as emphasized by Piore [1980(a)] they are susceptible to involuntary termination due to industrial or macroeconomic shocks and due to technical change that calls for job reorganization. Obviously separations may also occur for voluntary causes, such as the job search behaviour to improve the quality of the match between ability and job quality. The existence of voluntary and involuntary separations result in low wages ex post.

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Figure 5
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The second set of remarks concern the firm size differential, a topic that has been widely discussed over years in Japan. We have discovered that a significant firm size pay differential remains within each sector of the labour market, and that the firm size differential within the secondary sector (after controls on education and both kinds of experience) is smaller than that within the primary sector, which is a robust result that is seen to hold for all the specifications we estimated.

One tempting interpretation under the assumption that the secondary sector is close to a competitive spot market is that the measured firm size wage differential within the secondary sector expresses the unmeasured ability and motivational difference of the workers employed in large firms vis-à-vis small firms. In fact, unmeasured ability difference has been repeatedly referred to in much informal as well as academic discussion of the

topic, so far without any successful attempt at measuring its magnitude. Were the above assumption to hold true we might have claimed to arrive at a first formal estimate of the magnitude in question. Moreover, the residual 5% difference between the two segments (=(.16+.08)-(.12+.07)) could then be attributed to primary workers' bargaining share of the monopolistic quasi-rents accruing to large firms. (See Kishi [forthcoming] for a detailed estimation of wage differentials as caused by inter-firm scale profit differentials.)

Whereas the responsiveness of secondary sector wages to local economic conditions (as indicated by a significant positive coefficient on Metro3 variable) suggests that some competitive forces are at work, the simultaneous existence of firm specific learning as indicated by a significant rate of return on tenure suggests that the market is far from purely competitive. Workers in the secondary sector are also considered to be in a position to get a portion (albeit smaller than that of the primary sector workers) of monopolistic rents. Hence the 19% figure of wage differentials within the secondary sector is at most an upperbound of the unmeasured ability and motivational factors.

9. Conclusion

This paper attempted to evaluate the scale and the nature of primary and secondary segments in the Japanese labour market. The switching regression model with unknown dual regimes was applied to the Wage Census micro-data of 1980 and 1990.

The principal results of our study can be summarized as follows.

(1) The null hypothesis of a single earnings structure (i.e., the familiar OLS earnings function) is overwhelmingly rejected in favour of the hypothesis

of dual earnings structure. The estimated dual earnings structure generally accords well with the existing inductive formulation of the dual labour market hypothesis. In fact, the estimated primary sector pays the marginal rate of return of 9% on schooling, 7.7% on tenure and 3.8% on external experience for men (both evaluated at zero experience) while the estimated secondary sector pays the marginal rate of return of only 0.8% on schooling, 4.0% on tenure and 0.1% on external experience for men (again both evaluated at zero experience). The major discrepancy with the original dual labour market hypothesis (à la Doeringer and Piore) is a rather high rate of return on tenure within the secondary sector.

(2) The major factors that have been discovered to govern the assignment of workers between the primary sector and the secondary sector turn out to be education, old age and firm size of the work place. While the traditional practice of identifying the dual structure with the existence of firm size differentials is to some extent vindicated, firm size is only one of the major intervening variables. The sheer disadvantage in the female workers' access to the primary sector seems to have disappeared during the decade in question. (However, see item (3) below.) Because of increased overall levels of education, the predictive value of schooling in assigning workers to respective sectors has declined over the decade.

(3) The pay disadvantage of the secondary sector does not rest with just increments but also with absolute levels of pay. In fact, comparison of the distribution of wage rates among workers whose posterior probability of belonging to the primary sector is high (i.e., more than 70%, for whom we used the short hand the 'primary' group) and that among workers whose same probability is low (i.e., less than 30%, for whom we used the short hand the 'secondary' group) has shown that the two distributions become disparate very

quickly as age proceeds. The median level of hourly wage rate in the 'secondary' group becomes less than half of that in the 'primary' group for men above age 35 (the corresponding figure becomes less than 40% for women). Indeed there is little tendency for equalization to occur over life-time. Furthermore, comparison of the distribution of working hours of the 'primary' and 'secondary' groups have shown that the latter group tends to work longer hours than the former. Lower pay of the secondary sector is not compensated for by such non-pecuniary character of the job as shorter working hours. These two observations suggest that pay differentials between the two sectors are not explained away by the principle of equalizing difference. The existence of involuntary gueue to the primary sector has also been shown by a formal hypothesis testing.

(4) Between male and female workers, the pay in the primary sector is the same at an initial stage of employment, yet as time progresses the pay becomes wide apart. Marginal rates of return on tenure and external experience both dissipate very quickly for women. Within the secondary sector, women are paid roughly a quarter less than men with equal levels of schooling, tenure and external experience. There is a good reason to believe that such a difference manifests the presence of sexual discrimination.

(5) The proportion of the 'primary' group identified by the model is 27% for both 1980 and 1990, while that of the 'secondary' group is 38% for 1980 and 43% for 1990. There has been a mild increase in the proportion of the 'secondary' group over the economy. There also has been a contrasting movement between men and women. For men, the composition has definitely become deteriorated, for over the decade the 'primary' group decreased from 31% to 29%, while that of the 'secondary' group increased from 34% to 41%. Women's opportunity, on the other hand, seems to have improved slightly, for the

'primary' group increased from 19% to 22% while the 'secondary' group decreased from 48% to 46%. Male workers who are very young (aged 15-24), who are out of high-school, who work in manufacturing (white-collar and blue-collar alike) or in wholesale-retail industry, or who work in the middle size firm seem to have contributed most to the noted deterioration.

(6) In view of the fact that the Wage Census data covers a little less than half (46.6%) of the total working population in 1990 (using the 1987 Employment Status Survey figure in Table 1), we are now ready to translate our result to the economy-wide magnitude. Column (1) of the table below gives the proportions of each category of workers that we identified in the entire working population of 1990. Column (2) shows the modified proportions, again over the entire working population, when a bold assumtion is made to the effect that all part-time workers as well as all workers belonging to firms with 1-9 regular employees fall into the 'secondary' group while all public employees fall into the 'primary' group. The total 76.2(%) refers to the proportion of all employees in the entire working population. Column (3) adjusts the figures of Column (2) proportionally so that the ratios add up to 100%, i.e., against the total of all employed workers.

Workers in:	(1)	(2)	(3)
'Primary' Group	12.6(%)	21.0(%)	27.2(%)
'Ambiguous' Group	14.2	14.2	18.5
'Secondary' Group	19.8	41.0	54.3
	46.6(%)	76.2(%)	100.0(%).

Depending on the ultimate fate of the 'ambiguous' group the figures between the 'primary' and the 'secondary' groups may either come close to each other or depart further. Whatever that may be, however, we can conclude that a majority of the employed workers in Japan belong to the secondary sector. A

somewhat educated guess might put the proportion to two-thirds. This is considerably larger than the corresponding figure for the U. S. as found by Dickens=Lang [1987][11]. Nevertheless we have also observed out that the wages in the secondary segment exhibit a rate of return on tenure that is quite comparable with the rate of return on general experience for the primary sector workers in the U. S.

We should like to conclude by stating qualifications on the two major assumptions adopted in the present study.

The first qualification concerns the assumption of a stable dual earnings structure (except for a trend increase in wage rates). This assumption has been quite instrumental in our evaluation of the change in the composition of workers over the decade. There is no reason, however, to preclude any short-run or long-run perturbation in the earnings structure.

In fact, the switching regression models estimated for 1980 and 1990 separately shows a qualitatively similar dual structure for two years, yet individual changes in the coefficients add up to suggest the presence of a "structural change" between the two years[12].

When workers are classified into ´primary´ and ´secondary´ groups based on year-by-year posterior probability estimates there occurs some drift in the entire picture. Although the correlation coefficient between the two sets of posterior probabilities, one based on pooled estimates and the other based on yearly estimates, is quite high for each year (.98 for men and .92 for women in 1980 and .99 for both men and women in 1990), certain drifts in the result of classification arises in such a way that for year 1980 the order of the magnitude of workers in the ´primary´ and ´secondary´ groups reverses itself. Namely, according to the classification based on the yearly estimate of 1980, the proportion of workers likely to be in the primary

sector is 41.4%, while that of workers likely to be in the secondary sector is 29.8%. Another consequence is that the proportion of the 'primary' group declined from 41.4% in 1980 to only 22.5% in 1990, while that of the 'secondary' group increased from 29.8% in 1980 to 46.8% in 1990. What appeared to be a mild expansion of the secondary sector over a decade in our foregoing description may, in fact, have to be characterized as a wild expansion! Obviously a familiar index number problem is involved here.

What happened is that while the labour market of 1990 is more selective than the labour market of 1980 in assigning the primary status to workers the distance between the two sectors have become somewhat closer. More concretely, comparison of yearly estimates between the two years show that the difference in the marginal rates of return on tenure between the two sectors has declined significantly for workers with relatively short tenure (4.9% in 1980 to 2.6% in 1990, at zero tenure) while the absolute level of the marginal rate of return for workers with long tenure (more than 10 years) has risen in the primary sector. The latter implies that workers with long tenure must receive relatively much higher wage rate than in 1980 in order for them to be eligible for the 'primary' status. The former, on the other hand, implies that for workers with short tenure (in particular, young workers) the two sectors have been brought somewhat closer together. The fact that these tendencies have offset each other seems to be the reason why the degree of wage inequality has been shown to exhibit only a very mild increase over the decade (cf. Table 3).[13)]

Whether such a change is indeed a genuine long-run structural change implying that the Japanese society is tending towards a more polarized society or it is a mere reflection of the difference in the business cycle phases to which our particular sample years belonged (note that 1990 happened to be

at the height of a business upturn)[14] seems to have far reaching ramifications. Disentangling the possible cyclical effects must await the availability of the data of other neighbouring years.

The second qualification refers to the assumption of duality itself. After all we are averaging the structure of wages into two groups, not one. There is no a priori reason to exclude the possibility of three or more groups. In fact, one disturbing aspect of our classification of workers is that about one-third of workers remain in the status of 'ambiguous', which seems rather sizeable.

We may recall that as early as mid-1970's Piore himself departed from the simple duality concept of the Doeringer=Piore formulation, allowing for more varied groups to exist among workers and suggesting the spectrum of upper-tier, lower-tier, craft, and secondary jobs (Piore [1975],[1980(b)]). In the light of Piore's refined terminology, the primary sector emerged in our study may rightly be construed as falling between the upper-tier, on the one hand, and the lower-tier or the craft, on the other; also what emerged as the secondary sector in our study falls between the lower-tier and the genuine secondary jobs à la Piore.

There seems to be a good reason that the upper-tier workers equipped with independence and autonomy and characterized by high mobility are at least up to present not clearly visible in Japan (and hence naturally not caught by our model)[15]. Except for those who choose to become self-employed professionals talented and/or well-motivated individuals have been enclosured, if you will, mostly by large corporate firms and these workers compete and proceed along the internal promotion ladder. Such an aspect is already well described and there is no need for repetition. (See Ariga et. al. [1992] for a most recent study.) Whether or not highly mobile upper-tier

workers appear as a clearly demarcated group is a matter to be judged in future.

On the other hand, the secondary sector that we have delineated seems, in fact, to consist of at least three groups; first, a potentially genuine lower-tier group whose job careers have been intermittently and involuntarily cut short by business downturns or by major technical change; second, again a lower-tier group of workers who has voluntarily chosen to move into firms that opened up a new opportunity or provided a better job match; and third, the really dead-end jobs. For the former two sub-groups the wages could rise moderately as workers accumulate tenure, but in fact, they result in low wages. The pervasiveness of small firms in Japan with high business risks and yet with new business opportunities is certainly a major factor contributing to the intermittent career of lower-tier workers and thus to enlarge the magnitude of the former two sub-groups.

How are we then to understand the nature of the workers classified as 'ambiguous'? It turns out that the wage distribution of these workers for each age group are uniformaly much closer to the 'secondary' group than the 'primary' group. A natural interpretation may be to perceive them as successful lower-tier workers. In other words, our estimated secondary sector earnings curve may just be an average of a more vigorous earnings curve of the lower-tier sector and a flatter earnings curve of the genuine secondary sector.

These somewhat intuitive considerations suggest that allowance of a tertiary sector in the switching regression model may substantially add completeness in our assessment of the degree of segmentation in the Japanese labour market. Such a further computational task together with a further consideration of the relationship between the relative size of the market

segments and the business cycle phases consitutes an interesting topic for a future study.

Notes

1) See Dickens=Lang [1985, Appendix: 802-803] for the derivation of the log-likelihood function.

2) However, we have confirmed by using the 1980 data with part-time workers (about 3% of the entire sample) that inclusion of part-time workers does not alter the basic findings of this paper.

3) Comparison of Table 1 and Table 2 might raise the following query. The ratio of male working population to female working population is just about 3:2 in 1987, and the ratio of the degree of coverage by the Wage Census is .56 : .33, which implies that the ratio of sample sizes between men and women that appears in Table 2 should come to roughly 2.5 : 1. But, in fact, it is 2.2 : 1, implying a little over-sampling of women. The major source of such a discrepancy seems to be the definitional differences in the category of workers mentioned in text.

4) Alternatively one can estimate the same model with all the experience variables inside the switching equation. Experience is then considered to influence the type of job attachment continously throughout the individual's career.

5) While the OLS model is nested within the switching model, the switching equation becomes degenerate when the two regimes collapse, leaving the switch-related parameters unidentified. The likelihood ratio test suggested by Goldfeld and Quandt for such a circumstance sets the degrees of freedom equal to the number of constraints among parameters plus the number of unidentified parameters (cf. Dickens=Lang [1985: 797-798, fn. 3]) In our case, twice the difference between the log-likelihood of OLS and that of the switching model comes to as much as 3,416.8 while the 1% critical value of the chi-square distribution with 25 degrees of freedom is 44.7, overwhelmingly rejecting the null hypothesis of a single regime.

We have also conducted a test to see if there occurred a structural change in the switching equation. We did so by estimating the switching model with the constrait of identical coefficients (except for constant term)

for the switching equation, and compared the log-likelihood value of the two sets of estimates. In this case the standard likelihood ratio test can be employed. Twice the difference in log-likelihood values have become 2 x (-7240.9-7200.3) = 81.2, while the number of additional constraints in the parameters is 7. Since the 1% critical value of the chi-square distribution with 7 degrees of freedom is 18.5, the null hypothesis of a common switch equation for 1980 and 1990 is again comfortably rejected.

6) The assumption of exogeneity of X may be criticized to shun the recent and yet unsettled issue concerning a possible bias on the tenure coefficient. Several sources of bias that arise in an environment of continuous job search and job-matching have been pointed out in the literature.

One of them is the heterogeneity of job quality and worker-job matches when the object of search is a better job-match (Altonji=Shakotko [1987], Abraham=Farber [1987]). Because workers would choose to stay longer in good jobs and good job matches than in the case of poor ones such a heterogeneity generates a spurious positive correlation between tenure and earnings, resulting in an overstatement of the rate of return on tenure.

Another source of bias is the endogeneity of the worker´s career choice when the object of search is a better wage package in a Phelps-Lucas like-world of imperfect information (Topel [1991]). In such a setting workers who leave the firm must be offered a better wage package which more than offsets any foregone (net) return expected to arise should they choose to stay one more period. Any presence of fixed moving costs should reinforce this tendency. Therefore the observed (net) rate of return on tenure for workers who remain in the firm understates the true (net) rate of return on tenure for workers with the same tenure taken at random (i.e., including the movers).

Unfortunately, much depends on a paticular modelling of the career mobility, and no definitive statement can be made with regard to the net direction of bias.

It turns out, however, that by effectively identifying good jobs and poor jobs our segmentation model can be interpreted as partially controlling for the heterogeneity of job quality and the quality of worker-job matches. The fact that there still exists roughly 4 per cent difference between the external and the internal experiences (i.e., the net rate of return on tenure, all evaluated at zero experience) for the primary jobs indicates that

there indeed exists a large rate of return to seniority in Japan. The difference (i.e., the net rate of return on tenure) becomes smaller for secondary jobs, yet it too is significant. While heterogeneity of job matches (and the concomitant upward bias) may still remain within each segment, circumstantial evidence tends to suggest that the resultant bias may not be so worrisome in Japan. First, the rate of turnover for large firms (where primary jobs are predominant) is low in international standards. Second, a majority of worker turnover cases in small and medium firms (where secondary jobs are more predominant) tends to be involuntary in character (as shown by Genda's work in progress using the micro-data of the Survey of Employment Dynamics (Ministry of Labour)).

7) When a cross term between Female*Yr90 is added to the earnings function of the secondary sector its coeffient became .031 with t ratio 1.94, which is only marginally significant.

8) The coefficients of the unconstrained switching equation are identifiable only up to a proprtional constant. As with the other estimates of the switching equation in Tables 4 the estimates for the unconstrained model are given with the normalization that the variance of e_c is equal to 1. On the other hand, in the constrained model, the cross-equation restrictions act as a normalization, necessitating the variance of e_c to be estimated. Therefore the accounting of the change in the degrees of freedom becomes the number of cross-equation restrictions minus the normalization restriction thus relaxed, which is 2 - 1.

9) Reflecting the preciseness of the coefficient estimates presented in Table 4, the newly prepared table eqivalent to Table 6 based on the enlarged sample set appeared to be very much the same as the original Table 6. It is available on request.

10) If we confine ourselves to the electric and transportation machinery industries that represent the export industries of Japan, the proportion of the 'primary' group remains roughly 20% in contrast to the 'secondary' group of 40% (for both 1980 and 1990, each on the basis of well over 500 samples). The remaining 40% constitutes the 'ambiguous' group. How to interpret the 'ambiguous' group is discussed at the end of Section 9.

11) According to Dickens=Lang [1987: Table 4.2] the composition of U. S. workers between the 'primary' group and the 'secondary' group in 1981 is as follows. The criterion of classification is the same as in the present

study. The figures below are all in percentage terms.

	Total	White Men	Non-White Men	White Women	Black Women
'primary' group	55	67	35	45	32
'ambiguous' group	22	24	29	18	16
'secondary' group	23	9	36	37	52

12) The table of yearly switching regression results is available upon request. Twice the likelihood values of the difference between the sum of those in yearly estimates -(3208.9 + 3879.9) and the pooled estimate -7200.3 turns out to be 223.0 while the number of parameters freed is 30. Since 1% critical value of chi-square distribution with 30 degrees of freedom is 50.9, the null-hypothesis of identical earnings functions for 1980 and 1990 is rejected.

13) We have considered the possibility that our choice of the hourly total wage in contrast to the hourly regular wage might be the main actor causing the increase in the estimated slope of the primary sector wage curve with respect to tenure in 1990. The reason is that the bonus payment may fluctuate much more than the regular wage component over a business cycle. By calculating the ratio of hourly total wage (as we defined it) over hourly regular wage for each age group, using the published tables of the Wage Census for each year during 1980-1990, and plotting them on a graph with age group as the horizontal axis, we have found that the curves exhibit remarkable stability over the decade. This implies that the feature in question is not due to the particular choice of the dependent variable.

14) If this turned out primarily to reflect the business cycle, then it would be at variance with some familiar macro-theoretic characterization of the dual labour market. For instance, McDonald=Solow [1985] derives the property that in the primary sector aggregate demand shocks are primarily reflected in the pro-cyclical movement of employment, while in the competitive secondary sector the major impact takes the form of pro-cyclical wage movement, causing little employment fluctuations in net. The latter is explained, for the case of a positive macro shock, by a decrease in the labour supply as caused by the movement of workers from the secondary market to the separately existing labour queue of the primary sector, reflecting the improved prospect of obtaining employment in the primary sector. Yoshikawa [1989] also derives a similar property in a different model of the dual labour market where household wives' supplementary labour supply constitutes the source of the

secondary labour market. Thus when the income of the main earner in the household increases the supply of supplementary labour decreases, pushing up the wage of the secondary sector. The net effect is that little employment fluctuation occurs in the secondary labour market. The spirit of both models is not consistent with the relative expansion of the secondary sector during a boom period.

15) In a separate switching regression estimate focusing on the service industry, we have found for year 1990 that the rate of return on external experience exceeds that on tenure for the primary sector. (.0656 against .0524, both evaluated at zero experience) This implies,of course, that general experience is what counts in this industry. This result may be interpreted as a symptom of the ongoing major structural change in the Japanese labour market with the appearance of a typical upper-tier group. More data must be accumulated in order to evaluate this impact correctly.

References

Abraham, Katherine G., and Farber, Henry S. "Job Duration, Seniority and Earnings." American Economic Review 77 (June 1987):278-297.

Altonji, Joseph P., and Shakotko, Robert A. "Do Wages Rise with Job Seniority?" Review of Economic Studies 54 (July 1987):437-459.

Aoki, Masahiko, Information, Incentives and Bargaining in the Japanese Economy, Cambridge: Cambridge University Press, 1981.

Ariga, Kenn., Brunello, Giorgio., Ohkusa, Yasushi., and Nishiyama, Yoshiko. "Corporate Hieracchy, Promotion, and Firm Growth: Japanese Internal Labour Market in Transition." Journal of The Japanese and International Economies 6 (Decembe 1992): 440-471.

Asanuma, Banri, "Manufacturer-Supplier Relationships in Japan and the Concept of Relation-Specific Skill," Journal of the Japanese and International Economies 3 (March, 1989), 1-30.

Dickens, William T. and Lang, Kevin, "A Test of Dual Labor Market Theory" American Economic Review 75, (September, 1985): 792-805.

Dickens, William T. and Lang, Kevin, "Where Have All the Good Jobs Gone? Deindustrialization and Labor Market Segmentation," in K. Lang and J. Leonard (eds.) Unemployment and the Structure of Labor Markets, Oxford: Basil Blackwell, 1987.

Doeringer, Peter and Piore, Michael, Internal Labour Markets and Manpower Analysis, Lexington, Mass.: D. C. Heath, 1971.

Goldfeld Stephen M. and Quandt, Richard E. "Techniques for Estimating

Switching Regressions" in Studies in Nonlinear Estimation, Cambridge, Mass.: Ballinger, 1976: 3-35.

Goldfeld Stephen M. and Quandt, Richard E. "Some Properties of the Simple Disequilibrium Model with Covariance," Economic Letters 1 (1978): 343-346.

Hashimoto, Masanori. and Raisian, John. "Employment Tenure and Earnings Profiles in Japan and the United States." American Economic Review 75 (September 1985):721-735.

Kishi, Tomoko, "Do Profit Differentials Explain Interscale Wage Differentials?" Economic Studies Quarterly, 1993, forthcoming.

Koike, Kazuo, Chusho Kigyo ni okeru Jinzai Keisei (Human Resources Formation in Small and Medium Size Firms), Tokyo: Dobunkan, 1981.

McDonald, Ian and Solow, Robert, "Wages and Employment in a Segmented Labor Market," Quarterly Journal of Economics 100 (November, 1985): 1115-1141.

Ryan, Paul, "Segmentation, Duality and the Internal Labour Market," in F. Wilkinson (ed.) The Dynamics of Labour Market Segmentation, New York: Academic Press, 1981: 3-20.

Piore, Michael, "Fragments of 'Sociological' theory of Wages," American Economic Review, 63 (May, 1973): 377-384.

Piore, Michael, "Note for a Theory of Labor Market Stratification," in R. Edwards, M. Reich and D. Gordon (eds.) Labor Market Segmentation, Lexington, Mass.: D. C. Heath, 1975: 125-150.

Piore, Michael, "Dualism as a Response to Flux and Uncertainty," (a), and "The Technological Foundations of Dualism and Discontinuity" (b), in M. Piore and S. Berger, Dualism and Discontinuity in Industrial Societies, Cambridge: Cambridge University Press, 1980: 15-54 (a), 55-81 (b).

Shimada, Haruo, Earnings Structure and Human Investment: A Comparison between the United States and Japan, Tokyo: Kogakusha, 1981.

Thurow, Lester C., Generating Inequality, New York: Basic Books, 1975.

Topel, Robert. "Specific Capital, Mobility, and Wages Rise with Job Seniority." Journal of Political Economy 99 (February 1991):145-176.

Ujihara, Shojiro, "Keihin Kogyo Chitai ni okeru Dai-Kojo Rodosha no Seikaku (The Characteristics of Workers in Large Scale Factories in the Keihin Industrial Area)" and "Keihin Kogyo Chitai ni okeru Rodo Shijo no Mokei (A Model of the Labour Market in the Keihin Industrial Area)" (originally published in 1954). Reprinted in Nihon Rodo Mondai Kenkyu (Studies in Labour Problems in Japan), Tokyo: University of Tokyo Press, 1966: 351-425.

Yoshikawa, Hiroshi "Nihon no Rodo Shijo to Makuro Keizaigaku (The Japanese Labour Market and Macroeconomics)" Keizai Kenkyu 38 (July, 1987): 240-250.

Table 1: Composition of Workers by Size and Character of the Work Place

Male Firm Employee Size	1982					1987				
	1-9	10-99	100-999	1000+	Total	1-9	10-99	100-999	1000+	Total
Self-Employed Heads and Family Workers	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Agricultural	6.8	0.0	-	-	6.8	5.9	0.0	-	-	5.9
Non-Agricultural	14.4	0.5	-	-	14.9	13.5	0.4	-	-	13.9
Total	21.2	0.5	-	-	21.7	19.4	0.4	-	-	19.8
Private Firm Employees										
Ordinary Workers	11.0	20.7	15.1	16.0	62.9	12.1	22.5	17.0	16.3	67.8
Part-time Workers	2.0	2.1	0.9	0.5	5.5	1.0	1.3	0.5	0.3	3.1
Total	13.0	22.8	16.0	16.5	68.4	13.1	23.8	17.5	16.5	70.9
Public Sector Employees Total	-	-	-	9.9	9.9	-	-	-	9.3	9.3
Male Total	34.2	23.3	16.0	26.4	100.0	32.5	24.2	17.5	25.8	100.0

Female Firm Employee Size	1982					1987				
	1-9	10-99	100-999	1000+	Total	1-9	10-99	100-999	1000+	Total
Self-Employed Heads and Family Workers	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Agricultural	11.2	0.0	-	-	11.2	8.9	0.0	-	-	8.9
Non-Agricultural	22.5	0.5	-	-	23.0	20.3	0.4	-	-	20.7
Total	33.8	0.5	-	-	34.2	29.1	0.4	-	-	29.6
Private Firm Employees										
Ordinary Workers	8.4	14.8	9.2	7.3	39.6	8.8	15.0	10.3	7.9	42.0
Part Time Workers	6.1	7.0	3.5	2.0	18.6	6.4	8.2	4.3	2.4	21.4
Total	14.4	21.8	12.7	9.3	58.2	15.2	23.2	14.7	10.3	63.3
Public Sector Employees Total	-	-	-	7.6	7.6	-	-	-	7.1	7.1
Female Total	48.2	22.2	12.7	16.9	100.0	44.3	23.6	14.7	17.4	100.0

Source: Bureau of Statistics, Employment Status Survey, 1982, Tables 4 & 15, and 1987, Tables 5 & 22.

Notes:
- .Part time workers in this survey refer to the nomenclature in the work place rather than those classified by the number of work days or hours, as is the case with Wage Census.
- .Private Firm Employees include those employed in the self-employed sector.

Table 2: Characteristics of the samlples

		1980			1990		
		Total	Male	Female	Total	Male	Female
Number of Observations		14339	9843	4496	14980	10354	4626
			68.6%	31.4		69.1	30.4
Educational Attainment	Junior high school	33.6%	33.3	34.1	18.34	18.7	17.6
	High school	46.2	43.4	52.4	53.9	51.7	58.8
	Junior college	5.5	3.3	10.4	8.9	4.8	18.2
	College and university	14.7	20.0	3.1	18.9	24.9	5.3
	Mean(years)	11.7	11.9	11.3	12.4	12.5	12.0
	Std. dev.	2.3	2.5	1.9	2.2	2.4	1.8
Age	-24	19.5%	13.0	33.6	17.9	12.2	30.7
	25-34	29.2	32.7	21.6	25.3	26.4	22.9
	35-44	25.1	28.0	19.0	25.1	28.2	18.2
	45-54	18.3	18.4	18.0	21.1	22.2	18.8
	55-64	6.6	6.5	6.9	9.4	9.9	8.3
	65-74	1.2	1.3	0.8	1.1	1.0	1.1
	75-	0.1	0.1	0.1	0.1	0.1	0.1
	Mean(years)	36.3	37.2	34.4	37.8	38.9	35.1
	Std. dev.	11.9	11.3	13.0	12.3	11.7	13.2
Tenure	Mean(years)	8.74	10.2	5.5	10.3	12.0	6.7
	Std. dev.	8.0	8.5	5.8	9.4	9.9	7.1
Experience	Mean(years)	9.9	9.1	11.5	9.0	8.5	10.3
	Std. dev.	8.0	11.1	12.1	11.2	10.9	11.7
Area	3 major metrop. area	22.5%	23.7	20.0	24.3	25.7	21.2
District	Hokkaido and Tohoku	11.7%	10.8	13.6	10.6	9.9	12.4
	Kanto	31.8	33.8	27.5	34.2	35.5	31.3
	Chubu	18.1	17.4	19.6	18.1	18.2	17.8
	Kinki	18.9	19.8	16.8	18.6	18.9	17.9
	Chugoku and Shikoku	9.6	9.2	10.7	9.3	8.8	10.2
	Kyushu and Okinawa	9.9	9.0	11.9	9.3	8.8	10.4
Industry	Mining	0.4%	0.5	0.2	0.2	0.3	0.0
	(Production worker)	(64.5)	(73.58)	(11.1)	(65.6)	(70.0)	(0.0)
	Construction	9.4	11.3	5.0	7.6	9.6	3.1
	(Production worker)	(48.8)	(49.6)	(44.9)	(38.2)	(40.7)	(20.8)
	Manufacturing	40.0	40.7	38.5	36.6	37.0	35.7
	(Production worker)	(64.3)	(61.2)	(71.5)	(59.6)	(57.2)	(65.1)
	Wholesale and Retail	19.1	19.1	19.0	19.0	18.9	19.2
	Financing and Insurance	6.5	4.4	11.3	6.3	4.6	10.1
	Real Estate	0.4	0.5	0.4	0.8	0.8	0.7
	Transport and Comm.	8.0	10.6	2.3	10.0	13.0	3.3
	Utilities	0.6	0.8	0.2	0.8	0.9	0.6
	Services	15.5	12.1	23.1	18.7	14.9	27.3
Type of Workers†	Production workers	61.4	58.8	68.1	55.9	53.9	61.5
Firm Size	Large	29.5%	31.0	26.3	30.6	32.6	26.3
	Middle	33.3	33.2	33.4	33.9	33.5	34.6
	Small	37.2	35.8	40.3	35.5	33.9	39.1

†: This data is available only for the mining, construction, and manufacturing industry.

Table 3: The Summary Statistics on Work Hours and Income Distribution

	Male		Female	
Year	1980	1990	1980	1990
Monthly Work Hours (hrs.)				
Regular Work Hours (hrs.)	180.2	176.3	178.2	174.6
	(24.9)	(23.9)	(26.4)	(24.5)
Total Work Hours (hrs.)	198.3	196.0	184.4	182.6
	(34.1)	(34.4)	(28.1)	(27.4)
Real Earnings (1,000 Yen in 1990 Prices)				
Hourly Regular Wage	1.378	1.691	0.820	1.017
	(0.672)	(0.868)	(0.385)	(0.551)
Median	1.223	1.485	0.718	0.889
Gini Ratio	0.241	0.256	0.222	0.234
Hourly Total Wage	1.814	2.254	1.045	1.299
	(1.010)	(1.312)	(0.562)	(0.778)
Median	1.566	1.914	0.890	1.105
Gini Ratio	0.275	0.292	0.263	0.272
Monthly Regular Earnings	242.0	290.2	142.0	172.0
	(105.6)	(133.1)	(57.7)	(78.9)
Median	220.9	262.7	130.3	155.5
Gini Ratio	0.218	0.233	0.192	0.200
Monthly Total Earnings	345.6	422.1	186.4	229.1
(incl. Bonus)	(160.9)	(204.2)	(87.2)	(116.0)
Median	317.6	382.4	168.4	205.4
Gini Ratio	0.242	0.254	0.234	0.242
Annual Bonus Payment	906.8	1158.4	451.7	558.7
(Previous Year)	(770.0)	(995.2)	(399.9)	(513.0)
Median	781.9	964.7	383.1	475.2
Gini Ratio	0.425	0.434	0.468	0.470

Note: Numbers in Parentheses are Standard Deviations

Table 4. The Result of Estimating the Switching Regression Model

	OLS	Primary	Secondary	Switch	Switch·YR90
CONSTANT	1.21**	.899**	2.07**	−3.39**	−.845**
	(.0150)	(.0798)	(.0296)	(.181)	(.215)
METRO3	.0608**	−.000829	.111**	−.0473	.0767
	(.00455)	(.00772)	(.00900)	(.0671)	(.0720)
LARGE	.189**	.159**	.120**	.338**	.191**
	(.00493)	(.00916)	(.0131)	(.0701)	(.0714)
SMALL	−.120**	−.0784**	−.0723**	−.537**	.247**
	(.00469)	(.0108)	(.00895)	(.0627)	(.0672)
FEMALE	−.116**	−.0158	−.245**	−.174**	.199**
	(.00849)	(.0158)	(.0159)	(.0578)	(.0578)
ED	.0814**	.0895**	.00760**	.295**	.0238
	(.000986)	(.00462)	(.00269)	(.0148)	(.0164)
EXP	.0243**	.0380**	.0107**		
	(.000633)	(.00121)	(.000834)		
F·EXP	−.0258**	−.00822**	−.0259**		
	(.00107)	(.00217)	(.00146)		
TENURE	.0554**	.0771**	.0402**		
	(.000779)	(.00125)	(.00105)		
F·TENURE	−.00150	.00582*	.00539**		
	(.00156)	(.00262)	(.00194)		
EXP^2	−.000466**	−.000361**	−.000286**		
	(.0000168)	(.0000351)	(.0000195)		
$F{\cdot}EXP^2$	.000442**	−.000275**	.000544**		
	(.0000307)	(.0000698)	(.0000365)		
$TENURE^2$	−.000689**	−.000991**	−.000520**		
	(.0000247)	(.0000384)	(.0000303)		
$F{\cdot}TENURE^2$	−.000254**	−.000486**	−.000455**		
	(.0000580)	(.0000895)	(.0000694)		
YR90	.101**	.139**	.141**		
	(.00392)	(.00752)	(.00844)		
AGE60				−1.07**	.223
				(.105)	(.127)
N	29319	29319			
log-likelihood	−8908.7	−7200.3			
$\bar{R}^2$	.651				
S.E.	.328	.282	.306	1.00†	
Covariance‡		.0279	−.179		

Standard Errors in Parentheses

**: Significant at 1%

*: Significant at 5%

†: Normalized to 1

‡: Covariance with switching error

Table 5: The Test of the Voluntary Choice Hypothesis

	OLS	Unconstrained model			Constrained model		
		Primary	Secondary	Switch	Primary	Secondary	Switch
CONSTANT	1.35**	.426**	2.30**	−3.46**	.572**	2.24**	−.337
	(.0254)	(.0548)	(.0849)	(.132)	(.0416)	(.235)	(.202)
METRO3	.0829**	.0156	.143**	−.0128	.0144	.140**	—
	(.00852)	(.0128)	(.0118)	(.0572)	(.0128)	(.0164)	
FEMALE	−.221**	.0678**	−.662**	−.689**	.138**	−.554**	−2.08**
	(.0130)	(.0208)	(.0360)	(.0556)	(.0285)	(.158)	(.588)
ED	.0895**	.128**	.0401**	.316**	.116**	.0320**	—
	(.00174)	(.00332)	(.0126)	(.0113)	(.00232)	(.00721)	
EX	.0179**	.0435**	−.00226**		.0424**	−.00202**	
	(.000389)	(.000548)	(.000546)		(.000623)	(.000574)	
F·EX	−.0132**	−.0178**	.00226**		−.0231**	.000478	
	(.000577)	(.00106)	(.000767)		(.00119)	(.000737)	
N				14339			
Log-likelihood	−8075.8		−6659.6			−7105.9	
$\bar{R}^2$	.369						
S. E.	.425	.359	.341	1.00†	.377	.326	2.68
Covariance‡		.239	.0827		.670	−.109	

Notes:
Standard errors are in parentheses.
**: Significant at 1%.
*: Significant at 5%.
"—" indicates a constrained coefficient.
†: Normalized to 1.
‡: Covariance with switching error.

Table 6: Classification of Workers Implied by the Estimated Dual Labour Market Model

		1980						1990					
		Total		Male		Female		Total		Male		Female	
		Prim.	Sec.	Prim.	Sec.	Prim.	Sec.	Prim.	Sec.	Prim.	Sec.	Prim.	Sec.
Total		27.3	38.2	31.2	33.7	18.8	48.0	26.8	42.6	29.0	41.3	22.0	45.6
Education	Junior high school	2.4	80.5	1.7	77.8	3.7	86.3	1.2	94.3	0.6	95.6	2.6	91.3
	High school	19.9	22.7	21.7	16.7	16.7	33.7	11.9	44.0	11.0	42.7	13.7	46.6
	Junior college	61.5	8.0	64.0	9.0	59.8	7.3	43.3	10.3	35.8	10.2	47.7	10.4
	College or university	94.8	1.4	95.5	1.3	84.8	2.9	86.4	3.5	86.1	3.6	89.1	3.2
Age	–24	26.6	19.3	38.4	16.0	16.6	22.1	21.1	25.0	23.8	29.3	18.7	21.1
	25–34	34.7	21.7	36.4	16.8	29.2	38.1	37.7	24.6	39.2	23.3	33.9	27.7
	35–44	28.3	42.7	32.0	34.9	16.4	67.8	28.6	42.2	30.1	37.1	23.5	60.0
	45–54	21.5	60.4	24.0	54.9	15.8	72.7	23.1	61.2	25.3	56.8	17.4	73.0
	55–64	14.0	77.0	13.9	75.7	14.2	79.7	14.1	78.6	15.4	76.2	10.4	85.2
	65–74	3.6	93.3	3.9	93.0	2.8	94.4	6.4	89.8	7.6	88.6	3.9	92.3
	75–	—	—	—	—	—	—	—	—	—	—	—	—
Area	3 major metropolitan	23.1	38.4	26.1	35.9	15.6	44.9	23.4	41.7	24.7	42.1	19.8	40.5
	Other area	28.6	38.1	32.8	33.0	19.7	48.7	27.9	42.9	30.4	41.0	22.6	46.9
District	Hokkaido and Tohoku	18.2	49.9	22.0	44.3	11.6	59.6	14.2	57.8	15.7	54.5	11.5	63.8
	Kanto	36.3	27.7	38.8	25.9	29.4	32.3	38.6	29.1	40.5	29.5	33.9	28.2
	Chubu	19.3	46.3	24.1	40.0	10.0	58.5	18.3	50.4	21.0	48.4	12.4	54.9
	Kinki	30.7	33.5	33.5	31.7	23.4	38.1	30.6	38.6	31.9	39.5	27.5	36.6
	Chugoku and Shikoku	22.9	45.7	27.8	37.7	13.8	60.8	16.7	53.6	18.9	49.5	12.5	61.2
	Kyushu and Okinawa	22.0	44.7	26.0	37.9	15.4	56.0	16.6	56.8	17.5	55.0	14.9	60.3
Industry	Mining	9.7	64.5	11.3	66.0	—	—	12.5	59.4	13.3	56.7	—	—
	Construction	23.1	52.1	25.5	48.5	11.6	70.2	20.7	55.4	21.4	54.5	16.0	61.1
	Prod. workers	5.2	78.2	5.8	74.9	2.0	96.0	2.8	83.9	3.0	83.0	0.0	96.7
	Nonprod. workers	40.2	27.3	44.8	22.4	19.4	49.6	31.9	37.7	34.1	35.0	20.2	51.8
	Manufacturing	19.8	44.0	25.6	34.6	6.5	65.8	18.2	50.8	22.6	45.1	7.9	64.0
	Prod. workers	7.5	58.0	10.4	47.0	1.9	79.8	3.8	68.1	4.8	62.0	1.7	80.5
	Nonprod. workers	42.0	18.7	49.5	14.9	18.2	30.8	39.4	25.3	46.4	22.5	19.7	33.2
	Wholesale and Retail	33.0	27.8	40.0	22.6	17.6	39.1	31.7	32.2	36.9	30.3	20.4	36.4
	Finance and Insur.	59.6	8.1	75.0	3.7	46.4	11.9	68.0	10.2	77.2	7.8	58.6	12.6
	Real estate	53.2	16.1	50.0	18.2	61.1	11.1	49.2	26.3	52.4	26.2	41.2	26.5
	Transport. and Comm.	14.3	51.5	13.5	52.8	22.9	38.1	13.9	55.5	11.9	58.0	31.8	33.1
	Utilities	40.7	11.0	42.0	11.1	30.0	10.0	48.3	8.3	47.9	5.3	50.0	19.2
	Services	34.6	34.2	40.9	28.9	27.4	40.2	32.4	38.0	37.4	35.7	26.2	40.9
Firm Size	Large	43.9	14.0	46.9	13.0	36.0	16.8	47.4	16.3	47.1	17.1	48.5	14.2
	Middle	30.1	32.5	35.2	29.0	19.1	39.9	24.7	38.4	28.7	37.0	15.9	41.5
	Small	11.7	62.4	13.9	55.9	7.5	75.0	14.7	57.8	11.9	68.8	9.5	70.3

Notes:

· "Prim." is defined as the group of workers whose posterior probability of belonging to the primary sector is greater than 70%. Alternatively, "Sec." is defined as the group of workers whose posterior probability of belonging to the secondary sector is greater than 70%.

· — indicates that the number of observations was less than 20.

Male workers	1980						1990					
Age	-24	-34	-44	-54	-64	65-	-24	-34	-44	-54	-64	65-
size 10-99												
second. school												
primary	s (0.1)	n (0.0)	n (0.0)	251 (0.2)	204 (0.5)	s (0.2)	n (0.0)	n (0.0)	n (0.0)	s (0.0)	s (0.2)	s (0.1)
secondary	76 (7.2)	105 (8.8)	117 (14.5)	110 (20.6)	95 (33.1)	84 (41.1)	76 (5.4)	102 (2.9)	120 (8.1)	125 (11.3)	108 (24.1)	88 (39.0)
all	71 (8.2)	105 (8.8)	120 (14.9)	116 (22.1)	98 (34.7)	85 (42.0)	75 (5.6)	102 (2.9)	121 (8.1)	128 (11.7)	111 (24.7)	89 (39.3)
high school												
primary	41 (1.2)	257 (0.1)	242 (1.5)	255 (1.5)	228 (1.8)	s (0.6)	38 (0.2)	s (0.0)	266 (0.9)	275 (1.4)	261 (1.9)	s (0.7)
secondary	102 (4.3)	96 (2.5)	106 (6.1)	115 (7.3)	105 (10.1)	96 (16.0)	90 (15.0)	100 (15.0)	113 (11.6)	126 (9.1)	114 (15.0)	95 (18.1)
all	72 (21.8)	111 (16.6)	142 (14.6)	145 (11.4)	129 (13.3)	102 (16.9)	79 (22.2)	108 (17.9)	139 (17.7)	154 (12.7)	137 (18.4)	107 (19.3)
junior college												
primary	54 (0.5)	179 (0.1)	229 (0.2)	268 (0.4)	277 (0.7)	s (0.6)	s (0.1)	216 (0.2)	238 (0.4)	264 (0.2)	258 (0.2)	s (0.4)
secondary	n (0.0)	s (0.0)	97 (0.1)	122 (0.3)	119 (1.4)	124 (3.1)	n (0.0)	83 (0.2)	110 (0.4)	123 (0.3)	121 (0.8)	110 (2.0)
all	73 (1.8)	114 (1.2)	166 (0.7)	193 (0.9)	169 (2.3)	157 (4.0)	82 (2.9)	121 (2.5)	166 (1.4)	183 (0.5)	155 (1.1)	135 (2.5)
college												
primary	75 (4.0)	126 (5.5)	222 (2.2)	293 (1.3)	290 (1.1)	s (1.2)	82 (1.6)	156 (4.3)	238 (3.2)	319 (1.3)	327 (1.5)	356 (1.8)
secondary	n (0.0)	n (0.0)	95 (0.2)	124 (0.5)	116 (1.1)	116 (3.2)	n (0.0)	s (0.0)	104 (0.7)	129 (0.5)	137 (1.6)	99 (4.5)
all	76 (4.0)	123 (6.0)	192 (3.1)	231 (2.2)	198 (2.5)	179 (4.5)	85 (1.7)	134 (7.2)	189 (5.9)	253 (2.2)	225 (3.5)	176 (6.6)
size 100-999												
second. school												
primary	41 (0.3)	n (0.0)	s (0.0)	273 (0.5)	279 (0.6)	s (0.1)	n (0.0)	n (0.0)	n (0.0)	s (0.0)	301 (0.2)	s (0.0)
secondary	95 (2.3)	122 (5.3)	130 (8.5)	133 (12.4)	107 (14.9)	83 (14.9)	81 (1.7)	117 (1.6)	142 (4.8)	158 (7.0)	128 (12.8)	83 (11.3)
all	78 (4.2)	120 (5.6)	143 (10.9)	149 (16.0)	119 (17.2)	85 (15.2)	77 (1.9)	117 (1.6)	144 (4.9)	164 (7.5)	135 (13.4)	85 (11.3)
high school												
primary	58 (8.0)	171 (0.7)	251 (3.4)	293 (2.9)	277 (2.0)	s (0.3)	49 (0.8)	s (0.0)	287 (1.1)	333 (2.2)	302 (2.0)	s (0.3)
secondary	132 (0.7)	s (0.0)	104 (1.3)	123 (3.4)	111 (4.7)	108 (4.9)	109 (5.7)	106 (3.2)	127 (7.0)	147 (6.2)	126 (9.2)	102 (6.8)
all	81 (23.5)	129 (16.2)	176 (13.8)	195 (9.7)	165 (7.8)	127 (5.8)	84 (25.9)	121 (15.4)	168 (15.5)	206 (12.0)	166 (12.8)	114 (7.4)
junior college												
primary	78 (1.9)	134 (1.2)	224 (0.4)	311 (0.6)	309 (0.7)	s (0.8)	65 (1.2)	218 (0.2)	263 (0.5)	322 (0.3)	315 (0.4)	s (0.2)
secondary	s (0.0)	n (0.0)	s (0.0)	121 (0.2)	129 (0.4)	s (0.8)	n (0.0)	s (0.0)	117 (0.2)	147 (0.2)	119 (0.7)	s (1.0)
all	82 (2.1)	133 (1.3)	198 (0.6)	250 (0.9)	235 (1.4)	245 (1.9)	88 (4.6)	128 (3.0)	193 (1.5)	231 (0.7)	199 (1.3)	s (1.2)
college												
primary	83 (7.1)	145 (10.7)	241 (6.0)	342 (3.3)	367 (1.8)	472 (1.8)	97 (5.8)	149 (13.1)	254 (7.3)	353 (3.3)	408 (2.9)	454 (2.7)
secondary	n (0.0)	n (0.0)	s (0.0)	117 (0.1)	138 (0.4)	s (1.2)	n (0.0)	n (0.0)	112 (0.3)	147 (0.4)	143 (1.1)	124 (2.1)
all	83 (7.1)	145 (10.7)	237 (6.2)	319 (3.8)	307 (2.5)	332 (3.1)	97 (5.8)	146 (14.1)	228 (9.6)	313 (4.4)	323 (4.5)	309 (5.1)
size 1000 -												
second. school												
primary	s (0.1)	s (0.0)	s (0.1)	348 (0.5)	290 (0.8)	s (0.2)	s (0.0)	s (0.0)	s (0.0)	452 (0.1)	383 (0.3)	s (0.2)
secondary	120 (1.0)	164 (0.8)	146 (3.3)	168 (9.3)	147 (7.7)	105 (2.9)	106 (0.4)	145 (0.9)	178 (3.6)	195 (5.5)	179 (6.7)	92 (2.9)
all	103 (2.2)	147 (4.7)	178 (10.4)	201 (16.0)	173 (10.4)	117 (3.1)	98 (0.6)	144 (1.0)	189 (4.2)	215 (6.6)	202 (8.0)	102 (3.1)
high school												
primary	82 (10.6)	170 (4.6)	276 (7.3)	355 (4.8)	352 (1.6)	s (0.2)	70 (4.7)	233 (0.6)	317 (4.2)	385 (5.3)	378 (2.4)	n (0.0)
secondary	201 (0.2)	s (0.0)	116 (0.3)	145 (1.6)	138 (2.2)	113 (2.3)	163 (0.3)	s (0.0)	139 (1.9)	174 (3.4)	161 (4.5)	112 (2.1)
all	100 (18.8)	157 (16.5)	223 (15.8)	272 (10.0)	228 (4.9)	142 (2.6)	100 (19.2)	153 (15.7)	222 (18.9)	283 (13.9)	241 (8.6)	118 (2.2)
junior college												
primary	96 (0.8)	158 (1.1)	264 (0.4)	388 (0.9)	381 (0.9)	s (0.1)	94 (1.9)	148 (1.4)	274 (0.8)	385 (0.2)	342 (0.2)	s (0.1)
secondary	s (0.0)	n (0.0)	s (0.0)	s (0.0)	s (0.3)	s (0.2)	s (0.0)	n (0.0)	s (0.0)	s (0.1)	s (0.1)	s (0.5)
all	96 (0.8)	158 (1.1)	256 (0.4)	351 (1.1)	310 (1.4)	s (0.3)	98 (2.0)	149 (1.5)	241 (1.2)	310 (0.4)	278 (0.4)	s (0.6)
college												
primary	94 (5.5)	175 (11.3)	300 (8.6)	425 (5.6)	472 (1.3)	s (0.3)	104 (7.6)	173 (17.3)	305 (10.7)	436 (5.9)	455 (2.6)	s (0.8)
secondary	n (0.0)	n (0.0)	n (0.0)	s (0.0)	s (0.3)	s (0.3)	n (0.0)	n (0.0)	s (0.0)	147 (0.1)	168 (0.4)	s (0.4)
all	96 (5.5)	175 (11.3)	299 (8.7)	417 (5.8)	403 (1.7)	s (0.7)	104 (7.6)	173 (17.3)	299 (11.1)	420 (6.3)	402 (3.3)	s (1.3)

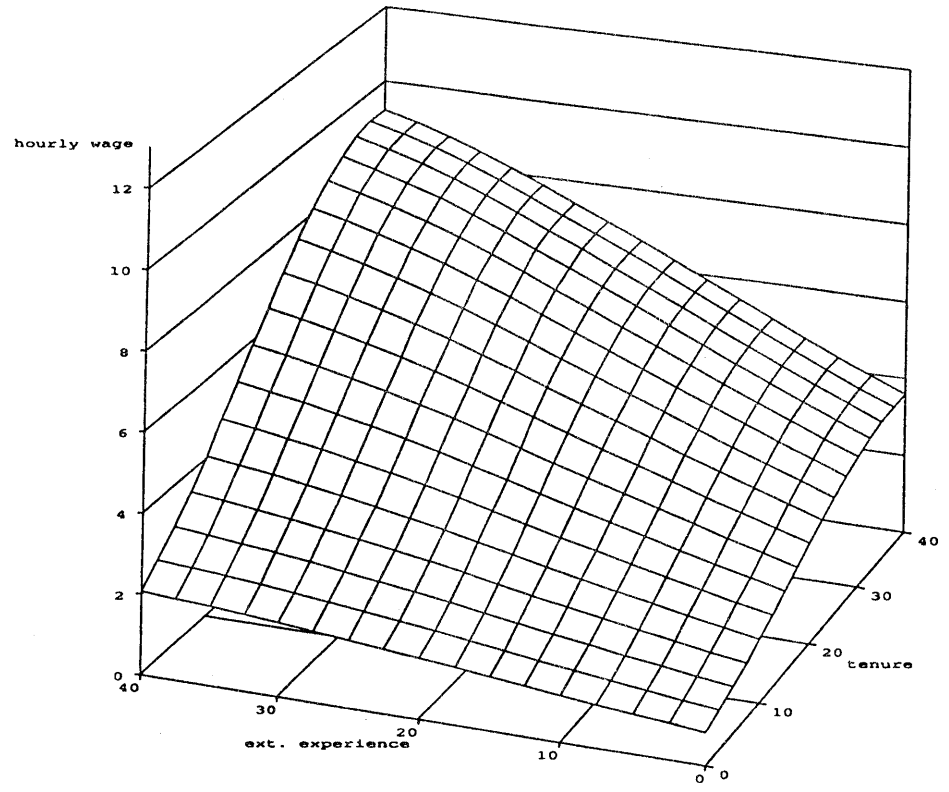
Female workers	1980						1990					
Age	-24	-34	-44	-54	-64	65-	-24	-34	-44	-54	-64	65-
size 10-99												
second. school												
primary	n (0.0)	s (0.0)	177 (0.3)	189 (0.3)	s (0.4)	n (0.0)	n (0.0)	n (0.0)	s (0.1)	187 (0.3)	236 (0.6)	s (0.2)
secondary	57 (3.1)	60 (8.4)	58 (24.6)	59 (33.1)	58 (41.9)	57 (50.0)	55 (1.3)	66 (1.6)	63 (8.8)	66 (20.0)	64 (31.4)	61 (42.3)
all	57 (3.1)	63 (8.7)	62 (26.2)	62 (34.9)	61 (43.1)	57 (50.0)	55 (1.3)	66 (1.6)	68 (9.3)	70 (21.0)	68 (32.4)	61 (42.5)
high school												
primary	s (0.0)	142 (2.2)	138 (2.9)	150 (2.6)	172 (1.9)	s (0.7)	s (0.0)	142 (1.4)	152 (3.2)	172 (3.4)	200 (2.1)	s (1.7)
secondary	57 (11.4)	60 (13.7)	63 (15.2)	67 (11.3)	67 (9.5)	73 (10.5)	61 (15.6)	64 (12.0)	67 (20.4)	70 (19.0)	71 (16.5)	70 (15.4)
all	65 (17.4)	78 (22.7)	78 (21.4)	85 (15.9)	86 (12.7)	87 (11.8)	67 (19.5)	79 (18.6)	83 (28.2)	88 (25.4)	89 (20.5)	92 (18.4)
junior college												
primary	118 (0.4)	127 (1.3)	144 (0.7)	180 (0.6)	s (0.5)	s (1.1)	123 (0.4)	134 (2.6)	153 (1.7)	185 (0.7)	198 (1.1)	s (0.9)
secondary	43 (0.1)	59 (1.2)	78 (0.7)	77 (0.5)	67 (0.5)	s (1.1)	48 (0.2)	64 (2.8)	79 (2.1)	82 (1.0)	s (0.5)	s (1.5)
all	71 (0.8)	90 (2.2)	111 (0.6)	131 (0.4)	145 (0.3)	s (0.2)	75 (7.7)	95 (9.7)	111 (4.6)	125 (2.0)	155 (1.8)	s (3.3)
college												
primary	94 (0.4)	141 (1.4)	234 (0.4)	216 (0.3)	s (0.3)	s (0.2)	98 (0.4)	136 (1.8)	198 (0.9)	260 (0.4)	s (0.4)	s (0.2)
secondary	n (0.0)	53 (0.3)	s (0.2)	s (0.2)	s (0.0)	n (0.0)	n (0.0)	60 (0.3)	74 (0.4)	s (0.2)	s (0.2)	s (0.2)
all	76 (0.8)	114 (2.2)	185 (0.6)	162 (0.4)	s (0.3)	s (0.2)	85 (0.7)	114 (2.8)	157 (1.5)	207 (0.6)	220 (0.6)	s (0.7)
size 100-999												
second. school												
primary	s (0.0)	s (0.0)	166 (0.5)	171 (1.0)	s (0.5)	n (0.0)	n (0.0)	n (0.0)	s (0.2)	204 (0.4)	s (0.4)	s (0.0)
secondary	64 (3.1)	69 (6.2)	64 (14.7)	66 (18.0)	65 (18.9)	73 (17.0)	60 (1.0)	68 (1.1)	74 (6.8)	75 (13.9)	73 (16.0)	61 (15.0)
all	61 (3.5)	76 (7.2)	72 (17.6)	76 (21.5)	72 (21.1)	73 (17.0)	60 (1.0)	70 (1.2)	80 (7.5)	82 (15.2)	80 (17.1)	62 (15.2)
high school												
primary	99 (0.3)	144 (3.9)	157 (3.0)	180 (2.1)	172 (1.1)	s (0.4)	s (0.1)	155 (1.4)	174 (3.8)	187 (2.9)	219 (1.8)	s (0.2)
secondary	65 (0.1)	60 (5.1)	67 (7.1)	71 (5.0)	73 (2.7)	s (1.1)	62 (3.0)	70 (8.6)	75 (12.9)	76 (11.6)	74 (7.0)	s (3.3)
all	74 (25.4)	104 (19.6)	96 (13.0)	103 (8.7)	104 (4.6)	s (2.0)	76 (25.4)	93 (18.3)	101 (20.3)	101 (16.9)	105 (9.9)	s (3.9)
junior college												
primary	89 (3.4)	136 (2.9)	175 (0.8)	225 (0.7)	204 (0.7)	s (0.2)	123 (1.8)	141 (4.9)	177 (2.3)	203 (0.9)	218 (1.4)	s (0.9)
secondary	n (0.0)	s (0.1)	s (0.1)	s (0.2)	s (0.2)	s (0.2)	n (0.0)	68 (0.8)	80 (1.0)	88 (0.5)	s (0.4)	s (0.2)
all	82 (5.3)	121 (3.9)	153 (1.0)	190 (0.9)	181 (0.9)	s (0.7)	87 (9.5)	116 (10.0)	143 (3.9)	160 (1.6)	188 (2.0)	s (1.3)
college												
primary	85 (1.2)	144 (2.3)	232 (0.8)	292 (0.3)	s (0.1)	s (0.4)	94 (1.7)	140 (3.6)	220 (1.2)	275 (0.5)	374 (0.6)	s (0.7)
secondary	n (0.0)	n (0.0)	s (0.1)	s (0.0)	n (0.0)	n (0.0)	n (0.0)	s (0.0)	s (0.2)	s (0.1)	s (0.0)	s (0.2)
all	85 (1.2)	141 (2.4)	217 (0.9)	277 (0.4)	s (0.1)	s (0.4)	93 (1.8)	134 (4.1)	195 (1.5)	250 (0.6)	358 (0.7)	s (1.1)
size 1000 -												
second. school												
primary	s (0.1)	s (0.1)	189 (1.1)	221 (1.9)	244 (2.4)	s (0.2)	n (0.0)	s (0.0)	230 (0.5)	271 (1.3)	337 (2.2)	s (2.4)
secondary	87 (1.1)	90 (2.5)	81 (3.3)	79 (3.9)	78 (4.8)	85 (5.9)	73 (0.6)	100 (0.5)	99 (1.8)	95 (2.6)	83 (3.0)	s (3.3)
all	71 (2.7)	107 (4.3)	112 (6.2)	126 (7.6)	133 (8.4)	100 (6.8)	71 (0.7)	113 (0.7)	134 (3.0)	151 (4.7)	187 (5.7)	213 (6.1)
high school												
primary	90 (4.1)	162 (7.0)	197 (4.7)	233 (4.0)	275 (4.0)	s (2.6)	95 (0.9)	178 (5.2)	228 (8.2)	260 (5.9)	295 (4.8)	s (2.0)
secondary	n (0.0)	55 (1.5)	68 (3.0)	84 (2.3)	88 (1.9)	s (3.3)	s (0.0)	70 (2.2)	84 (4.8)	90 (3.0)	102 (2.8)	s (3.5)
all	91 (27.2)	125 (18.2)	139 (10.2)	169 (7.5)	201 (7.0)	165 (7.4)	90 (19.0)	127 (18.5)	166 (16.4)	191 (10.6)	214 (8.5)	198 (6.1)
junior college												
primary	99 (6.4)	151 (4.0)	196 (0.6)	244 (0.5)	s (0.3)	s (0.7)	99 (10.8)	151 (8.3)	216 (2.1)	261 (0.7)	s (0.4)	s (0.2)
secondary	n (0.0)	s (1.5)	s (3.0)	s (2.3)	s (1.9)	s (3.3)	n (0.0)	s (0.2)	71 (0.4)	87 (0.3)	s (0.1)	s (1.1)
all	98 (6.4)	145 (4.5)	163 (0.9)	212 (0.6)	s (0.6)	s (1.3)	98 (11.0)	141 (10.2)	180 (3.0)	205 (1.1)	244 (0.5)	s (1.3)
college												
primary	95 (1.1)	150 (1.7)	229 (0.2)	321 (0.2)	s (0.1)	n (0.0)	103 (2.6)	150 (4.3)	228 (0.8)	345 (0.3)	s (0.3)	s (0.2)
secondary	n (0.0)	s (0.0)	s (0.0)	s (0.1)	s (0.0)	n (0.0)	n (0.0)	s (0.0)	s (0.1)	s (0.0)	n (0.0)	n (0.0)
all	95 (1.1)	148 (1.7)	215 (0.3)	273 (0.3)	s (0.1)	n (0.0)	103 (2.6)	149 (4.4)	239 (0.9)	311 (0.4)	s (0.3)	s (0.2)

Table 7: Composition of Workers and the Relative Wage Differentials among ´Primary´ and ´Secondary´ Groups Cross-Classified by Sex, Age, Education and Firm Size

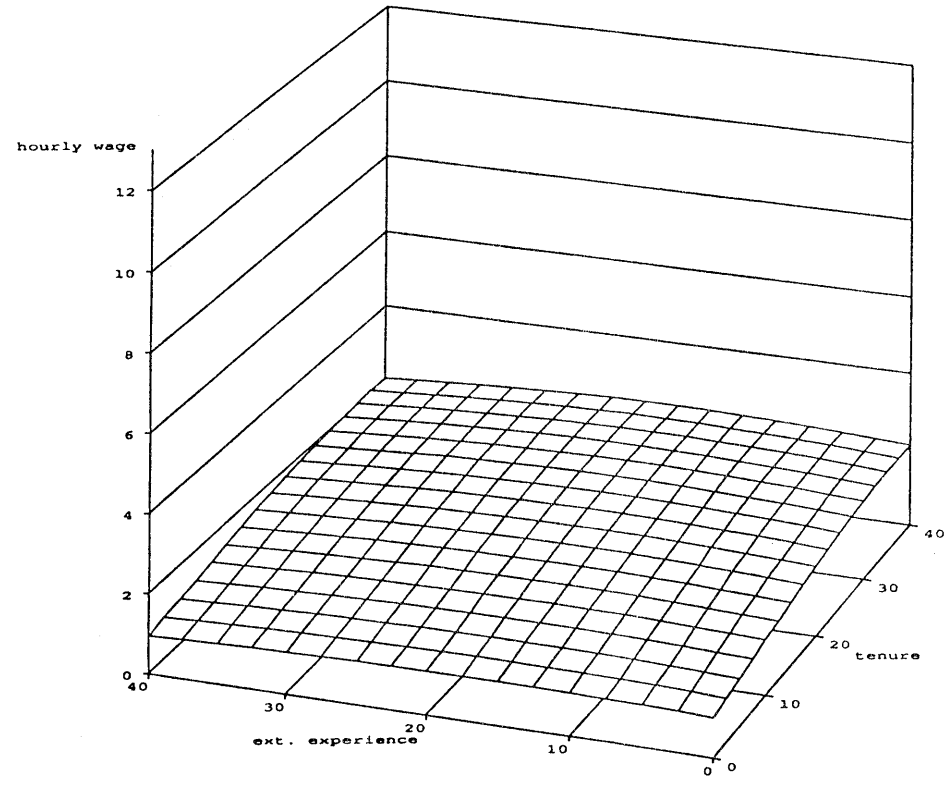
Notes:
1. All figures in this table are calculated on the basis of the expanded sample described in text and on the basis of coefficient estimates presented in Table 4.
2. For each cell, the upper figures represent the ratio (in percentage) of average wage rate for that group over that of "all" "male" "high school" graduates in "firm size 1000- " and "age -24" group. The base wage rate for the denominator is 1,185 yen in 1980 (in 1990 consumer price) and 1,325 yen in 1990.
The letter "n" indicates that there exists no sample for that cell, while the letter "s" indicates that the average figure is not shown because of small observation size, i.e., less than 20, for that cell.
3. For each cell, the lower figures represent the ratio (in percentage) of the number of observations for that cell over that of the age group total. The total numbers of observation for each age group, counted separately for each year and each sex are as follows.

Age Group	1980 - Men	1980 - Women	1990 - Men	1990 - Women
-24	12,473	15,389	12,159	13,598
-34	33,127	9,954	25,426	9,832
-44	27,447	8,750	28,659	8,871
-54	18,474	8,575	22,647	8,933
-64	6,616	3,086	9,913	3,699
65-	1,446	458	1,128	461
Total	99,583	46,212	99,932	45,394

Figure 1: Wage Manifolds with respect to Tenure and External Experience
(A) Men, Based on Switching Regression Estimates

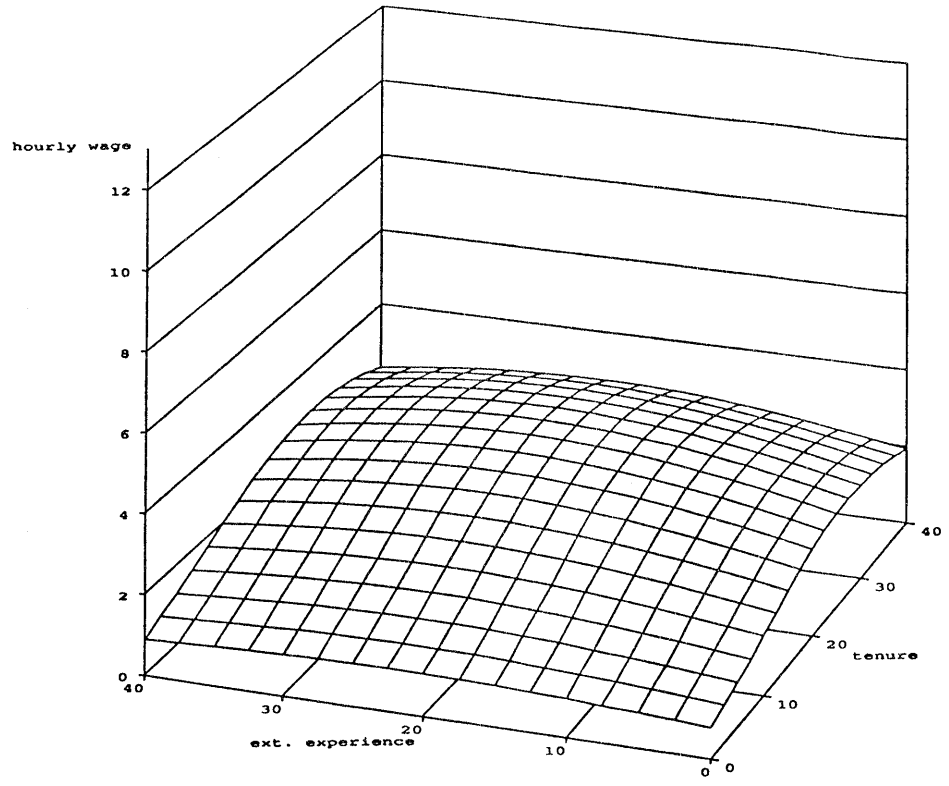


male
primary sector

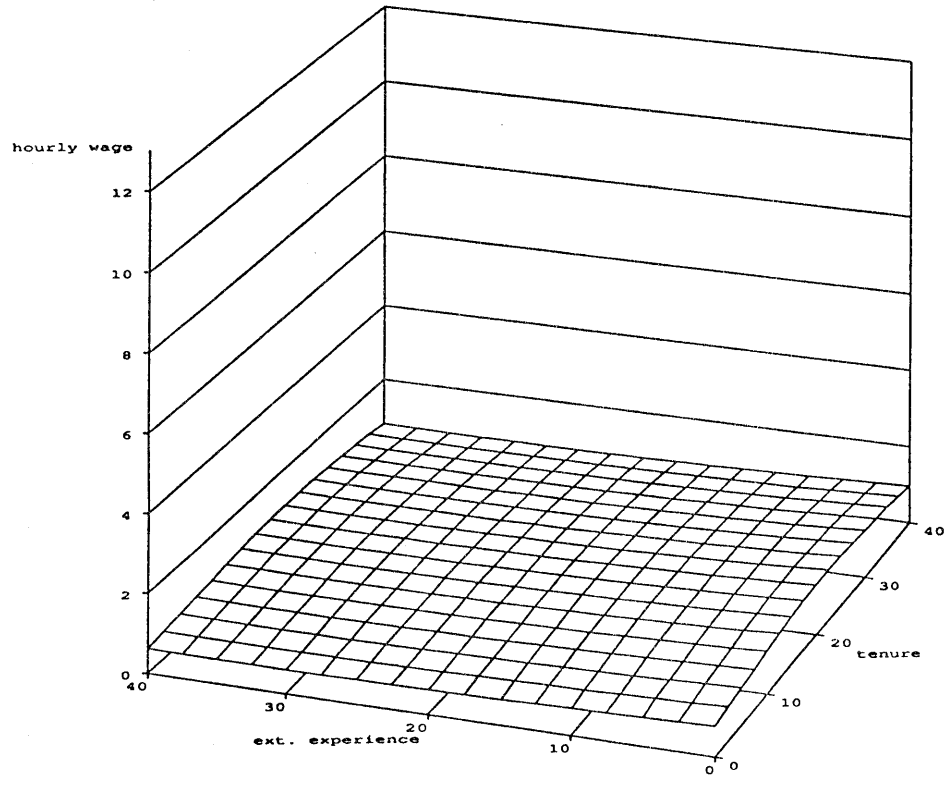


male
secondary sector

Figure 1: Wage Manifolds with respect to Tenure and External Experience
(B) Women, Based on Switching Regression Estimates

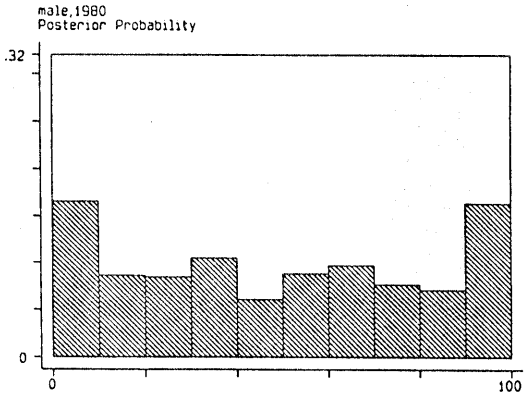


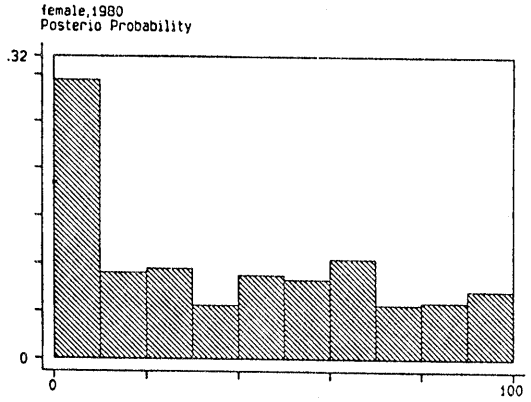
female
primary sector

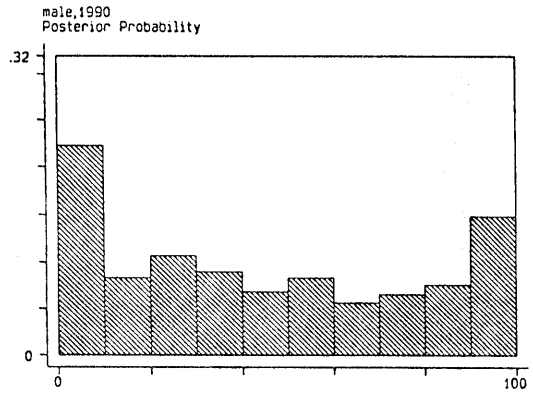


female
secondary sector

Figure 2: Distribution of the Posterior Probability of Belonging to the Primary Labour Market







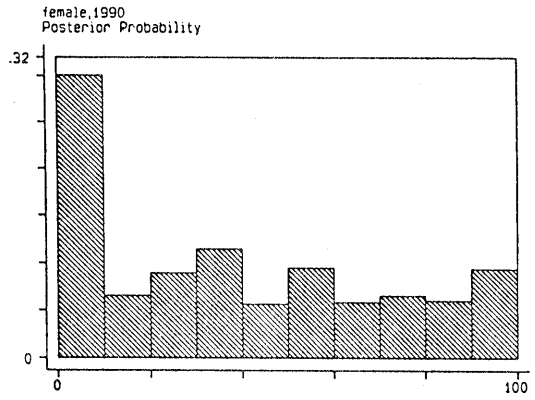
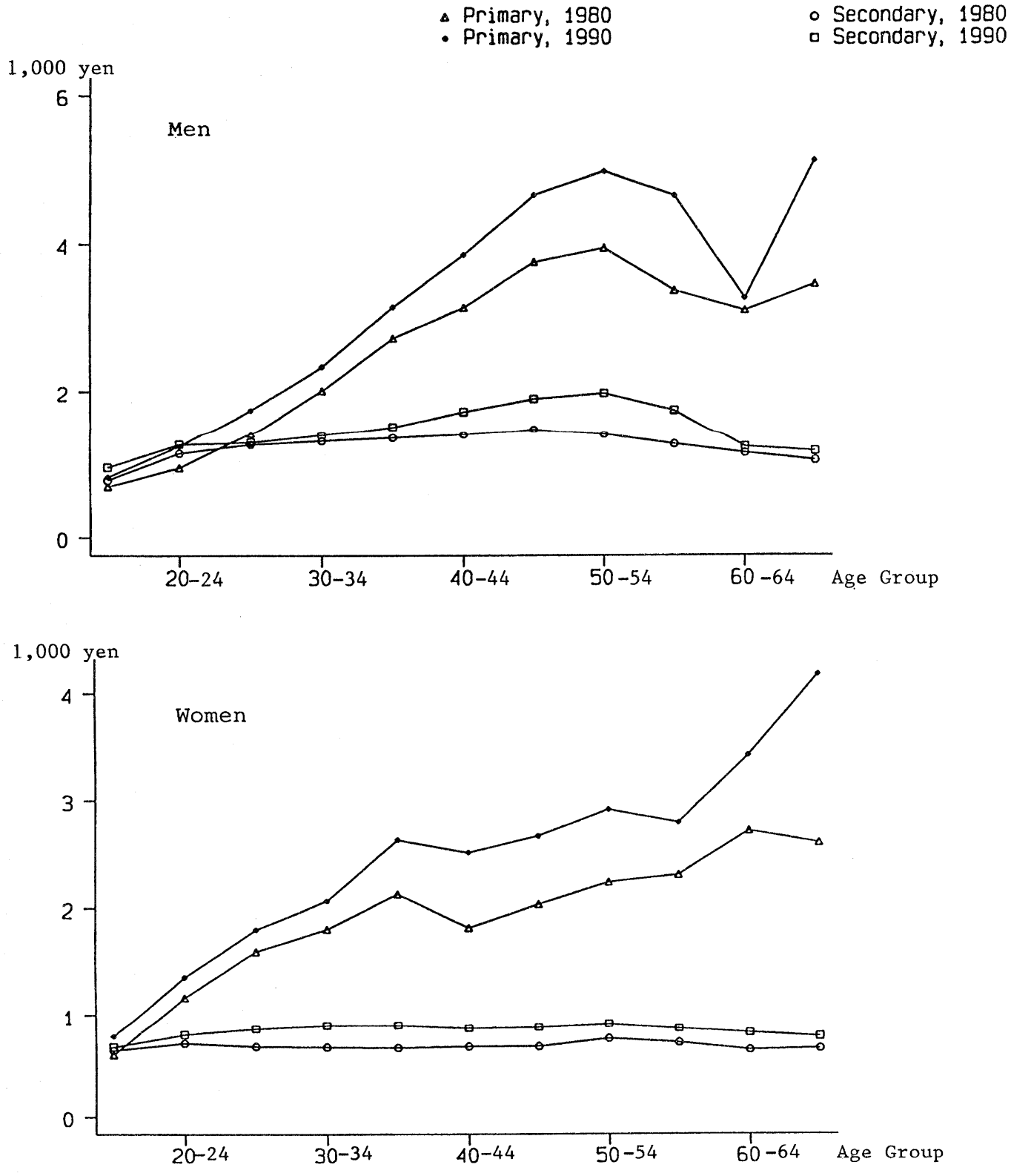


Figure 3. Observed Age-Wage Profiles for the 'Primary' and 'Secondary' Groups



Note: The wage rate figures refer to the median total wage (in 1,000 yen in 1990 consumer price) per hour in each age group.

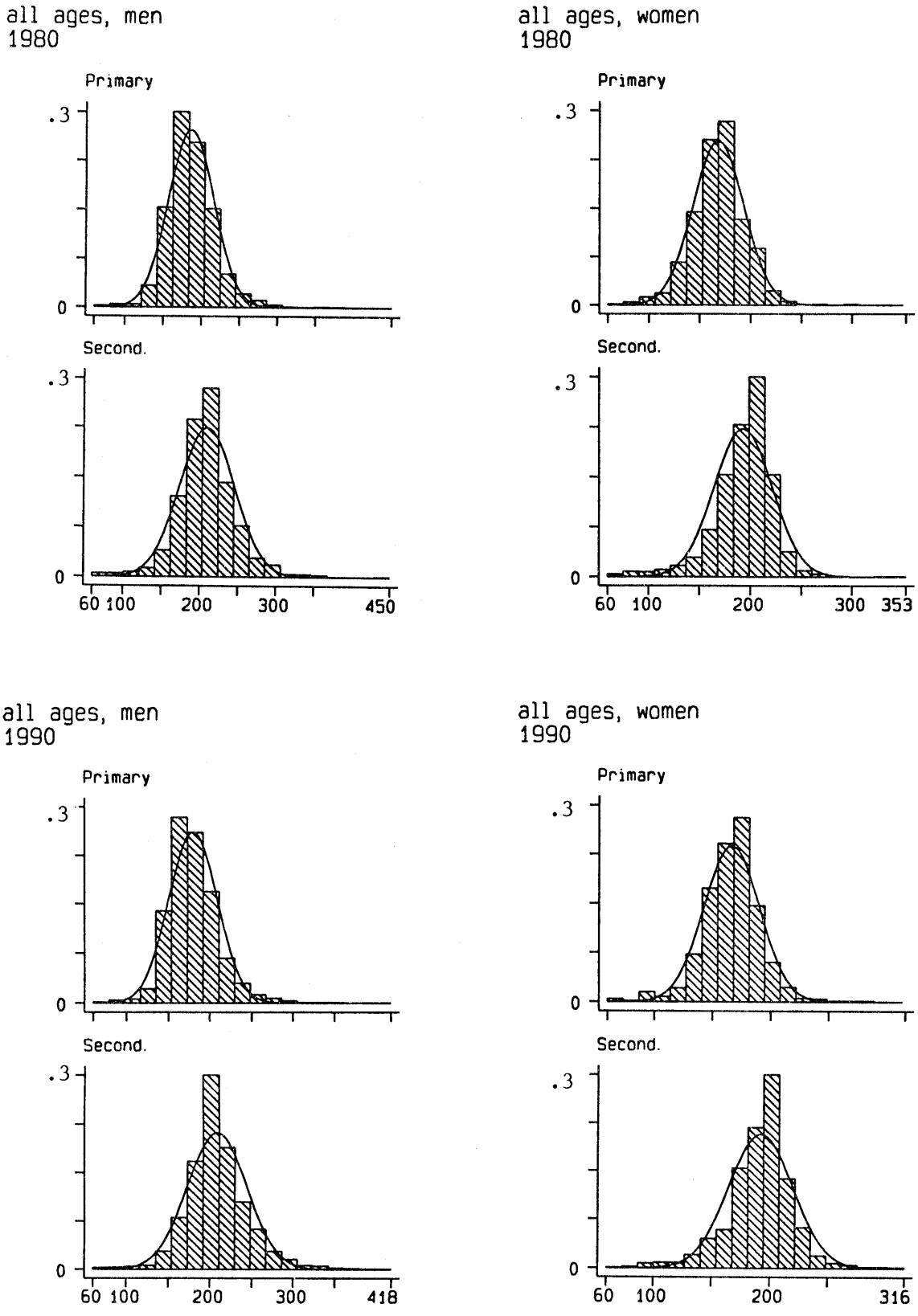


Figure 4: Distribution of Total Hours Worked by Sectorial Group

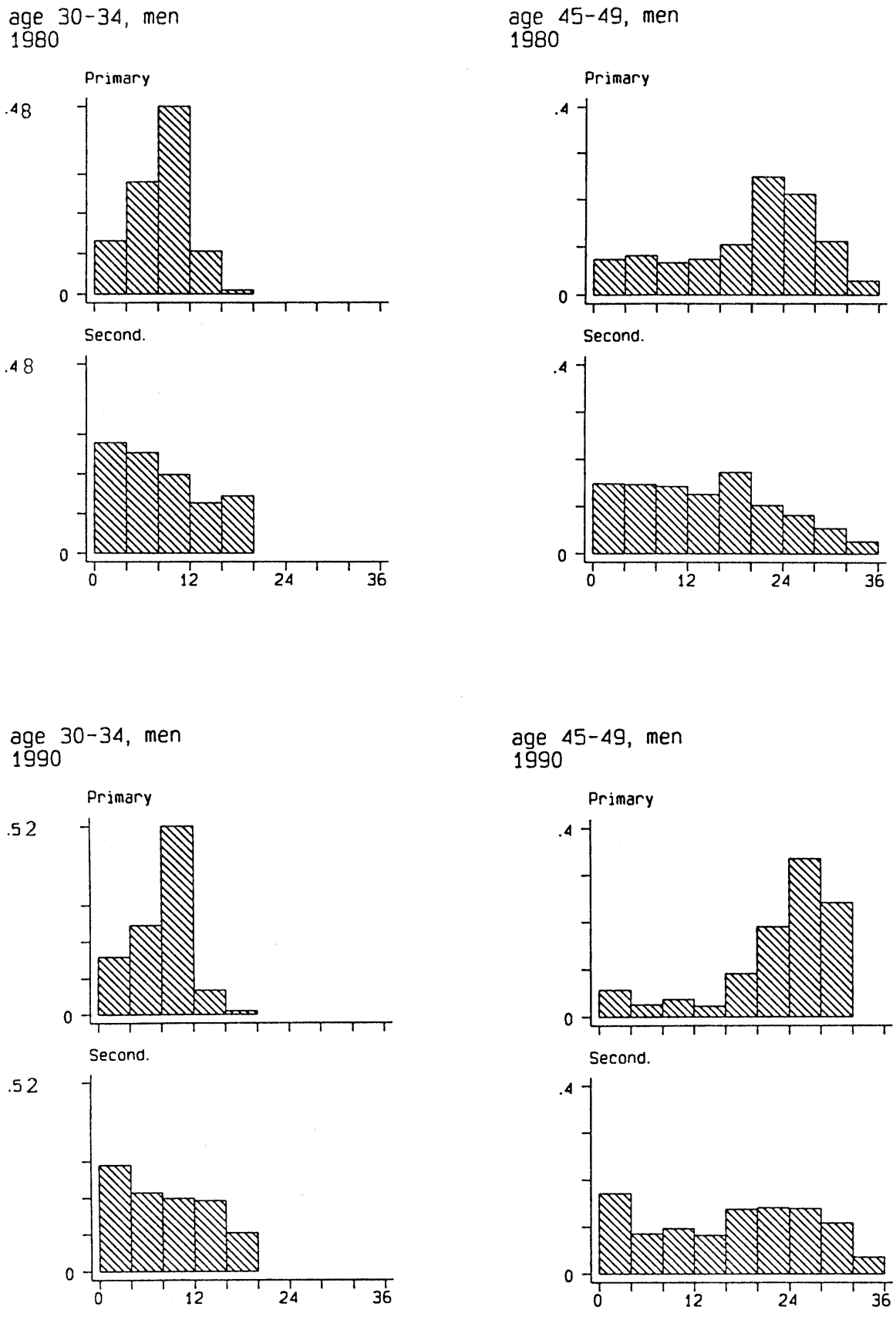


Figure 5: Distribution of Years of Tenure by Sectorial Group

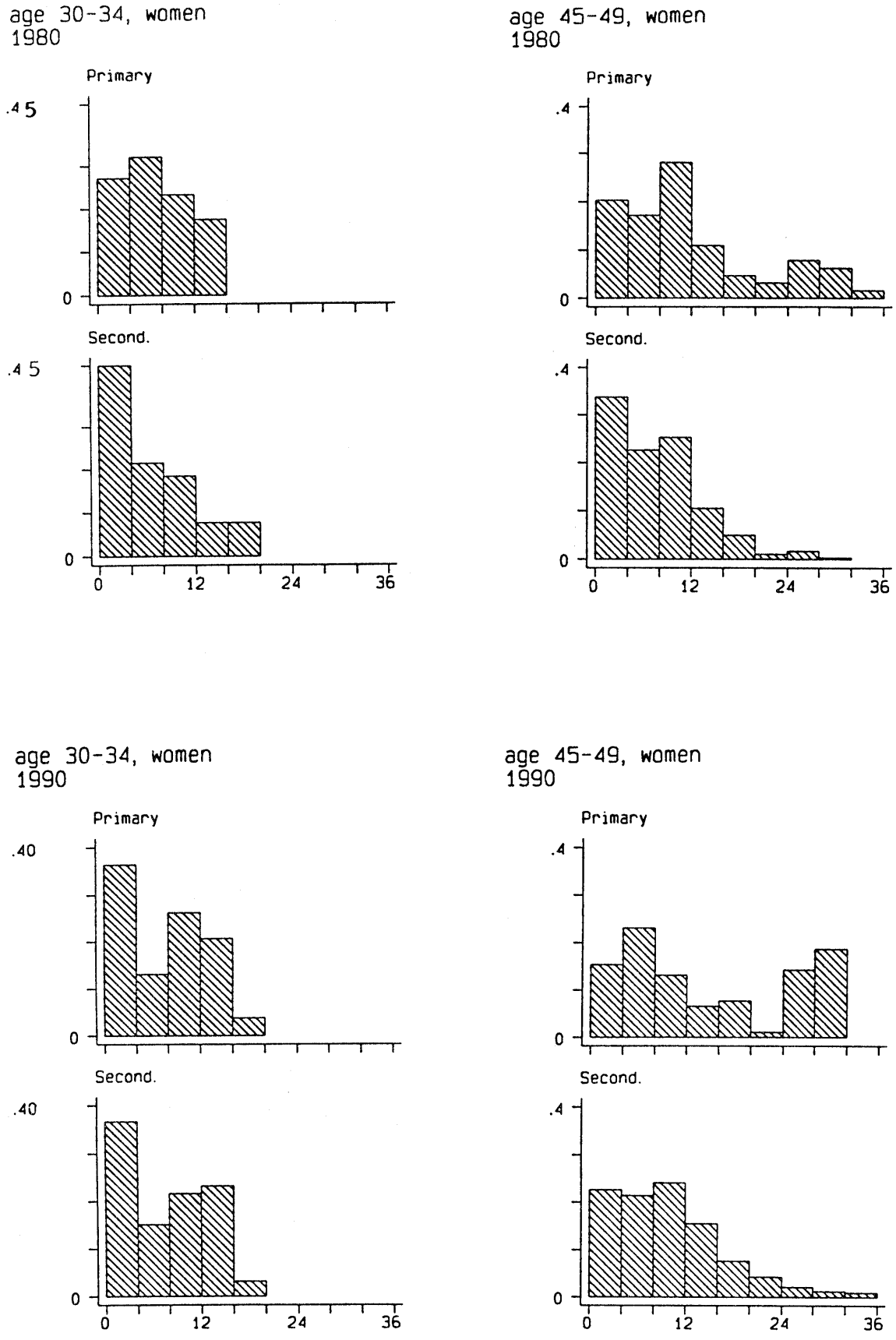


Figure 5: Distribution of Years of Tenure by Sectorial Group (Continued)