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Bonus and Employment in Small Firms : Reconsideration of Share Economy*

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abstract

As one reason for the low unemployment rate after oil shocks in Japan, the structual differences in earnings by enterprise size are considered. During the 1970s and 1980s, Japanese small firms had relatively large labor demand. This is because the bonus payments in these firms were more likely to be in form of profit sharing. Empirical tests show that in Japanese small manufacturing firms bonus payments had been determined differently from monthly wage payments. In particular, almost the half proportion of the bonus payment was the profit sharing segment there.

1 Introduction

The reason for the low unemployment rate in Japan since the oil shocks has been one of the controversial issues of the recent Japanese labor market studies. Then several points have been ever considered as its reason, such as the international difference in the definition of unemployment (for example, Shiraishi (1982), Taira (1983), and Sorrentino (1984)), the effect of female workers' dropping out labor forces (Ono (1981)), the labor hoarding of regular workers (because of accumulation of human capital (Higuchi (1989)), and the degree of the flexibility of real wages (Branson and Rotenberg (1980), Gordon (1982), Grubb, Jackman and Rayard (1983), Sachs (1983), Ohtake (1988)). In spite of so many discussions, however, it seems hard to say that the issue has been clarified.

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To consider it, I focus on the structural differences in wages, bonuses and employment between large and small firms. An original viewpoint was offered by Mizuso (1985), and he concluded that small firms played the crucial role of aggregate stable employment in Japan. In this paper I confirm his conclusion using other date, and offer the alternative hypothesis about the reason for large employment of small firms and the low unemployment rate in Japan.

TABLE 1

EMPLOYMENT SHARES BY ENTERPRISE SIZE (NUMBER OF EMPLOYEES)

Country	Sector	Year	-20	20-99	100-499	500+
United States	T	1982		45.7[a]	13.0	41.3
	M	1982		17.6[a]	12.7	69.7
Japan	T	1985	37.1[b]	17.9[c]	17.3	27.0
	M	1983	27.8[b]	19.3[c]	19.6	33.3
France	T	1985	25.8	20.4	18.3	35.5
	M	1979	10.7	17.9	22.0	49.4
Germany	T	1970	21.7[d]	22.5[e]	16.9	39.0
	M	1984		15.6[f]	24.1[f]	60.3[f]
United Kingdom	M	1981		27.1[g]	36.9[h]	29.2[i]
Italy	T	1981	53.2	16.1	12.2	18.5
	M	1981	33.7	21.8	18.5	26.0

Note :

T=Total economy

M=Manufacturing

a. 1-99 employees

b. 1-29 employees

c. 30-99 employees

d. 1-9 employees

e. 10-99 employees

f. Enterprises with less than 20 employees are not included in the sample.

g. 1-99 employees

h. 100-199 employees

i. 1000+employees

Reference : Loveman, Piore, and Sengenberger (1990)

One of the features in the Japanese labor market in contrast with other developed countries is a large employment share in small firms. Table 1 shows the international comparisons of employment shares by enterprise size. These are from Loveman, Piore, and Sengenbarger (1990). They are collected by the international institute for Labour Studies of ILO through its program, the New Industrial Organization. According to Table 1, Japan and Italy are the countries where small enterprises employing less than 100 workers have more than half an employment share in total economy. As to manufacturing, nearly a half of the employees working in manufacturing belong to small firms in Japan. In contrast, more than a half of all manufacturing workers belong to large firms (more than 500 workers) in the United States and Germany. The unemployment rate in Japan seems to largely depend on movements of labor inflow and outflow of small enterprises or establishments.

The main conclusion of this paper is summarized as follows : new hiring of small firms has been large and stable even after the oil shocks in Japan. At the same time separation rates of senior workers from small firms are decreasing during the 1980s as well as from large firms, and dismissal rates of small firms have not been necessarily large compared with large firms. These facts are probably because many small firms have had relatively large labor demand even in recessions. One of the reasons for their large labor demand is that payments in small firms are more likely to be in form of profit sharing. Then marginal cost of workers in small firms is smaller than those having the same productivity in large firms, as Weitzman (1984, 1985) suggested. Empirical testes suggest that in small firms bonus payments have been determined differently from monthly wage payments and, in particular, nearly the half proportion of the bonus payment is the profit sharing segment.

This paper is organized as follows. Section 2 shows the features of hiring, separation, and job openings in recessions by firm size. Section 3 offers a theoretical interpretation about these results. Section 4 shows empirical results estimating the effects of some factors on the wage and bonus growth and some calculations of the amount of sharing segments. Section 5 gives concluding remarks.

2 Hiring, Separation, and Job Openings

This section considers the difference in the employment structure between large and small firms. In the following, enterprises employing more than 1000 workers are called large firms and enterprises employing less than 100 workers are called small firms.

Firstly, the change in hiring rates of regular employees is divided by enterprise size. This is shown in Table 2.

TABLE 2

	hiring rates		growth rates of hiring	
	small firms 30-99	large firms 1000-	small firms 30-99	large firms 1000-
1971	22.2	13.8		
1972	21.6	11.4	-8.1	-17.5
1973	22.7	14.7	20.7	23.6
1974	18.9	12.3	-17.4	-13.1
1975	15.6	9.1	-12.9	-29.0
1976	17.2	7.6	4.2	-12.5
1977	15.4	7.7	-17.1	1.4
1978	15.8	7.4	4.7	-8.1
1979	16.5	9.3	22.0	35.7
1980	16.2	10.1	-8.1	9.0
1981	15.3	10.3	-10.3	5.3
1982	16.2	9.1	19.3	-19.1
1983	14.6	8.4	-11.7	-4.1
1984	15.5	8.9	5.4	2.6
1985	15.3	10.4	1.1	37.7
1986	14.9	9.0	-7.9	-16.8
1987	13.9	7.9	-9.4	-7.8
mean	16.9	9.9	-2.1	-2.1
std dev	2.7	2.1	12.9	19.5

Resource : Survey of Employment Trends.

Note : Data are those about regular employees. Hiring rates are to be defined as a rate of newly hired regular employees to total regular employees in each size.

In each year after the first oil shock the smaller is the firm size, the higher the hiring rate is. As a result, more than half of newly hired workers find jobs in small firms after the shock. While the hiring rate of large firms declined drastically after the oil shocks, small firms then maintained almost the same level of hiring rates as in the early 1970s. Table 2 also shows the annual growth rate of the newly-hired employment by enterprise size. The standard deviation in hiring of large firms is larger than that of small firms. In some years such as 1976, 77, 78, 80, 81, and 82, these rates move in opposite directions: when large firms employed more (less), small firms hired less (more). This table suggests that hiring of Japanese large firms is not necessarily stable and large. If the total hiring of small firms having a large employment share had also decreased, the unemployment rate in Japnan would have increased.

TABLE 3
QUIT RATES OF SENIOR WORKERS
(JOB LEAVERS/WORKING PERSONS)
AGE: FROM 45 TO 54

	1971[a]	1974[b]	1979	1982	1989
more 1000	7.8	4.6	4.3	3.8	5.5
more 300 less 1000	12.0[c]	8.8	5.9	5.9	5.3
more 100 less 300		13.7	8.9	7.3	9.2
more 30 less 100	11.0	10.9	8.2	6.8	5.4

Resources : Job leavers from Survey of Employment Trends. Working persons from Employment Status Survey.

a : leavers in 1970. b : leavers in 1975. c : more than 100 less than 1000 workers are employed in a firm.

Table 3 next shows job separation rates of senior workers by enterprise size. In the Japanese labor market, once those workers leave firms, it is not generally easy to get new jobs at once. If they would like to find jobs, they are likely to be in the unemployment pool for a while. The definition of separation rates here is the ratio of job leavers to workers whose ages are between 45 and 54. In addition to the proceeding aging society, their separation would largely affect the trend of the aggregate unemployment rate.[1] In the early 1970s the separation rate of small firms was much higher than that of large firms. During the 1970s and early 80s the former is still higher than the latter. It is, however, noteworthy

[1] The definition includes all kinds of separations such as retirement for employers' (or employees') sake, temporary transfer, mandatory retirement and so on. The data of the numerator is from Survey of Employment Trends, and that of the denominator is from Employment Status Survey.

that the separation rate in each size firm has been gradually decreasing since the 1970s, especially in small firms. In the late 1980s when the early retirement promoting system (*soki-taishoku-yugu-seido*) had steadily taken root in large firms, the separation rates had become almost the same among firms except the middle ones. The duration of unemployment is generally longer for senior workers than young workers in Japan. If the separation rate of small firms was not so low, it is sure that the senior unemployment would become much larger.

As to the firm size difference in job separation, dismissal rates by firm size which are defined to be the ratio of job leavers for employers' sake to total regular workers are also considered.[2] From Table 4, the dismissal rate of large firms has been smaller than that of small firms during these periods in total economy as well as in manufacturing.

TABLE 4

DISMISSAL RATES OF REGULAR WORKERS BY ENTERPRISE SIZE

	total economy		manufacturing	
year	1000-	30-99	1000-	30-99
1976	0.50	1.14	0.64	1.53
1977	0.53	1.55	0.58	2.31
1978	0.87	1.29	1.24	1.57
1979	0.50	1.06	0.64	1.35
1980	0.24	0.88	0.31	1.10
1981	0.33	0.81	0.40	1.00
1982	0.41	1.24	0.40	1.57
1983	0.39	0.96	0.42	1.37
1984	0.37	0.91	0.36	0.90
1985	0.35	1.54	0.39	1.44
1986	0.64	1.59	0.86	1.96
1987	1.09	1.24	1.43	1.50
1988	0.93	1.20	0.81	1.40
average	0.55	1.19	0.65	1.46

Resourse : Survey of Employment Trends.

[2] Note that those who are transferred temporally (so called *shukkou*) are not included by job leavers for employers' sake.

This may reflect the fact that the employment has been more guaranteed in large firms. However, both in total economy and manufacturing, the firm size gap of these rates is, on average, at most 1% and at the maximum is less than 2%. Hence, with respect to the job separation, we should not stress the effect of large firms' labor hoarding on unemployment too much. Rather we had better carefully consider the possibility of some kinds of labor hoarding even in small firms as well as in large firms.

FIGURE 1. THE NUMBER OF JOB OPENINGS BY ESTABLISHMENT SIZE

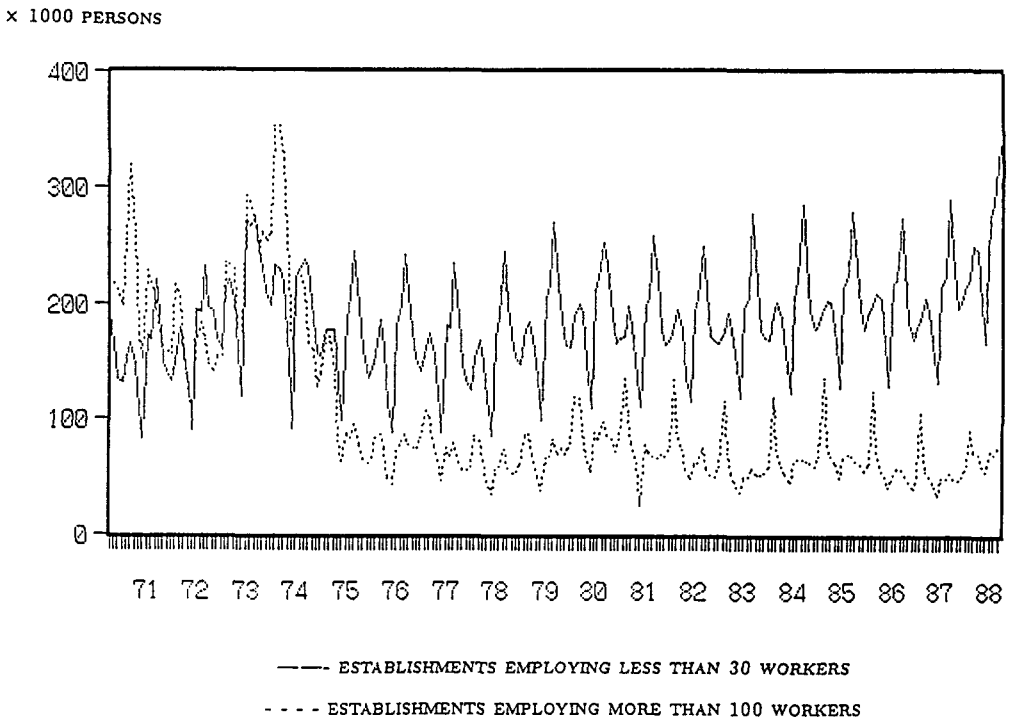
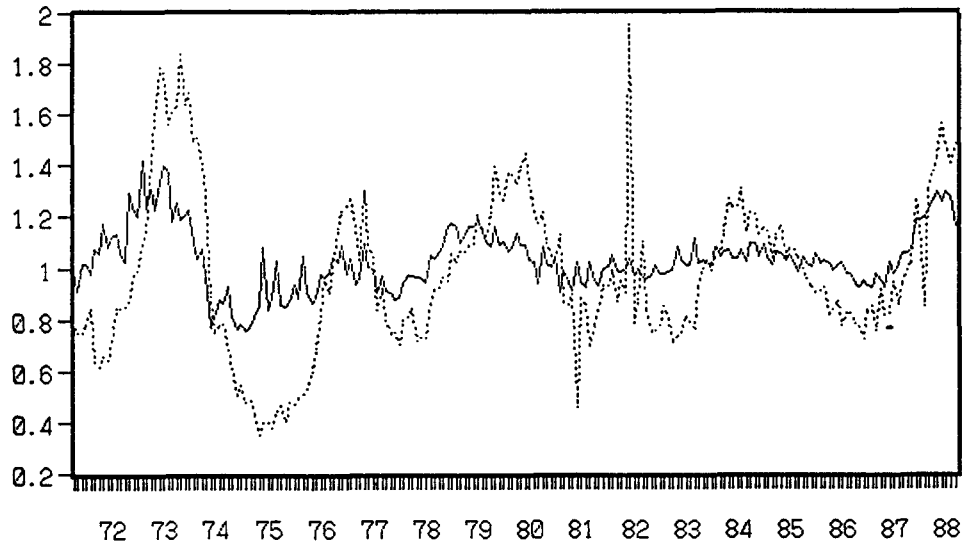


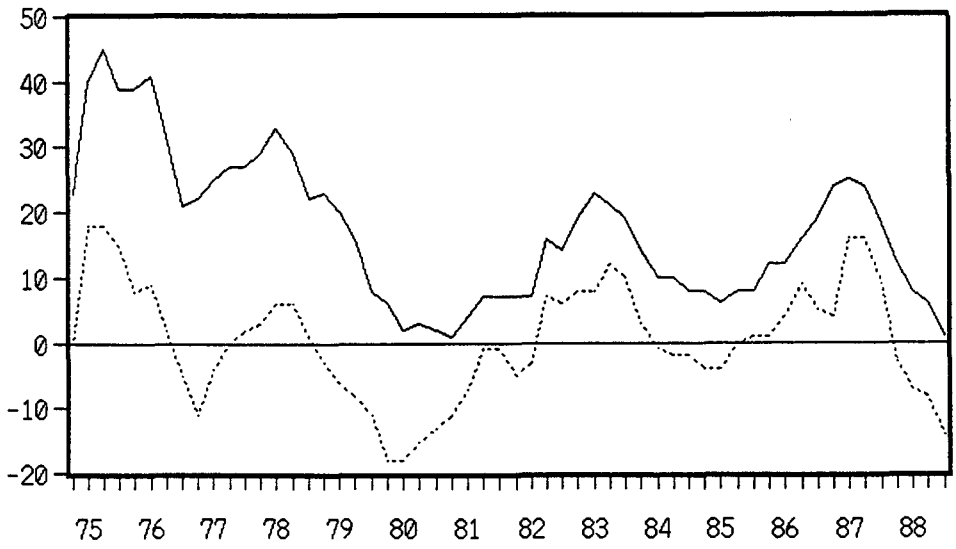
FIGURE 2. ANNUAL GROWTH RATES OF JOB OPENINGS
BY ESTABLISHMENT SIZE



——— ESTABLISHMENTS EMPLOYING LESS THAN 30 WORKERS

- - - - ESTABLISHMENTS EMPLOYING MORE THAN 100 WORKERS

FIGURE 3. D. I. INDEX OF EMPLOYMENT (BANK OF JAPAN)



——— ENTERPRISES EMPLOYING MORE THAN 500 WORKERS

- - - - ENTERPRISES EMPLOYING MORE THAN 50
AND LESS THAN 300 WORKERS

INDUSTRY:MANUFACTURING

Time series of monthly job openings in the Japanese labor market can be known using Employment Referral Statistics. The new openings by establishment size are shown in Figure 1. Aggregate job openings in large establishments (employing more than 100 workers) have declined significantly since the first oil shock. On the other hand, the job openings in small establishments (employing less than 30 workers) have been clearly larger than in large establishments since the oil shocks. And the seasonal volatility is much larger in small establishments than in large ones. Figure 2 shows annual growth rates of monthly job openings as a simple seasonal adjustment. This figure suggests, while the growth rate of large establishments has fluctuated significantly without seasonal changes, that of small firms is relatively stable.

Other data also confirm the fact that labor demand of small firms has been relatively large. The Bank of Japan inquires four times a year if firms have surplus personnel or would like to have more employment (*Nichigin-Tankan*). Then Diffusion Index are calculated as the percentage of firms having surplus minus the percentage of firms having shortage in manufacturing industries by enterprise size. Figure 3 shows how the index moved during the 1970s and 1980s.

According to this, during the periods from May 1974 to November 1990 it has been persistently positive for large manufacturing firms. It means large firms retain much labor redundancy. On the other hand, the index of small and middle firms employing more than 50 and less than 300 have been below zero in more than half of the periods. Although the index has been almost always above 10% in large firms, it has been rarely so in small and middle firms. Indeed the index moved procyclically for small and middle firms than large firms. However it is also the fact that middle and small manufacturing firms include some segments of labor shortages during these periods, contrasting to large firms.

In summary, employment of small firms has not been necessarily redundant even in recessions after the oil shocks. And some segments among small firms seem to have retained large labor demand. Consequently in small firms hiring was stable and the separation rate was not so large and declining during these periods.

3 A Hypothesis

This paper reconsiders Weitzman's share economy model (1984, 1985), and offers a hypothesis that many Japanese small firms have been under the share economy. Weitzman suggested that profit sharing plans will generate larger labor demand in the short run than the fixed wage plans, so that unemployment disappears. The next section shows some empirical evidences of the profit sharing especially in small firms.

The smaller the ratio of a fixed segment to total payment is, the larger labor demand is. Hence the proportion of the fixed part of a monthly wage and that of a bonus payment in each firm size are estimated respectively to clarify the reason for the firm size labor demand differential.

We denote a per capita monthly wage by W. It is

$$W = f_w + \frac{s_w}{12}\frac{[py - (12f_w + f_b)l]}{l}. \tag{1}$$

p, y, and l are a price of product goods, output, and employment respectively. f_w and f_b are fixed base parts of a monthly wage and a bonus. They will depend on job tenure, educational backgrounds, sex, and so on. And s_w is a sharing rate of a per capita return for production through a monthly wage and a bonus payment. These three variables, f_w, f_b and s_w, are assumed to be constant in the short run. B, a per capita bonus payment is also defined as

$$B = f_b + s_b\frac{[py - (12f_w + f_b)l]}{l}. \tag{2}$$

Then s_b is a constant sharing rate of the return through the bonus payment, and it is also fixed in the short run.

A sharing part of the wage (or bonus) payment is denoted by k_w (or k_b), that is,

$$k_w W \equiv s_w\frac{py - (12f_w + f_b)l}{12l}, \tag{3}$$

and

$$k_b B \equiv s_b\frac{py - (12f_w + f_b)l}{l}. \tag{4}$$

Suppose that a total annual payment is ω, which is defined as

$$\omega = 12f_w + f_b + (s_w + s_b)(\frac{py - (12f_w + f_b)l}{l}).$$

Then a firm faces the following maximization problem:

$$\max_l py - \omega l = (1 - s_w - s_b)(py - (12f_w + f_b)l) \tag{5}$$

The first order condition is

$$p(1 + \frac{1}{\epsilon})y'(l) = (12(1 - k_w)W + (1 - k_b)B). \tag{6}$$

Using the sharing plans is equivalent to reducing the total payment by $12k_wW + k_bB$. The smaller fixed part of the same total payment makes labor demand enlarge.

In the next section the null hypotheses that the sharing rates of these two kinds of payments are zero are tested. Suppose that py/l in this model is equal to a per capita real value added V. Under the above formulations, when we regress a per capita value added on a wage and a bonus, the estimators of the coefficients of a per capita value added will be

respectively equivalent to the sharing rate of each payment. Hence if the null hypotheses are rejected, f_w and f_b can be calculated given observed variables such as V, W, and B and the estimators of s_w, s_b from (1) and (2).

That is, the fixed parts of the wage and bonus are

$$f_w = \frac{(1-s_b)(12W - s_wV) + s_w(B - s_bV)}{12(1 - s_w - s_b)} \tag{7}$$

and

$$f_b = \frac{s_b(12W - s_wV) + (1-s_w)(B - s_bV)}{1 - s_w - s_b}. \tag{8}$$

Then we can know k_w and k_b in each firm size from (3) and (4).[3]

The ratio of the sharing part to the total payment can be also induced using the coefficient of a per capita real profit P. We define P as the follows:

$$P \equiv \frac{py - (12W + B)l}{l}. \tag{9}$$

Then f_w and f_b are respectively

$$f_w = W - \frac{s_wP}{12(1 - s_w - s_b)} \tag{10}$$

and

$$f_b = B - \frac{s_bP}{1 - s_b - s_w}. \tag{11}$$

s_w and s_b are also induced using the estimators of the coefficients of P in the similar way of using a per capita value added.

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[3] In this model, we assume that the rental cost of capital is paid from the employers' share. If the rental cost is also shared by the employees, (7) and (8) are transformed into

$$f_b = \frac{s_b(12W - s_wV) + (1-s_w)(B - s_bV) + s_wrk}{12(1 - s_w - s_b)}$$

and

$$f_b = \frac{s_b(12W - s_wV) + (1-s_w)(B - s_bV) + s_brk}{1 - s_w - s_b}.$$

r is the unit rental cost and k is the capital labor ratio. Hence as long as the capital labor ratio of large firms is larger than that of small firms, the firm scale gap of k_w and k_b would become larger.

The fact that stable and large labor demand appears in samall firms and some part of them is always under labor shortages even in recessions seems to be consistent with the interpretation of a share economy model as long as the payment of small firms involves the more sharing part. In this paper I focus on this effect, and show empirical results about it in the next section.

4 Empirical Tests

4.1 Data

Is it the profit sharing payment that made labor demand large in small firms after the oil shocks? The functions of profit sharing through the wage and bonus payment are investigated by firm size.

Now as wage and bonus measures the data on contractual wages and specialearnings paid in the previous year of the researching year are used from the Basic Wage Structure Survey (Wage Census) from 1974 to 1988. A main purpose is to research the differences in the payment structure by firm size in recessions, so that we choose the sample periods when the aggregate job opening/applicant ratio has been below 1 (that is, 1975-87). And the reason for choosing these periods is that the effect of sharing plans on the increase in employment is theoretically limited to the case when the economy is not constrained to labor supply conditions.

When this issue has been previously investigated, the data (especially for bonuses) were mainly induced from the Monthly Labor Survey (for example, Freeman and Weitzman (1985), Mizuno (1985) and Ohashi (1989)). Hence the effects of workers' characteristics such as job tenure, educational backgrounds, and sex as well as firm size difference in profit sharing were not sufficiently examined. And these data were distinguished by establishment size instead of enterprise size.

The Wage Census reports that these data wiht respect to the wage and bonus payments are available for three enterprise size (more than 1000, more than 100 and less than 1000, and more than 10 and less than 100 employees). In estimations I pick up enterprises employing more than 1000 workers and those between 10 and 100 workers. These data are divided by different worker classifications according to four kinds of educational backgrounds (junior high school, high school, junior college, and college), ten divisions of age (18-19, 20-24, 25-29, ..., 50-54, 55-59, 60-), job type (production or non-production), and sex. We also know the average age, job tenure and monthly total working hours in june in each bracket. Samples are limited to workers whose ages are between 20 and 60, and those who belong to the manufacturing segment.

Among the data, the effects of the growth of tenure and total working hours in each bracket on the real wage and bonus growth are considered as well as the effect of profit sharing. And the effects of economy-wide labor market conditions and its cross term with job tenure are also examined to investigate the alternative theories of bonuses and wages

discussed in the last section.

If a so called buffer theory is true, the payment in small firms will be more volatile to labor market conditions than in large firms because of less skill accumulation in the former. Similarly, the less skilled workers are, the more they are likely to be confronted with the wage and employment volatility due to changes in labor market conditions. So the wage and bonus of the less experienced workers would be more responsive to aggregate demand shocks than others. If a human capital theory is true and the human capital investment is more intensive in large firms, then the return to job tenure should be larger and less responsive in large firms than in small firms.

In order to investigate the effect of profit sharing, we use two kinds of variables from the Census of Manufactures as an independent variable to indicate changes in real performances of each firm size (note that in the census small firms are defined to be those employing more than 20 and less than 100 workers). The one is a growth rate of a per capita real value added defined by a per capita nominal value added in each firm size in manufacturing deflated by the 1980 whole price index of manufacturing products. The other is a growth rate of profits. We now have a remark on the profit variable. While the data on the nominal shipment volume, nominal value added, and total personnel expenses in each size can be utilized from the census, we cannot acquire the data on profits. So in the following tests the gap between a nominal value added and total personnel expenses is approximately regarded as profits. Hence a rental cost of capital, a depreciation of stock and financial expenses are ruled out here. Finally as an independent variable to indicate labor market conditions, the job opening/applicant ratio is available.

In summary, these assessments are examined by estimating the following equations in each firm size. With respect to the wage payment,

$$\Delta lnRW = const + \alpha_w \Delta T + \beta_w \Delta H + \gamma_w JOA + \eta_w^x \Delta X + \theta_w T * JOA + Dummies + \varepsilon_w. \quad (12)$$

As to the bonus payment,

$$\Delta lnRB = const + \alpha_b \Delta T + \beta_b \Delta H + \gamma_b JOA + \eta_b^x \Delta X + \theta_b T * JOA + Dummies + \varepsilon_b. \quad (13)$$

Here, $\Delta lnRW$, and $\Delta lnRB$ respectively indicate the rate of an annual change in a contractual monthly wage and a bouns in each bracket deflated by the consumer price index (1985 base); ΔT, the growth of years of job tenure in the bracket; ΔH, the growth of monthly total working hours in the bracket; ΔX, the per capita real performance growth rate in each firm size, and JOA, the job opening/applicant ratio which is common to the different firm size. As described above, one of the following two variables is chosen as ΔX in the estimation; ΔV, the per capita real value added growth rate or ΔP, the per capita profit (real value added minus the total personnel expenses) growth rate. In order to consider the difference in the effect of labor market conditions on wages and bonuses by job

tenure, a cross term of the job opening/applicant ratio and years of job tenure is involved. If the wage (bonus) of the less skilled workers is more responsive to JOA, its coefficient should become negative. Dummy variables for educational backgrounds, job type (production or non-production), and sex are added. ε_w and ε_b are the error terms.

These equations are estimated by the weighted least squares method WLS, and weights are the number of workers in each bracket with respect to wage and bonus payments. These results are shown in Table 5.[4]

[4] OLS estimates are available on request, and they are little different from WLS estimates. Note that the following Wald tests in Table 8 are based on the results by OLS.

TABLE 5

THE WEIGHTED LEAST SQUARES METHOD

	large firms				small firms			
	$\Delta lnRW$		$\Delta lnRB$		$\Delta lnRW$		$\Delta lnRB$	
const	-0.119	-0.0102	-0.159	-0.116	-0.0579	0.0811	-0.568	-0.118
	(-12.4)	(-1.33)	(-4.88)	(-4.27)	(-3.34)	(4.70)	(-25.0)	(-4.66)
ΔT	0.00971	0.0106	0.0240	0.0244	0.00451	0.00448	0.0411	0.0404
	(7.19)	(8.08)	(4.98)	(5.10)	(1.36)	(1.34)	(9.66)	(9.35)
ΔH	0.193	0.153	-0.391	-0.658	0.0598	0.0243	0.777	0.688
	(15.2)	(12.2)	(-0.838)	(-1.40)	(1.02)	(0.411)	(8.75)	(7.32)
ΔV	0.180		0.0450		0.241		0.725	
	(14.0)		(1.03)		(7.52)		(15.7)	
ΔP		0.127		0.0919		0.162		0.549
		(16.8)		(3.48)		(6.39)		(14.4)
JOA	0.170	0.0939	0.231	0.223	0.0817	0.0179	0.825	0.638
	(11.8)	(7.80)	(4.74)	(5.31)	(3.02)	(0.746)	(23.3)	(20.2)
$JOA\times$	0.000175	-0.000176	0.000103	-0.000185	0.00114	0.00107	0.000458	0.0000486
tenure	(1.06)	(-1.09)	(0.189)	(-0.335)	(1.75)	(1.63)	(0.549)	(0.0571)
high	-0.0000397	-0.00243	0.00468	0.00245	-0.00355	-0.00376	-0.00453	-0.00618
school	(-0.0238)	(-1.49)	(0.818)	(0.427)	(-1.25)	(-1.31)	(-1.19)	(-1.60)
junior	0.00290	-0.00134	0.00844	0.00522	-0.000406	-0.000837	-0.00362	-0.00566
college	(0.731)	(-0.345)	(0.633)	(0.392)	(-0.0514)	(-0.0896)	(-0.297)	(-0.458)
college	-0.000431	-0.00436	0.00611	0.00254	-0.00492	-0.00524	-0.00362	-0.00580
	(-0.164)	(-1.70)	(0.686)	(0.284)	(-0.747)	(-0.789)	(-0.417)	(-0.656)
white	-0.00261	-0.00118	-0.00283	-0.00189	-0.00376	-0.00367	0.000445	0.000983
collar	(-1.57)	(-0.726)	(-0.502)	(-0.336)	(-1.13)	(-1.09)	(0.101)	(0.220)
female	0.00221	0.000808	0.00824	0.00675	0.00617	0.00616	0.000201	-0.000642
	(1.08)	(0.408)	(1.19)	(0.980)	(2.07)	(2.05)	(0.0507)	(-0.160)
$adjR^2$	0.32	0.36	0.04	0.09	0.06	0.05	0.45	0.44
N	1092	1092	1092	1092	1092	1092	1092	1092

Resources : Wage Census, Ministry of Labor

sample periods : 1975-87

t-statistics are in parentheses.

industry : manufacturing

The WLS estimators are efficient, if a disturbance term ε is an error term which is not ex . ante included in the fixed segment of each payment and does not affect the determination of employment. If the disturbance term, however, involves some kinds of unobservable factors which change the fixed part such as a change in a bargaining power and a technological shock, the orthogonality condition may not be satisfied.

Hence the equation (12) and (13) in the case of using profit growth rates are also estimated by the instrumental variables method. These results are shown in Table 6. Under the assumption that while the change in a bargaining power affects the profit rate, it is weakly correlated with a growth rate of per capita volume of sales, the per capita sales growth rate may be the valid instrument. And the number of employment will depend on the change in search and recruiting costs influenced by the labor market conditions. Hence the job opening applicant ratio in the previous year is also used as an instrument by assuming that it is independent of a current technological shock.

TABLE 6

THE INSTRUMENTAL VARIABLES METHOD

	large firms				small firms			
	$\Delta lnRW$		$\Delta lnRB$		$\Delta lnRW$		$\Delta lnRB$	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
const	0.0141	0.0368	-0.0785	-0.0723	0.0945	0.0940	0.0865	0.122
	(1.51)	(3.47)	(-2.54)	(-2.47)	(4.92)	(4.92)	(2.62)	(3.64)
ΔT	0.0109	0.0113	0.0247	0.0247	0.00529	0.00526	0.0439	0.0445
	(7.66)	(6.59)	(5.07)	(5.05)	(1.56)	(1.55)	(9.52)	(9.44)
ΔH	0.124	0.0969	-0.118	-0.127	0.0176	0.0179	0.135	0.0345
	(8.58)	(5.75)	(-2.29)	(-2.56)	(0.297)	(0.301)	(1.18)	(0.301)
ΔP	0.235	0.337	0.236	0.260	0.196	0.195	1.01	1.09
	(11.8)	(18.5)	(3.82)	(5.65)	(5.90)	(5.91)	(17.4)	(18.4)
JOA	0.119	0.143	0.251	0.255	0.0278	0.0275	0.724	0.739
	(8.65)	(8.87)	(5.72)	(5.90)	(1.12)	(1.11)	(21.0)	(21.0)
$JOA\times$	-0.000538	-0.000878	-0.000668	-0.000750	0.000879	0.000885	-0.00158	-0.00187
tenure	(-2.88)	(-4.02)	(-1.13)	(-1.30)	(1.31)	(1.32)	(-1.72)	(-1.99)
high	-0.00528	-0.00796	-0.00143	-0.00209	-0.00429	-0.00427	-0.0124	-0.0135
school	(-2.87)	(-3.67)	(-0.238)	(-0.352)	(-1.49)	(-1.45)	(-2.97)	(-3.17)
junior	-0.00568	-0.00975	-0.000167	-0.00108	-0.00166	-0.00163	-0.0149	-0.0165
college	(-1.33)	(-1.92)	(-0.0122)	(-0.0792)	(-0.177)	(-0.174)	(-1.13)	(-1.23)
college	-0.00880	-0.0130	-0.00361	-0.00465	-0.00612	-0.00609	-0.0150	-0.0166
	(-3.04)	(-3.80)	(-0.385)	(-0.503)	(-0.919)	(-0.914)	(-1.59)	(-1.72)
white	0.000143	0.00138	-0.00386	-0.000132	-0.00322	-0.00324	0.00485	0.00554
collar	(0.0801)	(0.650)	(-0.0675)	(-0.0230)	(-0.958)	(-0.963)	(1.02)	(1.13)
female	-0.000676	-0.00207	0.00419	0.00376	0.00582	0.00583	-0.00353	-0.00404
	(-0.311)	(-0.797)	(0.594)	(0.533)	(1.92)	(1.93)	(-0.823)	(-0.921)
$adj R^2$	0.33	0.29	0.04	0.04	0.05	0.05	0.40	0.39
N	1092	1092	1092	1092	1092	1092	1092	1092

sample periods: 1975-87. Instruments are constant term, ΔT, ΔH, *JOA*, $JOA \times$ *tenure*, dummy variables of educational backgrounds, blue or white collars, and sex, and a per capita real volume of sales growth rate in equation (1). They are constant term, ΔT, ΔH, *JOA*, $JOA \times$ tenure, dummy variables of educational backgrounds, blue or white collars, and sex, and a job opening applicant ratio in the previous year in equation (2).

4.2 Empirical Results

Empirical results in Table 5 and 6 are explained according to the independent variables.

The effect of the job tenure growth on the wage change is more effective in large firms. In this test the coefficient of job tenure in small firms is not significant, and the effect in small firms cannot be observed. If job tenure can be regarded as a proxy for accumulation of a firm specific skill, this fact will mean that human capital of the specific skill is invested more intensively in large firms. However, its effect on the growth of bonuses is, on the contrary, more likely to be stronger in small firms than in large firms. This does not seem to be consistent with the interpretation that bonuses are payments of the share of rents produced by firm specific skills such as Hashimoto (1979). Note that when we observe bonus-age profiles of standard employees, it is not necessarily flatter in large firms than in small ones. This fact will mean that for some reasons the bonus in large firms may partly play a role of supporting the income of workers according to their ordinal expenditures (*seikatsu-kyu*). Hence bonuses in large firms may be mainly influenced by age of employees instead of job tenure.

Higuchi (1989) confirmed the Reder effect that the wage differentials between different years of job tenure tend to shrink in booms by inducing a cross-term of years of job tenure and the job opening applicant ratio. When we add the similar cross-term in estimations, we could not necessarily observe the Reder effect with respect to the bonus as well as the base wage. This different outcome is probably because our tests are different from his work in the point that we limit the sample periods when the job opening/applicant ratio is below 1, while in his test sample periods are from 1970 to 1987 except 1973 and it included the periods when the labor market is tight. And this outcome may come from the exclusion of the teen-age and senior workers from our sample.

In examining the working hour effect, as a result of workers in large firms, if current working hours have become longer than that in the previous year, the current wages become large. On the contrary, even if the growth rate of working hours in the current year becomes longer than before, the real contractual wages in small firms do not necessarily increase with it. This may probably mean that over-time payments are not paid sufficietly in small firms.

However, in Table 5, the bonus payment will increase in small firms, if working hours will become longer. Hence the increase in current working intensity such as the growing working hours may be compensated by the bonus payment instead of the over-time payment in small firms. As this tendency disappears in Table 6, we need a more careful research about this point.

We next see the effect of changes in labor market conditions during recessions on wages and bonuses. Now we can find two important facts here. The first is, while as to the wage growth estimation the coefficient of the job opening applicant ratio is significantly positive in large firms, that is not necessarily so in small firms. The real wage paid in large firms is more responsive to labor market conditions after the oil shocks than that paid in

small firms. This fact is surprising from the viewpoint of the dual labor market hypothesis, or the buffer theory. Because it seems to suppose that the real wage in small firms is more likely to be determined through labor market conditions, independent of the internal situations of individual firms, while the stability of the wage in large firms are relatively guaranteed.

The second is that the coefficient of the job opening applicant ratio on the bonus growth is much larger with respect to small firms than large firms. Ohashi (1989) found the positive effect of the job opening applicant ratio on the bonus payment, but his empirical research was limited to large establishments. Our finding is that this effect seems to be stronger about small enterprises than large enterprises. Ohashi interpreted the effect as the evidence of the feasibility of paying the efficiency wage premium through the bonus payment, but his interpretation is not always suitable for the results of small firms. Because it seems that many small firms need not (or cannot) pay the efficiency wage to prevent workers from shirking or quitting.

We finally focus on the main result of this paper. With respect to the real contractual wage, each coefficient of the growth rates of the value added and the profit is significantly positive in both firm size and it is larger about small firms than about large firms. As to the bonus payment, the coefficient is much larger in small firms than in large firms, and larger than the coefficient in the case of the wage growth. Mizuno (1985) examined the effect of the per capita profit rate on the growth of the bonus and wage by establishment size, but he did not distinguish the profit rate by establishment size. All variables in our estimations are distinguished by enterprise size except the job opening applicant ratio.

Following the results Section 3, I calculate the average sharing rates of a wage and a bonus during recessions from the results Table 5. Then I assume that the elasticities of a per capita value added on a wage and a bonus η_w^V and η_b^V have been almost constant during these periods and that theoretical constraints can be satisfied with respect to the average level of W, B, *and* V. That is, when these elasticities are estimated, these estimators result in the relationships as follows;

$$\widetilde{\eta_w^V} = \frac{s_w \overline{V}}{12\overline{W}} \tag{14}$$

and

$$\widetilde{\eta_b^V} = \frac{s_b \overline{V}}{\overline{B}}. \tag{15}$$

$\widetilde{\eta_{w(b)}^V}$ is a GLS estimator of $\eta_{w(b)}^V$ in (12) (or (13)). And $\overline{X}$ is the average level of a variable X.

Then the average level of sharing segments of a monthly wage and a bonus payments can be calculated using $\eta_{w(b)}^V$, $\overline{W}$, $\overline{B}$ and $\overline{V}$ from (7), (8), (14) and (15). And similarly under

the assumption that the ratio of a per capita profit to a wage and that of a per capita profit to a bonus have been almost constant during these periods these sharing segments can be also calculated in the same way.

TABLE 7

THE SHARING RATE AND THE PROPORTION OF THE SHARING PART TO THE PAYMENT THE AVERAGE LEVEL DURING 1975-87

	η_w^V	η_b^V	η_w^P	η_b^P	s_w	s_b	$100k_w$	$100k_b$	$100\frac{12Wk_w+Bk_b}{12W+B}$
large firms	0.180	0.0450			0.0450	0.00386	12.6	3.1	10.2
			0.127	0.0919	0.0447	0.0109	12.7	9.2	11.8
small firms	0.241	0.725			0.0931	0.0543	15.2	45.8	20.2
			0.162	0.549	0.0940	0.061	16.2	54.9	22.5

All of these results are shown in Table 7. Those calculations in Table 7 are based on the results in Table 5. The sharing rate of the wage (s_w) in small firms is about twice as large as that in large firms. The sharing rate of monthly wages is about 0.45% in large firms and 0.93% in small firms. The sharing rate of the bonus (s_b) in small firms is much larger than that of large firms, and the latter is at most 1%. Provided that the wage and bonus are determined under Nash bargaining between a firm and employees, the sharing rate will depend on the threat point of each party : the possibility of job vacancy and new hiring. The sector under labor shortages should make the sharing rate of employees larger than under labor redundancy. Hence our result of the large sharing rate in small firms seems to be consistent with the interpretation that small firms are relatively under labor shortages even in recessions.

As the results, both the proportion of the sharing part of the wage (k_w) and that of the bonus (k_b) are larger in small firms than in large firms. In particular, it is surprising that nearly the half of the bonus payment is the sharing part in small firms. Consequently the proportion of profit sharing in the total annual payment is more than 20% in small firms, while it is about 10% in large firms. As described in the previous section, this means that even if both size firms ex post offer the same total payment to the workers having the same productivity, small firms ex ante consider their marginal cost to be smaller than large firms by about 10%.

Using (10)-(13), we can know that the proportion of the sharing segment is equal to the coefficient of the per capita profit growth rate under the assumption about elasticities described above : that is, $k_w = \eta_w^p$ and $k_b = \eta_b^p$ in each firm size. Hence the null hypotheses that the proportion of the sharing segment to each payment is the same between large and small firms is equivalent to the hypotheses that η_w^p and η_b^p are the same between large and small firms. Wald tests about these constraints are shown in the uppere and middle part of

Table 8. The results in this table are based on OLS estimators about (12) and (13). Then the null hypothesis about bonuses can be rejected at 1% level, while the hypothesis about monthly wages cannot be rejected.

TABLE 8
WALD TESTS

H_0^a:η_w^P is the same between large and small firms	1.31	
H_0^a:η_b^P is the same between large and small firms	67.2**	
H_0^b :	large firms	small firms
$\gamma_w = \gamma_b, \eta_w^V = \eta_b^V, \theta_w = \theta_b$	9.97*	80.52**
$\gamma_w = \gamma_b, \eta_w^V = \eta_b^V$	9.97**	77.0**
$\eta_w^V = \eta_b^V$	2.39	29.1**

Note.

a : Dummy variables in (12) and (13) are omitted from equations with respect to these tests.

b : sample periods are 1976-87 (wage), and 1975-86 (bonus).

* : significant at 5% level.

** : significant at 1% level.

So far the growth rates of wage and bonus payments have been used as dependent variables. Then all what can be known as to sharing rates is the average levels under the above assumptions. To examine the changes in sharing segments, the growth level of each payment rather than its growth rate is alternatively used as a dependent variable and the growth level of a per capita value added (or a per capita profit) is used as an independent variable as to WLS. In this case coefficients of the growth level of a per capita value added on the growth levels of a wage and a bonus are $s_w/12$ and s_b. And coefficients of that of a per capita profit on those of a wage and a bonus are $s_w/12(1-s_w-s_b)$ and $s_b/(1-s_w-s_b)$ from (10) and (11). Under the assumption that the sharing rates have been constant during these periods the sharing segments of these payments in each date can be calculated using the estimated sharing rates and average levels of a wage, a bonus, and a per capita value added (or a per capita profit) in each year from (7) and (8), or from (10) and (11).

TABLE 9

THE CHANGES IN SHARING SEGMENTS BY FIRM SIZE

	large firms			small firms		
	$s_w/12(1-s_w-s_b)$ 0.00235(7.08)*			$s_w/12$ 0.00875(5.80)**		
	$s_b/(1-s_w-s_b)$ 0.0122(2.32)*			s_b 0.0264(6.38)**		
year	$100k_w$	$100k_b$	$100\frac{12Wk_w+Bk_b}{12W+B}$	$100k_w$	$100k_b$	$100\frac{12Wk_w+Bk_b}{12W+B}$
1974	5.7	8.4	6.3	20.2	24.8	21.0
1975	5.6	6.8	5.9	15.7	17.4	16.1
1976	6.3	8.1	6.7	15.7	21.1	16.5
1977	6.5	8.5	7.0	16.1	20.9	16.9
1978	7.3	9.4	7.8	17.1	22.6	17.9
1979	7.7	10.4	8.4	17.9	24.4	18.9
1980	7.5	10.0	8.1	17.8	22.7	18.6
1981	7.5	9.6	8.0	17.3	21.4	18.0
1982	7.9	10.1	8.5	17.3	21.7	18.0
1983	8.0	10.0	8.5	17.2	22.4	18.1
1984	8.4	10.9	9.0	17.6	23.9	18.6
1985	9.7	12.4	10.4	18.2	24.3	19.2
1986	9.5	11.7	10.0	17.8	22.8	18.6
1987	10.2	12.7	10.9	17.9	24.0	18.9

Note.* and ** : estimators of coefficients of a per capita value added are used as to large firms, while those of a per capita profit are used as to small firms. t-values are in parentheses.

The results of calculations are shown in Table 9. Note that as the sharing rates the estimators of coefficients of a per capita value added are used in the case of small firms, while those of a per capita profit are used in the case of large firms. This is because either of sharing rates of wages and bonuses is insignificant when the other variable is used in each case. The proportions of the sharing segments of a bonus and a wage in small firms have been continuously larger than these in large firms. And both of sharing segments have been gradually expanding in each firm size since 1975. This result is consistent with the interpretation of a share economy model that the Walrasian price adjusting mechanism can work in the long run through the expansion of the sharing segments.

We so far treated that wages and bonuses may be determined differently in accordance with respective mechanisms of payment determination. Some studies about the bonus payment, however, had doubt on the view that these payments are determined differently and regard the bonus as a segment of the wage payment (for example, Mizuno (1985)), as

they considered a bonus-wage ratio has been almost constant since the middle 1970s.

In our framework, if such a view is right, this means that the derivative of the per capita value added in the log linearized wage function is equal to that of the long linearized bonus function. That is, it is equal to the ratio of the common sharing parameter to the total annual payment. And bonuses and wages will be equally responsive to labor market conditions, so that the derivative of the job opening applicant ratio should be the same between (12) and (13). Wald tests about these constraints are shown in the lower part of Table 8. They show that the constraints about small firms are rejected at 1% level, so that the idea that the bonus is no more than a segment of the wage payment is not plausible to small firms. As to large firms, the constraints that both the coefficients of the per capita value added and the job opening applicant ratio are the same among two equations are also rejected as well as the case of small firms. However, under the constraint that only the coefficient of the value added is the same , this cannot be rejected in large firms.

5 Concluding Remarks

In this paper, we considered the puzzle why the unemployment rate in Japan has been so low since the oil shocks. As its reason, I showed the supportive results of Weitzman's share economy hypothesis especially in small Japanese manufacturing firms. The large sharing segment in bonus payments of these firms had enlarged labor demand even in recessions.

We suggest the possibility that profit sharing plans in small firms made the unemployment rate lower, but it is theoretically known that there should be some difficulties in inducing a share economy. Here I pick up two points and briefly suggest why small firm could avoid such difficulties. Weitzman (1984) suggested that one of the serious problems which make the use of profit-sharing plans difficult is that long tenure workers will not agree with these plans. It is because when long tenure workers get the payments above the reservation level, the application of profit sharing plans finally makes their wages be gradually equal to their reservation levels through the adjustment of the fixed base part.

TABLE 10

THE STARTING DATES OF THE PROFIT-SHARING BONUS SYSTEM

firm scale	a	before 1949	1950 -54	55 -59	60 -64	65 -69	70 -74	75 -79	80 -84	missing
total	(32.0)100	4.8	4.9	3.9	11.0	15.4	22.2	25.0	10.2	2.6
large[b]	(16.4)100	6.5	4.3	2.8	10.7	10.7	17.2	17.5	17.5	12.8
middle[c]	(33.8)100	4.6	6.0	6.5	10.8	11.6	25.6	21.5	10.1	3.5
small[d]	(31.7)100	4.9	4.4	2.9	11.1	17.1	20.8	26.7	10.2	2.1

Note. Values are percentages of the corresponding firms in each size.

Source. General Survey of Wage and Hours Worked System, Ministry of Labor, 1983

a : the proportion of firms currently paying the profit-sharing bonus.

b : the firms employing more than 1000 workers.

c : the firms employing more than 100 less than 1000 workers.

d : the firms employing more than 30 less than 100 workers.

Table 10 shows that the profit sharing bonus system in small firms mainly began between the middle 1960s and the late 1970s. At the time when the profit sharing bonus had begun in small firms, the average year of job tenure was not large there, and the number of those workers was small. In addition, wage tenure profiles were relatively flat in small firms, so that long tenure workers did not get so much premiums above the reservation wages. Hence the pressure of those workers do not seem to have been so large in small firms.

Second in a microeconomic framework a sharing plan is equivalent to inducing a simple linear piece rate. The empirical finding suggests that to promote workers' effort, the bonus payment may be used as the incentive mechanism (Okuno (1984)). It is known, however, that the asymmetric information between employers and employees with respect to the content of both jobs and effort makes linear peace rate sub-optimal (Gibbons (1987)) and the labor contract should become much complicated.

This kind of asymmetric property may cause difficulty in introducing simple sharing plans in large firms because of wide varieties of job characters . However, it is hard to believe that the complexity of job characters also makes the linear simple sharing plans in small firms. For there are not relatively so many varieties of job characters in small firms at least compared with large firms. So small firms might avoid such a problem about the information property.

Data Appendix

RW The real contractual monthly wage deflated by the consumer price index (1985 base) (Data source; the Wage Census (the Basic Wage Structure Survey))

RB The actual special earnings paid in the previous year of the researching date deflated by the consumer price index (1985 base) (the Wage Census)

T Years of job tenure (the Wage Census)

H monthly total working hours (the Wage Census)

JOA The job opening/applicant ratio (the Employment Security Statistics)

V The per capita value added by firm size deflated by the whole price index (1980 base) (Census of Manufactures)

P The per capita value added minus the total personnel expenses deflated by the whole sale price index (1980 base) (the Census of Manufactures)

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