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Bonuses and Employment in Japan*

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Japan has a relatively unique system of labor compensation. Most Japanese workers are paid large bonuses twice a year. This paper examines the cyclical movement of bonuses compared with wages and the relation of bonuses to employment in the context of the Weitzman "share economy." The paper makes three basic points: (1) The Japanese bonus is much more procyclical than Japanese base wages, but not as cyclically variable as profits. Bonuses can be interpreted as containing a quantitatively significant revenue- or profit-sharing component. (2) Bonuses have employment consequences quite different from those of base wages. Even after controlling for other economic factors, bonuses are positively related to employment, whereas base wages are negatively related to employment. (3) The bonus system of paying workers seems to play a modest role in helping to stabilize Japanese unemployment at comparatively low levels. *J. Japan. Int. Econ.*, June 1987, 1(2), pp. 168–194. Department of Economics, Harvard University, Cambridge, MA 02138; and Department of Economics, Massachusetts Institute of Technology, Cambridge, MA 02139. © 1987 Academic Press, Inc.

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The bonus payment system, by which Japanese workers receive upwards of one-quarter of their yearly pay in the form of semiannual bo-

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nuses, is one of the exotic features of Japanese labor markets that have long fascinated outsiders. Recently interest has been heightened by the realization that the bonus system may have important macroeconomic implications along the lines of a "share economy."[1] It is at least conceivable that some part of Japan's remarkable ability to stabilize unemployment at low, steady rates is due to the automatic pay flexibility that comes with profit or revenue sharing. For a subject of such potential importance, the Japanese bonus system has been studied relatively little.

This paper reports the results of a detailed empirical analysis of Japanese labor market data designed to address certain fundamental questions about the bonus system. In it we analyze data on bonuses and other labor market variables at the one- and two-digit industry levels from 1958 to 1983, as well as data from a case study of an individual firm. Our interpretations have been guided by the results of interviews with Japanese employer federation representatives and labor union officials.

I. Background

The purpose of this section is to place the subject of the Japanese bonus system in a broader context. This is important because the bonus system is only one part of the complicated, interrelated web of institutions and attitudes that constitutes Japanese labor relations. Although we have tried hard to guard against a monocausal interpretation of the Japanese labor market, it is quite possible that in analyzing the bonus system we inadvertently overlook other important aspects of the industrial relations system that have also influenced the behavior under study.

The following stylized facts might be taken as roughly descriptive of how the "Japanese model" of the labor market differs somewhat from others.[2]

(1) Firms hire workers directly out of school for "lifetime employment" (the *shushin koyo* system). In fact this is done primarily by the large firms, and only for their so-called "permanent" or "regular" employees. In the economy as a whole, 66% of all workers (including self-employed and family workers) are "regular" employees, of whom 54% are in firms with 50 regular employees or more and 24% in firms with 500 regular employees or more, making the permanent employees a minority of the work

[1] Weitzman, 1984, 1985.

[2] Shimada (1983) gives an excellent survey of the English language literature.

force. Nevertheless, the "lifetime commitment mentality" seems to be a fair characterization of the Japanese system as a whole.[3]

(2) There is a steep age-earnings profile for permanent workers up to retirement age of 55 or, more recently, 60. Pay is influenced greatly by seniority, but this *nenko* system has begun to erode in many places as it increasingly comes to be viewed as anachronistic and as Japan faces a decline in the number of younger workers relative to older workers.[4]

(3) The Japanese workplace is a relatively cooperative and egalitarian environment. There are few work rules, job reassignments are common, and a high degree of company loyalty motivates productivity-enhancing behavior.[5] Unions are organized along enterprise or company lines and include white-collar as well as blue-collar workers. In addition, blue- and white-collar workers in the same firm are comparatively less differentiated than elsewhere in terms of perquisites, treatment, method of payment (monthly salaries rather than hourly wages—with meaningful bonus payments), and how much they are paid.

(4) Japanese society as a whole displays a relatively intense commitment at a grass-roots level to maintaining full employment. Moreover, layoffs are not generally by seniority. There appears to be a high degree of social responsibility in wage setting in Japan, as was dramatically shown by labor's heeding the 1975 call for wage restraint in the face of strong inflation caused by the first oil shock. Work sharing is common, as Japanese firms tend to adjust hours more than employment and also to hoard more labor in downturns compared to firms in most other developed countries.[6]

(5) Bonuses are important quantitatively in the average worker's pay (upwards of one-quarter of pay is in the form of a semiannual bonus). They are also large relative to reported company profits, ranging from 42 to 76% of operating profits before taxes from 1965 to 1983, and have come to constitute roughly 10% of net domestic product.[7]

[3] Koike (1983a, b, and references therein) sometimes argues the contrary view that Japanese industrial relations, and particularly the lifetime employment system, are not nearly so unique as is sometimes made out. He has a point when he does not push this view too hard. Another view is given by Hashimoto and Raisian (1985). Tachibanaki notes that much of the difference in job tenure in Japan and the United States results from the fact that workers obtain permanent jobs directly out of school in Japan whereas in the United States workers job shop before taking a permanent job. For figures on regular employment see Japanese Ministry of Labor, "Yearbook of Labor Statistics," 1983, Table 4.

[4] For discussion of the *nenko* system, see, e.g., Shimada, 1983, or Shirai, 1983b. Also see Tachibanaki, 1982.

[5] For descriptions of the Japanese workplace, see Koshiro, 1983a. See also Koike, Skill formation system in the U.S. and Japan: A comparative study, in Aoki, 1984.

[6] On many of these points see Shirai, 1983b. Hours adjustments are discussed in Hamada and Kurosaka, 1984.

The typical Japanese worker's pay is divided into two categories. The first component is officially called *kimatte shikyusuru kyuyo*, "the wage that is surely paid," which we will refer to simply as base wages, although they are not hourly wages at all, but rather a monthly salary. (Actually, because wages are paid on a monthly basis the concept of "overtime" payments and work is not sharply differentiated in Japan, suggesting that employment rather than person-hours is the fundamental unit of labor usage for regular workers.) The second component is called "special cash payments" in the official statistics and the defining characteristic is held to be that it is a payment made "temporarily, unexpectedly, or erratically at the discretion of the employer." This category consists overwhelmingly of bonus payments, even though their terms and amount are often established by collective agreements and they are sometimes far from temporary, unexpected, or erratic.

Bonuses are usually paid twice a year—in summer (mostly June and July), and at year's end (December). Insignificant amounts are sometimes paid in August, March, and January. Although before the Second World War blue-collar and low-status white-collar workers often received a lump sum of money twice a year in addition to their regular pay, the small amount of money involved was in no way comparable to the significant semiannual bonuses received by high-status white-collar employees with advanced educational backgrounds. It was only after the war that the payment system emerged in its present form, as part of a broader trend. The main feature of this trend was a deemphasis, to the point of near-elimination, of the invidious status categories of prewar Japan with their implicit legacies of a feudal past. As one by-product of the immediate postwar process of democratizing the workplace, which the unions fully supported, all regular employees—blue collar and white—were henceforth to be paid a monthly salary instead of an hourly wage, supplemented by meaningful semiannual bonuses for every regular employee irrespective of category.[8] The bonus payments constituted less than 2 months' worth of supplement after the war, rose gradually to over 4 months by 1973, and fell back to slightly more than $3\frac{1}{2}$ months currently.[9]

The bonus system is widely viewed as serving three purposes. One purpose, of particular relevance to this study, is that the bonus system provides some pay flexibility to help firms maintain the lifetime employment commitment over bad times and good. Another purpose is to com-

[7] In this calculation we divide bonuses by operating profits. Using a narrower measure of profits, "current profits," we get from 56 to 160% between 1965 and 1983.

[8] This interpretation is emphasized by, among others, Shirai (1983b, p. 131).

[9] See Appendixes A and B.

pensate individual effort. Since the bonus is more discretionary than the base wage of the *nenko* system (which is primarily related to length of service), management typically makes some part of a particular employee's bonus depend on the merit appraisal of the individual worker's job performance.[10] Finally, the bonus emphasizes, symbolically and practically, the common bond linking the company's well-being with the well-being of its regular workers.

The timing of wage decisions and the timing of bonus decisions generally differ. Across many unionized companies base-wage determination is the primary concern of the economywide pattern-bargaining spring wage offensive (*shunto*), which usually starts in February and peaks in April.[11] Negotiations over bonuses are typically done after wages are settled; and, according to management and labor representatives, bonuses are more sensitive to a company's or an industry's specific circumstances than base wages, which are primarily dependent on the economy's national performance.

Firms that consistently do well generally succeed in paying a fairly steady number of month's wages as a bonus, so that in prospering sectors and times, their bonuses are unlikely to vary much with cyclical conditions. An oft-cited example of a firm that maintains such a policy is Toyota, which has paid about the same month's worth of bonus in each year since 1968. But for every Toyota Motor Company there are companies in, say, machine tools or shipbuilding where bonuses may vary from 2 to 10 months' pay in extreme economic conditions. At one such firm, Okuma Machine Works, the standard deviation of the percentage change of wages from 1957 to 1985 was 7, compared to a standard deviation of the percentage change of bonuses of 29. Bonuses varied from 9 months to 2 months of pay in postwar years. The majority of firms hold a position in between the positions of Toyota and Okuma. For manufacturing firms in the aggregate, the standard deviation of the log change in bonuses from 1959 to 1983 was 0.072 compared to a standard deviation of the log change of wages of 0.055.[12]

Because our analysis is based on averages of firms within an industry, it is likely that we will understate the variation of bonuses at the level of firms and thus may find less variation with respect to shifts in profits or revenues than would be found in a firm-level study.

To what extent are bonuses directly related to profits through some sort of formula?

[10] See, e.g., Okuno, 1984.

[11] See Grossman and Haraf, 1983.

[12] The Okuma data calculated here are from the union's report to its workers. The standard deviations for manufacturing are calculated from the Ministry of Labor data in Appendixes A and B of this paper.

Surveys conducted by *Nikkeiren*, the employers' federation, show that most firms think of bonuses as being influenced by profitability. Among corporations that make an explicit agreement with employees about bonus payments, some 15% of such contracts contain profit-sharing clauses.[13]

The Key Issues

There are three critical issues in evaluating the macroeconomic implications of the Japanese bonus system.

The first is the extent to which bonuses are more "flexible" with respect to profits or revenues than are wages, and thus operate as a form of profit or revenue sharing.

The second is the effect of bonuses on employment. If bonuses are a cost to employers similar to wages, with no share component, bonuses plus wages are the relevant variable defining labor demand, with increases in bonuses reducing employment just as increases in wages do; contrarily, if bonuses have a nonnegligible profit-sharing component, they might have a very different relation to employment.

The third, and perhaps the most difficult issue to assess, is the contribution of a bonus system that operates along share-economy lines to the overall performance of the Japanese labor market either by itself or relative to other institutional factors, such as the flexibility of the base wage in the annual Shunto negotiations. Our work focuses solely on the potential impact of the bonus system itself on the labor market.

The remainder of the paper examines these three issues. Sections II and III analyze the determinants of bonuses and the link between bonuses and employment using data for the entire Japanese economy, for manufacturing, and for more disaggregated two-digit industries, largely within manufacturing. Section IV turns to the macroeconomic implications of our findings.

II. Economic Fluctuations and Bonuses

Are bonuses more responsive to economic conditions than are wages, or are bonuses simply a markup of wages?

One direct way to examine the *relative* flexibility of bonuses and wages to economic conditions is to regress the ratio of monthly bonuses to monthly wages (the number of months of salary paid in bonuses, which is

[13] Koshiro (1983b, pp. 241–242) gives a good discussion of bonus responsiveness to profits. For figures on firms with explicit profit-sharing see Japanese Ministry of Labor, "General Survey on Wage and Working Hours System."

how most Japanese think of them) on measures of aggregate or industry economic conditions, conditional on past values of wages and bonuses.

Table I contains the results of such an analysis for all industry and for manufacturing in Japan. The dependent variable is the log of the ratio of bonuses to wages from the series of the Japanese Ministry of Labor; it relates to all firms with five or more regular employees. To measure economic conditions we have used the log of profits (π) as reported in the Statistical Survey of Corporate Enterprise series of corporate operating profits for firms of all sizes, and two related measures of revenues: net domestic product (NDP) taken from the Japanese Economic Planning Agency data on net output by industrial origin at market prices, and corporate value added (VA) as reported in the Statistical Survey of Cor-

TABLE I

ESTIMATES OF THE EFFECT OF ECONOMIC CONDITIONS ON LOG(BONUSES/WAGES), 1959–1983[a]

	Constant	Time	(Time)^2	ln(π)	ln(VA)	ln(NDP)	ln(B_{-1})	ln(W_{-1})	R^2	SEE
					All industry					
1.	−.08	−.09	.001	.18			.67	−.63	.98	.018
		(.03)	(.0002)	(.02)			(.08)	(.11)		
2.	−2.49	−.01		.15			.53	−.55	.98	.020
		(.004)		(.02)			(.07)	(.12)		
3.	−.29	−.14	.001		.38		.49	−.58	.98	.019
		(.04)	(.0003)		(.05)		(.09)	(.12)		
4.	−3.65	−.01			.29		.35	−.46	.97	.024
		(.004)			(.06)		(.10)	(.14)		
5.	1.53	−.17	.001			.42	.47	−.45	.94	.032
		(.09)	(.001)			(.17)	(.15)	(.20)		
6.	−2.64	−.02				.20	.41	−.33	.93	.034
		(.01)				(.11)	(.16)	(.20)		
					Manufacturing					
7.	.62	−.12	.001	.20			.71	−.64	.98	.021
		(.04)	(.0002)	(.02)			(.07)	(.28)		
8.	−2.41	−.002		.18			.60	−.68	.97	.026
		(.006)		(.03)			.53	(.10)		
9.	.94	−.21	.001		.49		.53	−.68	.99	.018
		(.03)	(.0002)		(.04)		(.06)	(.10)		
10.	−3.79	−.004			.37		.40	−.67	.96	.030
		(.007)			(.07)		(.10)	(.18)		
11.	2.55	−.22	.001			.38	.41	−.25	.94	.042
		(.10)	(.001)			(.14)	(.16)	(.23)		
12.	−2.57	−.02				.19	.40	−.31	.92	.046
		(.01)				(.12)	(.17)	(.24)		

Source. See Data Appendix; note that all variables are in "real" units, deflated as described in the text.

[a] Equations including π and VA are restricted to 1960–1983.

porate Enterprises. All of the nominal variables are deflated by the wholesale price index (WPI) series of the Bank of Japan, with the total WPI used for the entire economy, the manufacturing price series used for manufacturing, and separate indices for more disaggregate industries. All three indicators of economic conditions are measured over the Japanese fiscal year (April 1 to March 31), which correlates them more closely with the largely springtime determination of upcoming wage and bonus levels than with calendar year data. In addition to the measures of economic conditions, the equations include lagged values of bonuses (B_{-1}) and wages (W_{-1}) introduced separately to allow for differential autoregressiveness of the series. The even-numbered equations include a linear time trend variable while the odd-numbered ones include time and a time-square variable to allow for a more complex "exogenous" pattern of change in the bonus-to-wage ratio (in particular for the rise, then fall in the ratio shown in the underlying data).

The calculations provide a clear answer to the question of the relative responsiveness of wages and bonuses to economic conditions: in every case, the coefficient on the measure of economic conditions is positive and significant, indicating that bonuses are more responsive than wages to economic conditions. Moreover, the coefficient on lagged bonuses is positive and that on lagged wages is negative, of roughly comparable magnitudes, indicating that a "partial adjustment" type of model of the bonus-to-wage ratio with persistence of bonuses and wages over time is consistent with the data.

To see whether the results hold up at a more disaggregated level of analysis, we have estimated equations for the ratios of bonuses to wages for two-digit industries over the same time period. The results of this analysis are given in Table II in terms of the number of industries in which bonuses are more (less) responsive to the relevant explanatory variable than are wages, categorized by the size of the t statistic. As can be seen, the analysis supports the finding that bonuses are more responsive than wages to revenues and profits at the two-digit level of aggregation, with the vast majority of industries obtaining positive and often significant ($t > 2$) impact coefficients. We conclude that although bonuses are not a simple proportion of profits or revenues they depend substantially on those variables, to a much greater extent than wages, and thus vary more with economic conditions than do wages.

How do bonuses and wages, taken as separate variables, respond to economic conditions? Do both wages and bonuses respond positively to conditions with the Table I results due to the greater responsiveness of bonuses, or are bonuses responsive and wages inflexible?

To answer these questions we have estimated the following equations:

$$\log B = A + \lambda a \log \pi \text{ (or } R) + (1 - \lambda)\log B_{-1} + cT \qquad \text{(1a)}$$

TABLE II
SUMMARY OF THE COEFFICIENTS OF THE EFFECT OF PROFITS AND REVENUES ON LOG(BONUSES/WAGES)[a]

	A Bonuses more responsive to profits[b]		B Bonuses more responsive to value added[b]		C Bonuses more responsive to NDP[b]	
	Yes	No	Yes	No	Yes	No
$\lvert t\rvert < 1$	2	1	0	1	5	2
$1 < \lvert t\rvert < 2$	1	0	1	0	4	0
$2 < \lvert t\rvert < 3$	0	0	4	0	6	0
$\lvert t\rvert > 3$	10	0	8	0	0	0
Total	13	1	13	1	15	2

Source. Panel A and B industries included MI, CN, WR, RE, FO, TX, CH, CE, IS, NF, FB, MA, EQ, TQ. Panel C industries included MI, CN, WR, RE, TC, EL, FO, TX, CH, PA, FB, MA, EQ, TQ, FI, PE, PC. See Data Appendix for industry code definitions.

[a] Based on regressions of log(Bonuses/Wages) on time, log(Bonuses(−1)), log(Wages(−1)), and the log of the relevant measure of economic activity.

[b] The figures refer to the number of industries.

$$\log W = A' + b\lambda' \log \pi \text{ (or } R) + (1 - \lambda')\log W_{-1} + c'T. \quad \text{(1b)}$$

While the results of our analysis, given in Table III, show that bonuses are invariably more responsive than wages to economic conditions, the estimated coefficients tell somewhat different stories for the effect of revenues and the effect of profits on the two measures of pay. While both bonuses and wages are positively related to revenues, only bonuses are significantly affected by profits. Since our measure of profits is an "after-bonus" measure the finding of a positive profit–bonus relation is particularly striking.[14] Finally, note that when the coefficient on the lagged dependent variable is interpreted as a partial adjustment parameter, the implied adjustment parameter λ is invariably larger in the bonus than in the wage equation, strengthening the conclusion that bonuses are more responsive than wages.

Alternative Specifications

Thus far, we have estimated models in which bonuses and wages are endogenous variables. Given the timing of negotiations noted in Section I,

[14] If there is any resultant error in bonuses, it would induce negative correlation with profits less bonuses.

TABLE III

COEFFICIENTS AND STANDARD ERRORS FOR EFFECTS OF NET DOMESTIC PRODUCT, VALUE ADDED, AND PROFITS ON BONUSES AND WAGES, 1959–1983[a]

Dependent variable	Constant	Time	ln(*NDP*)	ln(π)	ln(*VA*)	ln(B_{-1})	ln(W_{-1})	SEE
			A. All industry					
1. ln(bonuses)	−.33	−.013	.44			.64		.041
		(.005)	(.14)			(.14)		
2. ln(wages)	1.41	.002	.34				.53	.051
		(.009)	(.13)				(.22)	
3. ln(bonuses)	−.13	−.009		.09		.94		.048
		(.006)		(.05)		(.09)		
4. ln(wages)	.21	−.01		−.05			1.12	.058
		(.01)		(.07)			(.18)	
5. ln(bonuses)	−1.36	−.012			.28	.74		.043
		(.005)			(.10)	(.12)		
6. ln(wages)	.25	−.002			.12		.81	.057
		(.01)			(.12)		(.24)	
			B. Manufacturing					
7. ln(bonuses)	.17	−.004	.38			.63		.045
		(.006)	(.11)			(.13)		
8. ln(wages)	1.24	.002	.21				.70	.045
		(.009)	(.09)				(.18)	
9. ln(bonuses)	−0.59	−.004		.14		.87		.045
		(.006)		(.04)		(.07)		
10. ln(wages)	.22	−.012		−.05			1.14	.049
		(.01)		(.05)			(.14)	
11. ln(bonuses)	−2.30	−.004			.37	.63		.038
		(.005)			(.08)	(.09)		
12. ln(wages)	.15	−.004			.05		.94	
		(.01)			(.11)		(.22)	.050

Source. Calculated by least squares using data described in the Data Appendix. The adjusted R^2 for every equation was 0.99.

[a] Equations including π and *VA* cover 1960–1983.

it is also reasonable to examine a model in which wages are exogenous (given, say, by the Shunto Offensive) and bonuses are dependent on wages and economic conditions. If bonuses are simply a markup of wages, as has sometimes been alleged, then the profit or revenue variables would not have a significant effect in this regression. Contrarily, if bonuses were determined solely by "sharing," the wage term would not enter significantly.[15]

[15] We recognize that bonuses and wages are set separately but since we omitted a relevant variable in both equations, we get wages entering the bonus equation as a proxy for the omitted variable.

To examine this possibility we estimate the following equation for all industry and manufacturing:

$$\log B = A + \lambda a \log \pi \text{ (or } R) + (1 - \lambda)\log B_{-1} + \lambda c \log W + dT. \quad (2)$$

The results given in lines 1 and 2 and 5 and 6 of Table IV show that while contemporaneous wages are closely related to bonuses, profits or revenues also have highly significant effects, indicating that bonuses depend on both factors. They are neither a pure markup of wages nor a pure markup of profits, although closer to the former than the latter. Finally, in the simple share-economy model workers are presumed to be paid a fixed proportional of profits per worker. To see whether our data are consistent with this view we estimate an equation in which we replace profits and revenues by profits per worker and revenues per worker. We record these results in lines 3 and 4 and 7 and 8 of Table IV. In this calculation we have simply divided fiscal year profits (revenues) by fiscal year employment; we have also experimented with calculations using last period's employment (see Table VI). As employment is relatively stable and profits are highly variable it does not matter substantially how we model the profit/

TABLE IV

COEFFICIENTS AND STANDARD ERRORS FOR ALTERNATIVE SPECIFICATIONS OF THE EFFECT OF ECONOMIC CONDITIONS ON LOG(BONUSES), 1960–1983[a]

Constant	Time	ln(π)	ln(VA)	ln(W)	ln(π/E)	ln(VA/E)	ln(B_{-1})	SEE
				A. All industry				
1. −3.34	−.02	.11		.75			.43	.026
	(.004)	(.03)		(.11)			(.09)	
2. −3.89	−.02		.26	.66			.33	.024
	(.003)		(.06)	(.10)			(.09)	
3. .89	−.01				.07		.99	.049
	(.01)				(.06)		(.08)	
4. 2.03	−.01					.25	.87	.046
	(.006)					(.13)	(.11)	
				B. Manufacturing				
5. −3.07	−.01	.14		.61			.52	.030
	(.005)	(.03)		(.13)			(.09)	
6. −3.87	−.01		.32	.48			.40	.029
	(.005)		(.06)	(.12)			(.09)	
7. 1.41	−.01				.14		.93	.046
	(.01)				(.04)		(.06)	
8. 2.96	−.01					.37	.77	.041
	(.006)					(.09)	(.08)	

Source. See Data Appendix. The R^2 for every equation was 0.99.

[a] Equations including E are restricted to 1960–1982.

employment or revenue/employment variable. As can be seen in Table IV, the resultant estimates are consistent with our interpretation of bonus determination as paying a share of profits per worker.

Comparing our results to those of other scholars, we are in accord with Weitzman (1986) (who uses somewhat different data) in finding bonuses to depend significantly on profits; in addition, however, we find that bonuses are related to another measure of economic performance, revenues. With respect to the responsiveness of wages to profitability, we cannot find any formal statistical evidence that base wages alone respond to profits, though we do find that wages respond to revenues. Some of the Phillips-curve-like pay-formation regressions in the literature have picked up, we note, a dependence of pay upon profits.[16] But in these exercises the authors typically attempt to explain the formation of total pay—defined as wages plus bonuses—and profits may be primarily affecting the bonus component. On the basis of our findings the entire subject of empirical Phillips curve measurements for Japan is worthy of reexamination, with more careful attention focused on separating base wages from bonuses in the pay-formation process.

Leaving aside the controversial issue of whether or not Japanese base wages themselves are more responsive to economic conditions than base wages in other countries, we conclude that in Japan bonuses respond more than base wages to economic conditions.

III. How Do Bonuses Affect Employment?

The finding that bonuses contain at least some "share" component raises the possibility that their impact on employment is different from the impact of wages. In this section we estimate several models of demand-for-labor type designed to examine the possibility. We start with a simple null hypothesis: that bonuses are simply part of normal labor costs comparable to wages, so that the appropriate measure of cost is $(W + B)$, with the division of compensation between wages and bonuses having no effect on outcomes. In particular we estimate two comparable partial adjustment forms of a demand relation between employment (E), bonuses (B), wages (W), and measures of the level of demand (X):

$$\ln E = A + b \ln(W + B) + \lambda c \ln B + \lambda dX + (1 - \lambda)\ln E_{-1} + e\text{Time} \tag{3a}$$

[16] See, e.g., Grubb *et al.*, 1983; Koshiro, 1983b; or the results reported in Hamada and Kurosaka, 1985.

$$\ln E = A' + \lambda' b' \ln W + \lambda' c' \ln(W+B) + \lambda' d' X + (1-\lambda')\ln E_{-1} + e'\text{Time}. \tag{3b}$$

In Eq. (3a), the hypothesis that bonuses are just part of normal labor cost is tested by the coefficient on $\ln(B)$: if the form of compensation is irrelevant to employment and the data are determined by demand forces, the coefficient on $\ln(B)$ will be (approximately) 0 while that on $\ln(W + B)$ will be negative. In Eq. (3b), the test of the hypothesis that the composition of compensation is irrelevant to employment is that the coefficient on $\ln(W + B)$ be negative and that on $\ln W$ be zero. Because we include both bonus and wage variables as separate factors in the equation, our model differs from those of other analysts of demand for labor in Japan.[17]

As the reader will note, it is the log form of the demand equations that dictates estimation of the two comparable forms. If we modeled demand as a linear equation, one of the two equations would be redundant.

A significant problem with demand relations of this form relates to the measurement of "level of demand" factors. Some analysts enter output measures or output measures instrumented on other variables to measure the level of demand. Other analysts prefer to exclude such variables due to the production function relation between output and employment. Such exclusions yield reasonable demand relations for some European countries but not for the United States (see Symons and Layard). To make sure that our results do not depend on how we treat demand-shift variables, we include output measures in some regressions and exclude them from others, with, as will be seen, little effect on our findings.

Another problem with models of this form relates to specifying the causality as going from wages (bonuses) to employment in an aggregate economy with extremely low unemployment. Most analyses of labor demand, in fact, focus on manufacturing where one can plausibly argue that wages are set economywide, making employment a function of wages at the sector level. A priori, one anticipates that a demand model will fit a single sector better than it will fit an entire, essentially full-employment, labor market.

Table V presents our estimates of the impact of wages, wages plus bonuses, and of bonuses, on employment. Panel A treats the manufacturing industries where our results are particularly striking; Panel B treats the entire economy. The even-numbered equations exclude output; the odd-numbered equations include output as a measure of the level of demand. In addition to the calculations in the table, we experimented with various other demand-shift variables (including profits) and with instrumental variable estimates of demand shifts, instrumenting output on such

[17] See the references in footnote 16.

factors as exports, money supply, etc. Because inclusion of the output variables has only a modest impact on our estimated bonus and wage coefficients, the way in which we treat demand-shift variables is not a critical issue in the analysis (in contrast to the importance of output terms in U.S. labor demand equations).

The key finding, which runs through all the calculations, is that bonuses and wages have markedly different effects on employment: bonuses obtain *positive* and wages *negative* coefficients in the estimates. When our two variables are bonuses and bonuses plus wages, the coefficient on bonuses is significantly positive while the coefficient on wages plus bonuses is significantly negative. When bonuses plus wages are included with wages, the wage term obtains a negative coefficient while the bonus plus wage yields a positive coefficient.

The strength of our finding differs, we note, between highly cyclical manufacturing and the rest of industry. In manufacturing, the two elements of compensation have such different effects that we can fairly readily reject our null hypothesis. In all industry, the weaker estimated negative effect of wages (wages plus bonuses) on employment gives a more equivocal result, although even here it is apparent that bonuses have a positive impact on employment different from the effect of wages.[18]

What might explain the divergent pattern between all industry and manufacturing? One possibility is that bonuses play one role in a highly cyclical sector and another in the rest of the economy. Another possibility is that the labor supply facing manufacturing is more elastic than is the relatively fixed supply facing the entire economy, permitting bonuses to raise employment more in manufacturing than elsewhere. The first explanation stresses possible differential demand behavior based on cyclical fluctuations while the second stresses differences based on labor supply conditions.

Probing the Results

The finding that bonuses are positively rather than negatively associated with employment (in contrast to wages) is sufficiently striking as to merit additional probing.

Could the result be due to some type of aggregation bias?

To see if the result holds up at a more disaggregated level we estimated equations like those in Table V for separate two-digit industries and found results consistent with those in the table. In these calculations bonuses obtain positive coefficients in 6 of 10 manufacturing industries in Eq. (3a) and bonuses plus wages obtain positive coefficients in the same 6 in Eq.

[18] One interpretation of the "better" results for manufacturing than for all industry is that we are not identifying a demand equation in a full-employment economy.

(3b), with 5 of the positive coefficients having $t > 1$.[19] In 6 nonmanufacturing industries, by contrast, the results were weaker, which is consistent with the weak economywide results obtained in panel B of the table.[20] Our strongest finding is clearly for manufacturing.

Could the result be due to some form of reverse causality or related problem in which bonuses and employment are positively correlated because increases in employment (reflecting good times) cause higher bonuses?

To examine this possibility we have estimated two lagged models which enable us to "test" whether employment determines bonuses or bonuses determine employment by examining the lagged impact of bonuses on employment and of employment on bonuses in the spirit of Sims–Granger causality tests. For simplicity, we report results where all variables are defined on a *calendar* year basis; the results with bonuses related to fiscal year variables as in our earlier tables give results comparable to those in the table. The results, given in Table VI, suggest that the causal link is from bonuses to employment rather than from employment to bonuses. In manufacturing, lagged bonuses have a positive effect on employment (in contrast to the negative effect of lagged wages on employment), while lagged employment has a negative effect on bonuses. In all industry,

[19] The equation $\ln(E) = a + b\ln(B + W) + c\ln(B) + d\ln(NDP) + e\text{Time} + f\ln(E_{-1})$ was estimated for 10 manufacturing industries with the following results:

	Number of industries with coefficients $b < 0$ and $c > 0$	Number of industries with other values for b and/or c
$\lvert t\rvert < 1$	1	3
$1 < \lvert t\rvert < 2$	2	1
$2 < \lvert t\rvert < 3$	3	0
$\lvert t\rvert > 3$	0	0
Total	6	4

The manufacturing industries included are FO, TX, PA, CH, PE, FB, MA, EQ, TQ, PC. See Data Appendix for industry codes. Similar results were obtained estimating $\ln(E) = a + b\ln(B + W) + c\ln(W) + d\ln(NDP) + e\text{Time} + f\ln(E_{-1})$.

[20] The equation $\ln(E) = a + b\ln(B + W) + c\ln(B) + d\ln(NDP) + e\text{Time} + f\ln(E_{-1})$ was estimated for six nonmanufacturing industries with the following results:

	Number of industries with coefficients $b < 0$ and $c > 0$	Number of industries with other values for b and/or c
$\lvert t\rvert < 1$	2	2
$1 < \lvert t\rvert < 2$	1	1
Total	3	3

The nonmanufacturing industries included are MI, WR, FI, RE, TC, EL. See Data Appendix for industry codes. Similar results were obtained estimating $\ln(E) = a + b\ln(B + W) + c\ln(W) + d\ln(NDP) + e\text{Time} + \ln(E_{-1})$.

TABLE V
COEFFICIENTS AND STANDARD ERRORS FOR ESTIMATES OF THE EFFECTS OF BONUSES AND WAGES ON LOG(EMPLOYMENT), 1959–1982

Constant	Time	$\ln(W+B)$	$\ln(W)$	$\ln(B)$	$\ln(NDP)$	$\ln(E_{-1})$	R^2	SEE
				A. Manufacturing				
1. 7.21	.0002	−.37		.21	.15	.59	.99	.009
	(.002)	(.06)		(.05)	(.03)	(.05)		
2. 10.37	.0001	−.33		.28		.72	.98	.014
	(.003)	(.10)		(.07)		(.08)		
3. 6.60	.0001	.49	−.65		.16	.59	.99	.009
	(.002)	(.15)	(.14)		(.03)	(.05)		
4. 4.39	.0008	.83	−.87			.74	.98	.015
	(.003)	(.23)	(.25)			(.08)		
				B. All industry				
5. 6.59	.005	−.39		.14	.32	.56	.99	.019
	(.003)	(.16)		(.13)	(.09)	(.14)		
6. 2.80	.003	−.20		.18		.86	.99	.025
	(.004)	(.20)		(.16)		(.14)		
7. 6.20	.005	.14	−.40		.33	.56	.99	.019
	(.003)	(.38)	(.39)		(.09)	(.14)		
8. 1.99	.002	.39	−.41			.88	.99	.025
	(.004)	(.50)	(.51)			(.14)		

Source. See Data Appendix.

bonuses have an insignificant positive impact on employment (contrasted to a negative effect for wages) whereas employment negatively affects bonuses. These results are inconsistent with an employment-causes-bonuses model but are, we note, consistent with a share-model interpretation of the data, as increases in employment reduce workers' earnings from profit sharing in the share model.

Taking our finding of a positive bonus–employment relation at face value, how might we go about interpreting it?

There seem to be two basic modes of interpretation: one in which bonuses are viewed as operating along theoretic share-economy lines; and one in which bonuses are taken as an indicator of the level of demand in a given period.

First, from a share-economy perspective, one may want to read the result as indicating that bonuses, while part of the attractiveness of jobs to workers, are not fully part of the marginal cost of employment to firms. From this perspective the data suggest that we are estimating a mixed supply-and-demand reduced-form equation, with $W + B$ primarily reflecting supply influences on employment and W primarily reflecting demand

TABLE VI
ALTERNATIVE MODELS OF LAGGED RELATIONS, 1959–1983[a]

Dependent variable	Constant	Time	ln(*NDP*)	ln(E_{-1})	ln(B_{-1})	ln(W_{-1})	ln(*B*)	ln(*WP*)	SEE
				A. Manufacturing					
			Model I: Wages, bonuses, and employment taken as endogenous						
ln(*W*)	−.42	.007	.19	.14	.07	.56			.042
		(.009)	(.12)	(.35)	(.20)	(.28)			
ln(*B*)	11.10	−.017	.57	−.77	.90	−.22			.026
		(.006)	(.08)	(.22)	(.12)	(.18)			
ln(*E*)	9.13	−.003	.19	.42	.12	−.24			.013
		(.003)	(.04)	(.11)	(.06)	(.08)			
			Model II: Bonuses and employment endogenous; wages exogenous						
ln(*B*)	7.10	−.02	.47	−.57	.72		.14		.027
		(.006)	(.08)	(.19)	(.09)		(.14)		
ln(*E*)	7.67	−.002	.21	.53	.08		−.26		.010
		(.002)	(.03)	(.07)	(.03)		(.05)		
				B. All industry					
			Model I: Wages, bonuses, and employment taken as endogenous						
ln(*W*)	8.09	.009	.51	−.46	.29	.14			.040
		(.008)	(.14)	(.32)	(.19)	(.26)			
ln(*B*)	5.72	−.01	.60	−.48	.81	−.18			.028
		(.005)	(.10)	(.23)	(.14)	(.18)			
ln(*E*)	6.43	.006	.23	.55	.08	−.25			.021
		(.004)	(.08)	(.17)	(.10)	(.13)			
			Model II: Bonuses and employment endogenous; wages exogenous						
ln(*B*)	1.07	−.016	.41	−.22	.59		.29		.027
		(.004)	(.13)	(.21)	(.10)		(.16)		
ln(*E*)	6.87	.004	.35	.52	.05		−.32		.019
		(.003)	(.09)	(.15)	(.07)		(.11)		

Source. See Data Appendix. The R^2 for every equation was 0.99.
[a] Equations including *E* are restricted to 1959–1982.

influences, with the gap between them indicating the "excess demand" for labor in a share system.[21]

What might one do to test such an interpretation? One approach would be to develop a detailed econometric model of supply-and-demand disequilibrium to estimate the "structural equations" and to evaluate the predicted excess demand for labor. To implement such a program in

[21] In terms of the usual supply–demand graph bonuses are a measure of the gap between supply and demand along the cost axis at the point where employment is set in a share economy. Note that such a disequilibrium interpretation does not allow the inference that the employment fluctuations are necessarily amplified due to the existence of a positive statistical relation between bonuses and employment because we are estimating a reduced-form mixed supply-and-demand equation on a disaggregated level.

practice would require more data on the Japanese labor market than the wage, employment, and bonus series that we have analyzed here. For example, one would want some direct measure of the share parameter that in principle determines the contract, rather than measures of bonuses. (Bonuses differ significantly from share parameters in that they change for two reasons: changes in labor's share of profits (revenues) or changes in the level of profits (revenues).) One would also want direct measures of vacancies by sector and over time to indicate potential changes and differences in "excess demand for labor" as bonuses vary. It would also be useful to have evidence on patterns of recruitment of new workers. In the absence of such data, and the need to make specific and somewhat arbitrary assumptions about disequilibrium forms, we are loathe to pursue this line with our data. Virtually any reasonable disequilibrium formulation will end up with reduced-form mixed supply-and-demand equations like those we have estimated, with predicted coefficients having signs like those we have found.

A second possible interpretation of our finding is that bonuses are a "proxy" for shifts in labor demand. We do not think that this offers as good an interpretation of the data. First, we have attempted to control for such demand shifts by the explicit inclusion of output terms; yet the signs on bonuses and wages were unchanged. Additionally, the causal lag relation between employment and bonuses we have found is inconsistent with this view. Furthermore, it is not enough for a particular firm or sector to "demand" more labor in a full-employment economy; a plausible story must be told about how the labor is obtained—e.g., through increased pay ($W + B$) on the supply side. Of course it is still logically possible to argue that bonuses are a superior measure of the level of the labor-demand schedule. (After all, we did find them to vary substantially with the cycle.) Even this interpretation, however, clearly supports the notion that bonuses are *not* part of normal labor cost.

In any case, whatever the ultimate explanation, bonuses are different from wages in Japan, in their effects on employment as well as in their sensitivity to economic conditions. Without pushing the "share economy" interpretation of the data too far, our results do seem to have the "flavor" of such a system.

IV. Macroeconomic Implications of the Bonus System

We come now to the difficult question of whether the Japanese bonus system influences macroeconomic performance, and more particularly, whether it helps account for the low unemployment rates found in Japan

over the last quarter century.[22] Other things being equal, it stands to reason that the existence of a bonus component of pay with a more automatic procyclical link than base wages should help an economy to maintain a higher level of employment than would be maintained if wages alone were paid. But how important a factor, quantitatively, is this likely to be in the Japanese case? Given the current state of macroeconomics, with widely divergent schools of thought, it is not clear how to pose the appropriate hypothesis formally so that the existing data might, at least in principle, allow us to extricate an answer that is reasonably controversy-free. Rather than trying to confront the issue head on with a formal model, we limit ourselves here to some rough calculations designed to give likely orders of magnitudes of effects.

The bonus itself is about one-fourth of an average worker's total pay. By running regressions in logarithms we have estimated the elasticity of aggregate bonus response to changed aggregate profits at about 0.09 (see line 3, Table III). Converting this parameter to a linear equivalent, we obtain the same elasticity of 0.09 if 9% of the bonus payment is strictly proportional to profits, while the other 91% is like a fixed constant. The following crude imputation can then be made. About 2.25% (9% × 25%) of a Japanese worker's total pay can be treated as genuine profit-sharing income, compared with the other 97.75%, which for economic purposes is better described as being like an imputed base wage.

A rough check on this calculation is possible using our equations linking bonuses to revenues. The elasticity of aggregate bonus payments with respect to aggregate value added, or revenue, was estimated to be about 0.44 (see line 1, Table III). Converting to an equivalent-elasticity linear revenue-sharing formula makes 44% of the bonus payment strictly proportional to revenues, while the other 56% is like a fixed constant. If aggregate imputed base wages are roughly three-fourths of aggregate revenues, that leaves one-fourth for gross profits. By this calculation, 11% ($\frac{1}{4}$ × 44%) of the bonus payment is strictly proportional to profits, while the rest is like a fixed constant. Following this line of reasoning, about 2.75%

[22] It should be noted that Japan's number one status in having the lowest unemployment rate among major industrialized economies did not emerge until the 1970s. In the 1960s, some other countries like Germany had equally good employment records. There has been some discussion in the literature about the extent to which Japanese statistics may underestimate the unemployment rate by international standards. Taira (1983) and a few others have tried to argue this case. But it is not very convincing (see, e.g., Sorrentino, 1984; Hamada and Kurosaka, 1985). The basic point is that when reasonable adjustment measures are applied uniformly to all countries in an attempt to make international standards more uniform, then all countries' unemployment rates increase slightly, but without much altering their relative standing. Japan's unemployment record remains outstanding even after readjustment.

(11% × 25%) of a typical Japanese worker's total pay can be treated as genuinely proportional to profits, while the remainder is like an imputed base wage.

Splitting the difference between the high (2.75%) and low (2.25%) calculations, we can make the following very rough statement: in any year about 97.5% of an average Japanese worker's total pay is like a fixed imputed base wage, while 2.5% automatically responds directly to profits. If pay contracts are annually renegotiated, the marginal cost to the employer of hiring an extra unit of labor in any given year is just the (imputed) base wage, as opposed to total pay. If the relevant contract adjustment period is more than a year, due to pay parameter stickiness, the profit-sharing component grows in importance relative to the base wage component because of the distributed-lag difference equation. In that case the effect of profit sharing is somewhat more pronounced. Taking the 2.5% as a conservative measure of the pure-profit-sharing part of pay, the relevant theory predicts that the Japanese economy should behave like an otherwise absolutely identical (but hypothetical) wage economy whose wages are 2.5% lower than actual Japanese pay (base wages plus bonus) but whose maintained levels of aggregate demand (autonomous spending, the money supply, and world demand for Japanese exports) are the same.[23] In other words, if someone who thought that Japan was a wage economy and has just now been informed that it is in fact (partially) a revenue- or profit-sharing economy wants to know what difference that makes, the answer is: the same difference *as if* money wages were perpetually 2.5% lower than what they appeared to be.

While the exact ramifications of a 2.5% wage cut depend on the macromodel in which it is embedded, our reaction is neither to dismiss this effect as negligible nor to argue that it is likely to represent an overwhelming factor in the economy. At one extreme, assume a model in which a 2.5% reduction in wages reduces prices by 2.5%. Supposing, further, that this is equivalent to a 2.5% expansion in output, then employment will increase 2.5% (given constant returns to scale). At another extreme, assume that a 2.5% reduction in wages does not affect prices at all (they are set on world markets) so that the reduction in wages raises employment along a fixed demand curve. If the elasticity of demand is taken conservatively to be about one-half, we would have 1.25% higher employment, giving us a range of employment effects from 1.25 to 2.5%.

Such counterfactual exercises should be understood in proper perspective. First, the calculations are extremely crude. Second, they are based

[23] See Weitzman, 1985. The basic idea is that the effect on the firm of converting 2.5% of pay from base wages to profit shares is to lower wages by 2.5% and simultaneously subject the firm to a compensating tax on profits.

on a particular interpretation of a particular theory. Third, the "thought experiment" is necessarily artificial. (If there were lower bonuses but higher base wages, it could be argued, wages might become more flexible, timing in the economy might be altered, or fiscal or monetary policy might be changed, perhaps thereby neutralizing some of the effects calculated here.) Limitations notwithstanding, we think the exercise is useful for gaining some rough insight into the likely size of what might be called the "pure bonus effect." We interpret the orders of magnitude involved as suggesting that the Japanese bonus system may have exerted a nonnegligible macroeconomic influence by helping automatically to boost employment without inflationary pressure. But the significance of an "as if" 2.5% money wage cut is not nearly so great as to account for the entire unemployment story, nor to eliminate demand-caused output fluctuations,[24] nor to do away with the need for discretionary policy to maintain full employment, especially in the face of severe economic shocks.

That the bonus system alone cannot possibly be explaining the entire macroeconomic adjustment story is made abundantly clear by the extreme example of Japan's response to the energy crisis. After the first oil shock, in 1974, consumer prices increased by about 25% and wholesale prices by over 30%; output in manufacturing and mining fell by 10%. At first the unions had no better premonition than other groups that a permanent terms-of-trade deterioration was under way, and they were concerned to recoup lost purchasing power as well as to obtain their customary pay increase. In the spring offensive of that year, base wages jumped by 33% while strike days lost were 2.7 per 10,000, a rate double that in previous years and above the rate in the United States in many years. An observer looking simply at these figures would have predicted that the Japanese economy would have been more likely to have gone into a major stagflation decline than the U.S. or European economies. But such was not the case. At this point, when the mechanics of a potentially vicious wage–price spiral started to become evident, the Japanese consensus took over. Government officials, labor experts, businessmen, and labor union leaders began preaching wage and price restraint. The 1975 *shunto*

[24] Depending on how output is detrended from its high growth rates, Japanese output stability might be judged outstanding or mediocre. Actually, Japan has the steadiest growth rate among all OECD countries over the past quarter century if it is measured by *relative* deviations from a standardized mean. In terms of *absolute* deviations from a nonstandardized mean, Japanese growth shows much more cyclical variability. Note that, with a sprinkling of temporary price stickiness, the relevant model of a profit-sharing economy would predict relatively full employment but some building up of inventories, make-work, or labor hoarding during slack periods. Thus, the large Okun coefficient for Japan (see Hamada and Kurosaka, 1984) is not in itself a theoretical contradiction with share-economy-like interpretations.

saw base wages increase by only 13%, and they have been held to the single-digit range since then; the consumer price index rate of increase fell to 10.4%, and while output in manufacturing and mining declined by 4.4% in 1975 it rose by 10.8% in 1976. Strike days lost fell sharply to 0.9 per 10,000 in 1976 and to virtually zero in succeeding years.[25]

Because base wages constitute three-fourths of Japanese pay, and only a part of bonuses is responsive to profits (revenue), the deceleration of wage increases was quantitatively more important than the adjustment of bonuses in stabilizing employment. However much the Japanese bonus system may be helping as an automatic employment stabilizer (months-of-bonus pay declined sharply after 1974 while the ratio of bonuses to wages fell from a peak value of 0.35 in 1974 to 0.29 in 1983, according to the figures in Appendixes A and B), in stepping back from high inflation in the mid-1970s Japan relied to a greater extent upon flexible wage setting than upon flexible bonuses, as it had to, given the share of wages in total compensation and the magnitude of the macroeconomic shock.

Conclusion

In this paper we have examined a relatively unique aspect of the Japanese labor market—payment of bonuses which constitute a quarter of workers' pay. Our analysis has rejected the notion that bonuses are just another form of wage payment on two grounds: (1) Bonuses behave differently than wages over the cycle, responding to profits and responding more to revenues than do wages; and (2) bonuses affect employment differently than wages, having a positive rather than a negative link to employment. While bonuses are not set by pure share-economy principles, they are sufficiently responsive to profits or revenues and affect employment in ways that have the flavor of a share economy. Our estimate is that they contribute somewhat to the success of the Japanese economy by automatically helping to stabilize unemployment at relatively low levels. The importance of reductions in the rate of change of base wages during the first oil crisis, however, makes it clear that, as presently constituted, the bonus system in Japan is by no means the main factor behind Japanese ability to weather severe shocks of that kind better than most other developed countries. This example highlights our basic conclusion. The bonus system helps Japan to maintain relatively tight labor markets, but so too do other, probably complementary aspects of the Japanese system beyond the focus of this study.

[25] Data in this paragraph are taken from Japan Productivity Center," Practical Handbook of Productivity and Labor Statistics," 1985.

DATA APPENDIX

I. *Industry Code Definitions*

AL All industries covered
MI Mining
CN Construction
WR Wholesale and retail trade
FI Finance and insurance
RE Real estate
TC Transportation and communication
EI Electricity, gas, and water
MF Manufacturing

FO Food, tobacco, and kindred products
TX Textile mill products
AP Apparel and related products
LU Lumber and wood products
FU Furniture and fixtures
PA Pulp, paper, and paper products
PR Publishing, printing, and allied products
CH Chemical and allied products
PE Petroleum and coal products
RU Rubber and rubber products
LE Leather and leather products
IS Iron and steel
NF Nonferrous metals and products
FB Fabricated metal products
MA Machinery
EQ Electrical machinery, equipment, and supplies
TQ Transportation equipment
PC Precision machinery

II. *Data Definitions and Sources*

Variable	Name	Definition and source
*B**	Bonuses	Special cash payments not included in any previous contract, agreement, or rule. Average yen per month per regular worker in firms with 5 or more regular workers. Monthly average over the calendar year. Japanese Ministry of Labor, "Monthly Labor Statistics."
E	Employees 1964–1983	Total number of regular workers employed indefinitely or under contract for a period longer than 1 month, in establishments with at least 5 regular workers. Data for January 1 of each year were shifted to a calendar year average. Japanese Ministry of Labor, "Yearbook of Labor Statistics, Survey on Employment Trend."
	1958–1963	*Nonmanufacturing industries* The number of regular workers employed in establishments with at least 5 regular workers, by industry, was estimated with the following methodology:

DATA APPENDIX—*Continued*

Variable	Name	Definition and source
		A = number of regular workers in firms with 30 or more regular workers, available for December 31 of each year. Japanese Ministry of Labor, "Yearbook of Labor Statistics, Labor Turnover Survey." B = total number of employees in firms with 5 or more regular workers. These data were available for December 31 of 1957, 1960, and 1963; data for other years were interpolated between these figures. Japanese Census of Establishments, Bureau of Labor Statistics, Office of the Prime Minister. C = total number of employees in firms with 30 or more regular workers. Availability and source same as for B. This series was then calculated as $A^*(B/C)$. The ratio B/C is used as an estimate of the ratio of regular workers in firms with 5 or more regular workers to regular workers in firms with 30 or more (the actual ratio was unavailable except for 1960). A comparison of the two ratios for 1960 by industry was favorable, indicating that the estimate is a fairly good one. The end-of-year data for 1958–1963 was scaled to a first-of-year basis based on the 1963/1964 comparison. The first-of-year series was then shifted to a calendar year average. *Manufacturing industries* The number of regular workers employed in establishments with at least 5 regular workers, by industry, was estimated with the following methodology: A = number of regular workers in firms with 30 or more regular workers, on December 31 of each year. Japanese Ministry of Labor, "Yearbook of Labor Statistics, Labor Turnover Survey." B = total number of employees in firms with between 4 and 29 regular workers, on December 31 of each year. Japanese Office of the Prime Minister, "Japan Statistical Yearbook, Census of Manufacturing." C = ratio of total employees to regular workers in firms with 5 to 29 regular workers, for 1960. Japanese Census of Establishments, Bureau of Labor Statistics, Office of the Prime Minister. This series was then calculated as $A + (B \times C)$. These end-of-year data for 1958–1963 were scaled to a first-of-year basis based on the 1963–1964 comparison. The entire series was then shifted to a calendar year average.
*NDP***	Net domestic product	Net output by industrial origin at market prices over the calendar year. In 1978 the Japanese Economic Planning Agency overhauled its system of national accounts, resulting in some discrepancies in the time series. Because of this the 1970–1979 (ARNA) series is spliced onto the 1979–1983 (ARNA) series, and the 1958–1974 (ARNIS) series is spliced onto the 1970–1983 (ARNA) series. Japanese Economic Planning Agency, "Annual Report on National Accounts (ARNA)," previously "Annual Report on National Income Statistics (ARNIS)."

DATA APPENDIX—*Continued*

Variable	Name	Definition and source
		These data were used on a fiscal year basis in Tables I through IV and on a calendar year basis in Tables V and VI.
*P***	Profit	Total corporate operating profit for firms of all sizes by industry for fiscal years (e.g., data for 1960 cover April 1, 1959 to March 31, 1960.) "Statistical Survey of Corporate Enterprise."
Time	Time trend	Linear time trend over all years in sample.
*VA***	Value added	Total corporate value added for firms of all sizes by industry for fiscal years (e.g., data for 1960 cover April 1, 1959 to March 31, 1960.) "Statistical Survey of Corporate Enterprise."
*W**	Wages	Cash earnings paid on the basis of previously determined contracts, collective agreements, or wage regulations. Average yen paid per month per regular worker in firms with 5 or more regular workers. Monthly average over the calendar year. Japanese Ministry of Labor, "Yearbook of Labor Statistics."
WPI	Price index	Calendar year average of the wholesale price index by groups of commodities; 1980 = 100. Industries were assigned the price index of the most closely aligned commodity. Bank of Japan, "Economic Statistics Annual."

* Variable deflated by the WPI.

** Variable deflated by a fiscal year WPI calculated as $FYWPI_t = \frac{3}{4}WPI_{t-1} + \frac{1}{4}WPI_t$.

APPENDIX A

Background Data for All Industry

Year	Bonuses	Wages	Bonus-to-wage ratio	Employment	WPI	Fiscal year NDP	Fiscal year profit	Fiscal year value added
1958	3048.4	15796	0.192986	10365651	41.237	—	—	—
1959	3476.0	16743	0.207609	10962109	41.667	10107450	—	—
1960	4137.2	17889	0.231271	11519854	42.097	11841500	2307512	6958948
1961	4961.7	19565	0.253601	12536066	42.527	14266000	2594128	7738271
1962	5512.5	21984	0.250751	13648936	41.839	16847750	2646799	8755160
1963	6349.6	24328	0.261000	14040339	42.570	19302250	3121667	10130053
1964	6975.1	26908	0.259220	15244350	42.656	21927500	3412227	11763563
1965	7680.6	29576	0.259690	16383700	43.000	24620000	3592424	13364943
1966	8727.3	32554	0.268087	16919900	44.032	27446000	4481157	15935935
1967	9966.6	35921	0.277459	17600900	45.300	32159750	5698615	19114107
1968	11678.0	40601	0.287628	18228550	45.700	38102250	7177309	24859740
1969	14306.0	46262	0.309239	20051150	46.700	44895250	9135588	30327477
1970	17006.0	53441	0.318220	21880150	48.400	53404000	10113470	35601981
1971	19343.0	61165	0.316243	22039400	48.000	62395000	9473392	38593492
1972	22644.0	70456	0.321392	22278650	48.400	68831750	11580990	45782392
1973	29701.0	83674	0.354961	23027600	56.000	80515500	18630744	62002833
1974	38478.0	104310	0.368881	23494250	73.700	97999750	19178407	75458233
1975	40463.0	122770	0.329584	23504300	75.900	112902500	13660256	77724732
1976	44666.0	137180	0.325601	23414850	79.700	124010000	17031324	88981109
1977	48197.0	150920	0.319355	23718400	81.200	138667500	16735237	93880516
1978	50041.0	162080	0.308743	24385950	79.100	151977500	18887352	105582102
1979	53341.0	170420	0.312997	24914700	84.900	166152500	25707795	120113545
1980	57073.0	181100	0.315146	25119500	100.000	180005000	28935239	133277188
1981	60015.0	190830	0.314495	25662100	101.400	194370000	27717791	143728232
1982	61231.0	198740	0.308096	26327900	103.200	204235000	25532111	147111682
1983	61702.0	205610	0.300092		100.900	213872500	25821673	151388294

APPENDIX B

Background Data for Manufacturing Industries

Year	Bonuses	Wages	Bonus-to-wage ratio	Employment	WPI	Fiscal year NDP	Fiscal year profit	Fiscal year value added
1958	2444	14472	0.168878	6109218	46.483	—	—	—
1959	2911	15522	0.187540	6547760	47.188	3076800	—	—
1960	3542	16791	0.210946	7128689	47.423	3917850	1372081	3948972
1961	4284	18355	0.233397	7780812	47.423	5039075	1559131	4388207
1962	4694	20578	0.228108	8278334	46.483	5990950	1544331	4747820
1963	5347	22735	0.235188	8390859	47.000	6693300	182584	5564036
1964	5866	25205	0.232732	8525500	47.000	7809400	1915327	6300418
1965	6350	27681	0.229399	8663450	47.000	8593400	1911173	6938103
1966	7295	30660	0.237932	8855900	47.799	9289225	2479970	8228383
1967	8572	34156	0.250966	9152800	48.900	11173250	3307799	9925239
1968	10566	39023	0.270763	9492050	49.000	13696750	4049236	12632972
1969	13127	44719	0.293544	9938000	49.900	16349750	5222491	15549439
1970	15756	51467	0.306138	10332000	52.000	20037750	5520676	17565848
1971	17461	58799	0.296961	10263000	51.500	23458750	4740825	18471754
1972	20420	67849	0.300962	10155000	52.000	25271750	5794825	21606634
1973	27969	80789	0.346198	10444000	59.900	29158000	9559785	29287361
1974	35567	100510	0.353865	10449000	77.100	35548500	9243834	34161588
1975	36237	115780	0.312982	10144000	78.500	39000000	6515463	32645495
1976	39492	129910	0.303995	9960900	82.000	40162000	7884748	37838841
1977	42516	143170	0.296962	9863700	83.500	46023500	7706935	39972201
1978	44218	153450	0.288159	9744900	82.200	50393000	8728605	43611892
1979	48643	161890	0.300496	9721400	87.100	55296000	13189666	51593600
1980	52667	172620	0.305104	9796800	100.000	59696500	13414387	54889198
1981	56092	182470	0.307404	9846050	100.800	64791500	13403043	59259656
1982	57707	190770	0.302495	9904950	101.900	68884750	11658460	58750550
1983	58541	198520	0.294887		100.400	71732750	12902679	61514504

REFERENCES

AOKI, M. (Ed.) (1984). "The Economic Analysis of the Japanese Firm" North-Holland, Amsterdam

GRUBB, D., JACKMAN, R., AND LAYARD, R. (1983). Wage rigidity and unemployment in OECD countries, *Europ. Econ. Rev.* **21,** 11–39.

GROSSMAN, H., AND HARAF, W. F. (1983). Shunto, rational expectations, and output growth in Japan, NBER Working Paper No. 1144 (June).

HAMADA, K., AND KUROSAKA, Y. (1984). The relationship between production and unemployment in Japan: Okun's law in comparative perspective, *Europ. Econ. Rev.* **25,** No. 1 (June), 71–94.

HAMADA, K., AND KUROSAKA, Y. (1985). Trends in unemployment, wages, and productivity: The case of Japan, paper prepared for the Conference on the Rise in Unemployment, May 1985.

HASHIMOTO, M., AND RAISIAN, J. (1985). Employment tenure and earnings profile in Japan and the U.S., *Amer. Econ. Rev.* (September), 721–735.

ISHIKAWA, T., AND UEDA, K. (1984). The bonus payment system and the Japanese personal savings, *in* "The Economic Analysis of the Japanese Firm" (M. Aoki, Ed.), Elsevier, Amsterdam/New York.

KOIKE, K. (1983a). Internal labor markets: Workers in large firms, *in* "Contemporary Industrial Relations in Japan" (T. Shirai, Ed.), Univ. of Wisconsin Press, Madison.

KOIKE, K. (1983b). Workers in small firms and women in industry, *in* "Contemporary Industrial Relations in Japan" (T. Shirai, Ed.), Univ. of Wisconsin Press, Madison.

KOSHIRO, K. (1983a). The quality of working life in Japanese factories, *in* "Contemporary Industrial Relations in Japan" (T. Shirai, Ed.), Univ. of Wisconsin Press, Madison.

KOSHIRO, K. (1983b). Development of collective bargaining in postwar Japan, *in* "Contemporary Industrial Relations in Japan" (T. Shirai, Ed.), Univ. of Wisconsin Press, Madison,

OKUNO, M. (1984). Corporate loyalty and bonus payments, *in* "The Economic Analysis of the Japanese Firm" (M. Aoki, Ed.), Elsevier, New York.

SHIMADA, H. (1983). Japanese industrial relations—A new general model? A survey of the English-language literature, *in* "Contemporary Industrial Relations in Japan" (T. Shirai, Ed.), Univ. of Wisconsin Press, Madison.

SHIRAI, T. (ed.) (1983a). "Contemporary Industrial Relations in Japan" Univ. of Wisconsin Press, Madison.

SHIRAI, T. (1983b). A theory of enterprise unionism, *in* "Contemporary Industrial Relations in Japan" (T. Shirai, Ed.), Univ. of Wisconsin Press, Madison.

SORRENTINO, C. (1984). Japan's low unemployment: An in-depth analysis, *Mon. Lab. Rev.* **107,** 3 (March), 18–27.

SYMONS, J., AND LAYARD, R. Neoclassical demand for labor functions, London School of Economics Discussion Paper 166.

TACHIBANAKI, T. (1982). Further results on Japanese wage differentials: Nenko wages, hierarchical position, bonuses, and working hours, *Int. Econ. Rev.* **23,** No. 2 (June).

TAIRA, K. (1983). Japan's low unemployment: Economic miracle or statistical artifact? *Mon. Lab. Rev.* **106,** No. 7 (July), 3–10.

WADWANI, S. (1985). The macroeconomic implications of profit sharing: Some empirical evidence, London School of Economics working paper.

WEITZMAN, M. L. (1984). "The Share Economy," Harvard Univ. Press, Cambridge, MA.

WEITZMAN, M. L. (1985). The simple macroeconomics of profit sharing, *Amer. Econ. Rev.* (December).

WEITZMAN, M. L. (1986). Macroeconomic implications of profit sharing, *in* "N.B.E.R. Macroeconomics Annual" (S. Fischer, Ed.), MIT Press, Cambridge, MA.