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The bonus share of flexible pay in Germany, Japan and the US: Some empirical regularities

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Abstract

Many compensation schemes consist of cash flow streams with different risk characteristics. For example, bonuses, which help align a firm's wage bill with business cycle fluctuations, are more variable than regular (fixed) pay. We investigate empirical regularities in compensation schemes involving risky pay which is contingent on certain random outcomes. Using data for Germany, Japan and the US, we find that the ratio of bonus pay to total pay increases as worker qualifications rise. This is consistent with another finding that the returns to human capital investment observed for bonus payments are larger than the returns observed for regular pay. © 1998 Elsevier Science B.V.

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1. Introduction

Many compensation schemes consist of cash flow streams with different risk characteristics. For example, most employed workers in Japan are paid 25 to 33 percent of their total earnings in the form of bonus payments. Unlike regular pay the amount of which is known at the start of each contract year, the amounts of bonus payments are not prespecified and are contingent on firm performance and individual workers' achievements,[1] among

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[1] This does not mean that regular wages do not fluctuate over time. Due to annual wage adjustments, Japanese regular wages are more flexible, for example, than their North American counterparts. Bonus payments, however, respond even more than regular wages to short-run, year-to-year changes in macro economic conditions and firm performance.

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other factors. Thus the Japanese bonus pay is considerably more variable than regular pay.[2]

While most employed workers in Japan receive substantial portions of their pay in bonus form regardless of their ranks and positions, risky forms of pay[3] like bonuses are also found for workers in Europe and North America. For example, some German workers participate in profit-sharing schemes.[4] Their pay consists of regular salaries and profit share income, the latter of which is risky in the sense that it fluctuates significantly with firm profit.

In the US bonuses and other types of incentive pay exist for company executives and managers. The amounts of these bonuses typically depend on the outcomes of such random events as firm and worker performance. As a result U.S. executives' bonus payments are much more variable than regular pay.

From a policy perspective the introduction of risky pay of the sort we discuss in this paper in firms' compensation packages for ordinary workers is likely to increase firms' wage bill flexibility and add an important dimension to the policy debate on labor market flexibility. (See, e.g. Blyton, 1992,Hart and Ruffell, 1993.)

The purpose of this paper is to investigate empirical regularities in the determinants of regular pay and bonus payments with different risk characteristics. First, we are interested in how the expected proportions of risky payments in total pay vary with worker qualifications. Secondly, we are interested in empirical relationships that relate worker qualifications to regular and bonus payments.[5] Our empirical results would be potentially useful for personnel managers who must determine the expected level of risky pay relative to workers' fixed wages (regular pay).

In Section 2 we present our empirical results for Germany, Japan and the US. Our main findings are that, relative to regular pay, a larger bonus is paid to highly skilled

[2]For example, the coefficients of variation calculated for year-to-year changes in regular and bonus payments for Japanese workers for the period 1967–1988 using data from the Bank of Japan (various years) are 0.79 and 1.36, respectively.

[3]Another form of risky pay is salespersons' commissions. It is also possible to view self-employed workers' income as risky income. Since the interest of this paper is the pay structure in organizations, we do not consider self-employed workers' compensations.

[4]In this paper Germany refers to (the former) West Germany.

[5]Due to the lack of data our analysis does not consider non-wage compensation. However, for Japan, for example, there is evidence that: (1) the share of non-wage compensation increases with total compensation and firm size, and is higher for male than for female workers; (2) legally mandated benefits are negatively correlated with regular pay; and (3) non-mandated benefits increase with bonus payments (Nakamura and Nakamura, 1989). Our analysis does not consider taxes either. Regular pay and bonuses are taxed the same way in Germany and Japan. However, German workers can avoid paying income and social security taxes on the portion of profit share income (up to DM500) used for the purchase of employee stock in the firm (Commission of the European Community, 1991) bonuses often receive favorable tax treatments. Neither do we consider non-taxable perquisites such as a corner office for U.S. executives and large entertainment expenses for Japanese managers in this paper. Simultaneous analysis of wage and non-wage compensation subject to tax incentives (to minimize the combined taxes payable by the employer and the employees) is potentially a fruitful area of future research in the structure of compensation.

workers and that bonus/regular wage ratio also increases with skills. In Section 3 certain behavioral hypotheses on compensation schemes are briefly reviewed in search of possible explanations for the empirical regularities we find for the three countries in Section 2.

2. Empirical estimates for bonus-to-regular-pay ratios and bonus premiums for Germany, Japan and the US

In this section we investigate empirically the determinants of bonus and regular pay as well as the determinants of bonus-to-regular-pay ratio. We are particularly interested in studying the role of human capital and other worker qualification variables using data from Germany, Japan and the US.

Human capital investments are measured by the numbers of years of schooling and tenure with the present employer. Since large firms are believed to attract more qualified workers and also provide more job-related training (human capital investment) than small firms, the size of the employer may also reflect the level of worker quality (Oi, 1983). Age could reflect the accumulation of general and firm-specific human capital for continuously employed workers, but it may also reflect the rate of depreciation of skills and other life cycle factors for workers. (See also footnote 6 below.)

Our data for Japan are grouped data taken from the Ministry of Labor (1984, 1986, 1988). Data for Germany are from German Socio-Economic Panel (Hanefeld, 1984). Data for the US come from the Panel Study of Income Dynamics (PSID) pooled over 1975–1982 for male heads of households in management and administrative positions. We begin our empirical analysis with Japanese pay schemes.

The Japanese data are grouped based on 4 educational groups and 3 firm (establishment) size groups for 4 industries for men and women. (No public use household micro data exist in Japan. See Table 1 for descriptive statistics.) Hence mean values for educational group and firm size dummies are, respectively, equal to one-fourth and one-third. The total number of cells for men and women pooled over 3 years is 288 $(= 4 \times 3 \times 4 \times 2 \times 3)$. Regular salary and bonus payments are measured in terms of monthly income for Japan (in 1,000 yen measured in 1985 yen).

Estimation results for Japanese workers pooled over 1984, 1986 and 1988 are presented in Table 2. The estimated coefficients for tenure, education and firm size variables for the log of regular wage $(\ln(R))$ equations are generally smaller in magnitude than those for the log of bonus payments $(\ln(B))$ equations. (See Columns 1, 2, 4, 5, 7 and 8 in Table 2.) This means that the returns to human capital investments observed in bonus form are larger in value than the returns observed in the form of regular wages. Firm size effects are measured with the reference group being large firms in the regressions reported in Table 2. The returns from working for larger firms are also greater for bonus payments than for regular wages. We call the difference in the returns to human capital investment observed between bonus and regular pay equations *bonus premiums*.

Table 1
Data characteristics: Means (standard deviations)

	Japan [a]			Germany		US	
	All	Men	Women			(PSID, men)	
Tenure (in years) at present employer	9.5(4.5)	12.3(3.8)	6.7(3.2)	Tenure (in years) at present employer	14.1(8.8)	Tenure (in years) at present position	6.3(7.0)
Regular salary (excl. bonuses) [b]	220.4(61.5)	270.3(40.7)	170.5(30.4)	Regular salary (excl. bonuses) [b]	33,295(16,016)	Regular salary (excl. bonuses) [b]	13,909(7,460)
Bonus [b]	73.0(36.2)	96.8(35.3)	49.2(15.4)	Bonus [b]	5,034(5,791)	Bonus [b]	2,535.9(5,601)
Bonus/regular pay ratio	0.317	0.349	0.285	Bonus/regular pay ratio	0.121	Bonus/regular pay ratio	0.194
Age	37.0(7.9)	39.8(6.0)	34.1(8.6)	Age	39.5(10.4)	Age	42.1(8.7)
				Years of schooling	14.5(3.3)	Years of schooling	14.0(2.3)
				Years of experience [c]	19.2(9.9)	Years of experience	20.8(13.1)
				Male dummy	0.79	Marriage dummy	0.95
				Firm size dummy 1 [d]	0.04	Non white dummy	0.11
				Firm size dummy 2	0.14	Job level dummy	3.20
				Firm size dummy 3	0.22	Job level dummy	4.31
				Firm size dummy 4	0.60		
No. of observations	288	144	144	No. of observations	364	No. of observations	1,752

Data source: The grouped data for Japan are taken from the Ministry of Labor (1984, 1986, 1988). Data for Germany are from German Socio-Economic Panel (Hanefeld, 1984). Reported profit shares were used as bonus payments. Data for the US come from the Panel Study of Income Dynamics (PSID) pooled over 1975–1982 for male heads of households in management and administrative positions. Only those observations for which the following selection rules were satisfied were included in the sample: $30 \leq \text{age} \leq 65$; earnings (without bonuses) $\geq$\$5,000 1970 dollars; bonuses >0 for a particular year; not eligible to receive overtime payments. While the PSID variable reporting bonuses may also contain overtime and commission payments, our selection rules used are likely to eliminate most of those male managers/administrators who have received commissions and/or overtime payments.

[a] Japanese data are grouped based on 4 educational groups and 3 firm (establishment) size groups for 4 industries for men and women. Hence mean values for educational group and firm size dummies are, respectively, equal to one-fourth and one-third. The total number of cells for men and women pooled over 3 years is 288 $(= 4 \times 3 \times 4 \times 2 \times 3)$.

[b] Regular salary and bonus payments are measured in terms of monthly income for Japan (in 1,000 yen measured in 1985 yen) and for Germany (in 1970 marks), and in terms of annual income for the PSID data (in 1970 dollars).

[c] Age – years of schooling – 6.

[d] Firm size (FS) is measured in terms of the number of employees (E) such that: FS $= 1$ if $E < 20$, FS $= 2$ if $20 \leq E < 200$, FS $= 3$ if $200 \leq E < 2,000$ and FS $=$ 4 if $E > 2,000$.

Table 2
Determinants of regular and bonus payments for Japanese workers: 1984–88 [a]

	All			Male			Female		
	$\ln(R)$	$\ln(B)$	$\ln(B/R)$	$\ln(R)$	$\ln(B)$	$\ln(B/R)$	$\ln(R)$	$\ln(B)$	$\ln(B/R)$
Tenure at present	0.026	0.057	0.030	0.028	0.051	0.023	0.032	0.081	0.049
Employer	(10.7)	(12.3)	(9.23)	(12.0)	(10.9)	(7.21)	(5.34)	(7.26)	(7.23)
Education [b]									
Low	–	–	–	–	–	–	–	–	–
Middle	0.276	0.470	0.194	0.256	0.605	0.350	0.487	0.497	0.010
	(9.60)	(10.3)	(5.41)	(9.11)	(12.0)	(8.64)	(8.17)	(3.96)	(0.12)
High	0.378	0.630	0.251	0.344	0.759	0.415	0.660	0.698	0.038
	(11.9)	(12.8)	(6.33)	(11.2)	(14.1)	(8.86)	(9.57)	(4.52)	(0.37)
University	0.529	0.841	0.311	0.497 1	0.04	0.540	0.787	0.864	0.078
	(17.2)	(16.6)	(7.63)	(16.1)	(19.1)	(11.9)	(12.4)	(6.00)	(0.80)
Firm Size [c]									
Large	–	–	–	–	–	–	–	–	–
Medium	−0.071	−0.162	−0.090	−0.056	−0.152	−0.096	−0.075	−0.148	−0.073
	(5.27)	(6.87	(5.21)	(4.65)	(5.96)	(4.66)	(3.51)	(4.22)	(3.08)
Small	−0.087	−0.396	−0.309	−0.045	−0.376	−0.331	−0.136	−0.400	−0.264
	(4.68)	(11.8)	(12.6)	(3.31)	(10.8)	(10.5)	(4.30)	(7.60)	(8.11)
Age	0.014	0.015	0.001	0.014	0.035	0.021	0.024	0.006	−0.018
	(6.23)	(4.01)	(.25)	(6.96)	(9.08)	(6.07)	(6.04)	(0.87)	(4.15)
Male	0.231	0.255	0.024	–	–	–	–	–	–
	(11.3)	(7.30)	(1.01)						
Constant	4.21	2.65	−1.56	4.44	2.04	−2.39	3.66	2.76	−0.901
	(49.9)	(18.1)	(13.5)	(46.0)	(11.2)	(14.2)	(24.0)	(8.39)	(4.04)
R^2	0.890	0.836	0.668	0.835	0.857	0.763	0.558	0.547	0.573
Number of Observations	288	288	288	144	144	144	144	144	144

[a] Calculated from grouped data taken from Ministry of Labor (1984, 1986, 1988). The industries included are: manufacturing, wholesale and retail trade, finance and insurance, and services. The estimation method used is least squares. Absolute *t*-ratios given in parentheses are based on heteroskedasticity-adjusted standard errors.
[b] The education dummies are defined by: Lower secondary school (Low), Upper secondary school (Middle), Junior College (High) and College or University (University).
[c] The firm size dummies are measured in terms of the number of workers at establishment and are defined by: 1000 employees and more (Large), 100–999 employees (Medium) and 10–99 employees (Small). The reference group is the large firm group.

Coefficient estimates for Age for Japanese men are positive for both regular and bonus payments, indicating the presence of age effects that are not captured by tenure.[6] Such age effects are observed for regular wages but not for bonus payments for Japanese women. (This and other aspects of bonus behavior for Japanese women will be further discussed in the next section.)

Bonus premiums in the returns to human capital investment are explicitly estimated as the coefficients of human capital variables in the regression of the bonus/regular pay ratio ($\ln(B/R)$) in Table 2. The coefficient estimates reported in the columns labelled $\ln(B/R)$ for all workers (Column 3), men (Column 6) and women (Column 9) are statistically insignificantly different from the differences between the respective coefficient estimates for $\ln(B)$ and for $\ln(R)$. This suggests that no seriously omitted variables exist in the equation error terms which are correlated with included explanatory variables.[7] Hence we expect no serious omitted variables bias to exist in our regression results.

From these estimation results for $\ln(B/R)$ it is clear that the bonus-to-regular-pay ratio increases as worker qualifications rise, where qualifications are measured in terms of tenure, education and firm size, among other variables. We also note that this bonus-to-regular-pay ratio behavior is consistent with the presence of bonus premiums for human capital variables.

It is of interest to see if these empirical regularities that we find for Japan related to bonus and regular pay equations also hold for other countries. We will investigate this using data from Germany and the US.

Some West German workers are covered by profit-sharing plans. Unlike regular wages, the income from a profit-sharing plan is not predetermined at the start of each contract year and hence forms a risky cash flow. German workers also have a choice of whether or not to participate in a profit-sharing plan.[8] We are interested in the sample of those workers who participated in profit-sharing plans and hence had both regular wage and profit share income. Such participation decisions might cause selection bias problems in estimating the determinants of regular wages and profit shares. For this reason a selection bias term (Heckman, 1979) was included in the regressions for German workers reported in Columns

[6]The role of age in our wage equations is ambiguous. While it captures some of the returns to human capital investments, Age also captures workers' life cycle plans, health statuses and other labor supply factors. For example, increased tenure is likely to lead to increased wages, but aging may result in wage decreases due to workers' deteriorating health statuses. Since our interest here is to measure the differential effects of workers' qualifications variables such as tenure and schooling, we have not included the quadratic age term which is sometimes included to measure the life cycle effects in wage rates. Our preliminary wage regressions including the quadratic age term indicate that the coefficients of other regressors change little. Also, we have not included quadratic tenure and schooling terms for the following reasons: (i) it would be difficult to interpret the results; (ii) it is not commonly done in the literature; and (iii) potentially serious multicollinearity problems exist.

[7]For example, if firm profit, an omitted variable, were a main determinant of bonus payments and were, as we expect, correlated with worker qualifications reflected in tenure and the level of education, then the coefficient estimates for the equation for $\ln(B/R)$ would differ significantly from the differences in the coefficient estimates for the equations for $\ln(B)$ and $\ln(R)$.

[8]Such a choice does not exist for Japanese workers. See Hart and Hübler (1991) for an analysis of German workers' decision on participating in profit-sharing plans. Note also that not all German firms provide profit-sharing plans. See also Nakamura and Nakamura (1981, 1989) for a type of choice model being assumed here for deriving a selection bias term.

Table 3
Determinants of regular and bonus payments: German workers, and U.S. male managers and executives

	German Workers in Profit Share Plans (1984–87) [a]			U.S. Male Managers and Executives (1975–82) [b]		
	$\ln(R)$	$\ln(B)$	$\ln(B/R)$	$\ln(R)$	$\ln(B)$	$\ln(B/R)$
Tenure [c]	0.014	0.036	0.02	0.005	0.019	0.013
	(3.19) [d]	(2.25)	(1.67)	(3.34)	(4.21)	(2.98)
Schooling [e]	0.058	0.209	0.132	0.065	0.071	0.025
	(4.01)	(4.25)	(3.61)	(12.7)	(4.11)	(1.69)
Married [f]	0.153	0.581	0.404	0.099	0.153	0.081
	(0.77)	(1.03)	(0.95)	(1.87)	(0.927)	(0.596)
Male [g]	0.347	0.586	0.182	—	—	—
	(2.48)	(1.36)	(0.56)			
Nonwhite [h]	—	—	—	−0.103	−0.109	0.133
	(3.38)	(0.952)	(1.28)			
Constant	6.31	1.69	−4.46	8.34	5.55	−3.09
	(21.1)	(1.76)	(6.18)	(87.1)	(17.8)	(11.6)
R^2	0.394	0.292	0.190	0.101	0.020	0.006
Number of Observations	364	364	364	1,752	1,752	1,752

[a] These regression results were derived using data from the German Socio-Economic Panel (Hanefeld, 1984). The estimation method used is that discussed in Kmenta (1986, pp. 622–625). Firm size and Heckman's (1976) selection bias term were also included in these regressions but were statistically insignificant.
[b] These regression results were derived using pooled data on U.S. employed male workers in management/administration positions for 1976–1982 obtained from the Panel Study for Income Dynamics of the University of Michigan. To be selected into the pooled sample, a male worker must be between 30 and 65 years of age, earned at least $5,000 in 1970 dollars (without counting bonuses), and received some bonuses in a particular year. Those workers who received or were eligible to receive overtime payments were eliminated since bonuses and overtime payments are reported in a single item in PSID.
[c] Years of tenure at present employer for German workers and at present position for U.S. managers and executives.
[d] Numbers in parentheses are heteroskedasticity-corrected absolute t-ratios.
[e] Years of schooling.
[f] Set equal to one if a worker is married and zero otherwise.
[g] Set equal to one if a worker is male and zero otherwise.
[h] Set equal to one if a worker is nonwhite and zero otherwise.

1–3 of Table 3. (Selection bias was not statistically significant and hence its regression coefficients are not shown in Table 3.) Comparing estimated regular wages $(\ln(R))$ and profit share income $(\ln(B))$ equations, we see that the returns to human capital investments (i.e. tenure and years of schooling) observed for the profit share equation are larger in magnitude than for the regular wage equation. This is consistent with our results for Japan and shows the presence of bonus premiums in the returns to human capital investment.[9]

[9]Unlike for Japan, firm size in German regression equations is either insignificant or only marginally significant. Since profit-sharing plans are more likely to be found in large German firms and hence our sample is highly skewed towards large firms, firm size is not a good indicator of human capital investments for German workers in our sample. We have not included Age in our regressions for Germany and the US because of the multicollinearity problems arising from collinearity between the tenure and Age variables.

The positive coefficient estimates for tenure and schooling in Column 3 ($\ln(B/R)$) of Table 3 also indicate that the profit share/regular pay ratio is an increasing function of worker qualifications, as it is for Japan.

Unlike Germany and Japan where ordinary workers receive bonuses as part of their pay, bonuses are typically paid to managers and executives in the US. In the last three columns of Table 3 estimation results are presented for regular and bonus equations for U.S. managers and executives using data from the PSID. Coefficient estimates for human capital variables (tenure and schooling) for regular earnings ($\ln(R)$), bonus payments ($\ln(B)$) and the regular pay/bonus ratio ($\ln(B/R)$) equations are consistent with our findings for Japan and West Germany. That is, we do find bonus premiums contained in the coefficients for tenure and schooling in the bonus equation.[10] We also see that the portions of bonus payments in total pay increase as worker qualifications increase.

Our empirical findings for Germany, Japan and the US are similar despite the fact that the bonus payments used in obtaining our empirical results mean somewhat different things for these three countries. Bonuses are usually paid to most employed workers in Japan regardless of their rank, tenure or sex. In Germany not all workers choose or are able to participate in profit-sharing plans. In the US bonus payments are typically paid to managers and executives.[11] Yet the same empirical regularities seem to hold: that the returns to human capital investments paid out in bonus form contain bonus premiums and that the ratio of bonus-to-regular-pay rises as worker qualifications increase.

Finally, estimates for an increase in bonus premiums in the returns to an additional year of tenure at the present employer are given by the coefficient estimates of the tenure variable under the columns for $\ln(B/R)$ in Tables 2 and 3 as follows[12]: 0.023 (men) and 0.049 (women) for Japan, 0.020 for Germany, and 0.013 for the US. The range for these estimates for bonus premiums seems quite narrow given the diverse demographic groups that the data used in this study represent. Our empirical results are also consistent with Abowd (1990, Table 2) who estimated, among other equations, $\ln(1 + B/R)$ using a sample of 99 212 U.S. managers and executives for the period 1981–1986. His estimated $\ln(1 + B/R)$, or equivalently estimated bonus-to-regular-pay ratio increases with worker qualifications. Using Abowd (1990, Tables 1 and 2) bonus premiums in the returns to an additional year of tenure are calculated to be 0.008 (detailed calculations available on request). This estimate is quite comparable to our estimates for the US discussed above.

[10]The regression R-squares are higher for Japan (Table 1) than for Germany or the US (Table 2) primarily because the Japanese data are grouped data. The lower R-squares for U.S. equations than for German equations suggest that there are also factors other than the ones included in the equations such as individual-specific or firm-specific characteristics which explain the variations in U.S. executives' pay.

[11]Workers' expected lengths of employment with the present employer also differ among the three countries. The methods for negotiating for bonuses also vary. Most U.S. executives individually negotiate for bonuses while Japanese enterprise unions (but not individual workers) negotiate the aggregate bonus pay for their members. In Germany firms' shareholders and works councils decide on adoption of profit-sharing plans. They also negotiate profit shares to be paid to workers.

[12]The bonus premiums with respect to tenure are a proportional increase in the difference between bonus and regular pay given an additional year of tenure. Thus such premiums for Japanese and German male workers are 2.3% and 2.0%, respectively.

3. Possible explanations for the observed empirical regularities

Employed workers receive part of their income in the form of risky pay for various reasons. For example, employers and employees may find it impractical to agree on an employment contract under uncertainty which specifies workers' pay for every possible outcome of the state of nature. The sources of uncertainty include macroeconomic conditions, firm performance and workers' accomplishments.

Agency theory provides one possible explanation for the presence and behavior of risky pay in some compensation packages. According to the agency literature (e.g. Jensen and Meckling, 1976,Jensen and Murphy, 1990), performance-based compensation schemes are effective in generating incentives for the agents (corporate managers and executives) to align their interests with those of shareholders (principals). It is often the case that the incentive portions of executives' pay contain cash bonuses. Lazear (1986) also showed, however, that where relatively inexpensive monitoring is possible, it is optimal for both agents and principals to choose non-contingent salary-based compensation schemes. It is much more expensive to monitor workers in higher rank positions than workers in lower rank positions since the types of tasks workers in higher rank positions are expected to perform tend to have associated with them vaguely defined mental inputs and noisy outputs. These inputs and outputs are difficult to be prespecified precisely at the time of contract negotiation and to be monitored for contract fulfillment. Thus optimizing behavior implies that contingency portions (bonus portions) of agents' total pay are higher for those in upper level positions than for those in lower level positions.

This type of agency model may explain why German profit share-based compensation schemes are more prevalent among workers at larger firms than at smaller firms. This is because larger firms employ more workers than smaller firms in higher level positions who are more difficult to monitor.

In Japan where lifetime (or long-term) employment and job rotations are the norm, job descriptions for regular (mostly male) employees are virtually non-existent in employment contracts, since it is not practical to prespecify job contents for a worker who is likely to be working in a team environment involving regular job rotations.[13] Standard assessments of workers are therefore based on workers' achievements as related to some expected career advancements in the long run. Monitoring workers under such circumstances may be expensive even for production workers since a pure comparison between the prespecified job-tasks and the actual tasks achieved, an inexpensive way of monitoring, is simply not available. Flexible bonus assessments may be used as a tool to accommodate some of personnel evaluations based on vague inputs and noisy outputs for workers in positions ranging from relatively low rank positions to company executives. It is therefore possible

[13]Most Japanese companies use a few broad titles to classify workers. For example, at Hitachi, Ltd., one of the largest manufacturers of electric machinery in Japan, most workers (except for executives and some specialists and engineers) are basically classified into three job categories with small numbers of ranks attached to them: planning job category (3 ranks), supervisory category (4 ranks) and clerical and technical job category (8 ranks). These ranks reflect the status differentiation and associated pay gradation but they do not represent functional demarcation. (While there are only 9 job classes in the technician job category at Hitachi, Ltd., there can be more than 100 blue-collar job titles at a unionized electric machinery company of a comparable size in the US.) (See Dore, 1973,Aoki, 1988.)

that the agency model of the sort discussed above is consistent with the Japanese employment system where bonus payments are part of compensation packages for many employed workers including blue collar workers.[14]

An empirical implication of this type of agency model is that the expected bonus-to-total-(or equivalently bonus-to-regular) pay ratio rises as worker qualifications increase, since higher levels of vague inputs and noisy outputs are associated with workers in the positions requiring higher qualifications than with workers in lower rank positions.[15]

Statistically insignificant effects of Education Dummies and a significant but negative Age effect in the $\ln(B/R)$ equation for Japanese female workers in Table 2 suggest, however, that they may follow career paths which are different than that of male workers. If the degree of dependence of the bonus-to-regular-pay ratio on workers' tenure, education and firm size is an indication of the difficulty of monitoring associated with the positions occupied by these workers as agency theory suggests, then we may conclude from the lack of dependence for women of the bonus-to-regular-pay ratio on education that the positions female workers occupy are of less managerial nature and easier to monitor than the positions male workers occupy. This appears consistent with the findings in the literature that Japanese female workers do not enjoy the same types of career development opportunities as their male counterparts (Hill, 1984).[16]

While the principal–agent framework of the sort discussed above provides an attractive setting for empirically testing implications of the agency theory, the explicit connection between workers' incentives and the principal's objectives, the basic ingredient required for the principal–agent framework may not exist for some of our datasets. For example, in Japan bonuses are typically paid, not only to regular employees, but also to non-regular employees including part-time workers many of whom are women. All employees in the public and non-profit sectors (including those who work for government, schools and universities) are also paid bonuses.

The variation in bonuses paid to non-regular workers and regular workers at lower ranks in Japan is most likely to be caused by factors exogenous to these workers and do not serve as an incentive scheme. Since bonuses for Japanese workers are negotiated in collective bargaining, the effectiveness of bonuses as an incentive pay may be even weaker.

[14]In the long run both incentive effects and effective monitoring could be achieved using, not only bonuses, but also regular pay raises. For example, Japanese firms generate many long-term worker incentives by maintaining distinctly positive probabilities for internal promotions at all levels within their carefully designed rank ordering system (Aoki, 1988, Ch. 3) while bonus payments accommodate short-term incentives.

[15]Workers' incentives in the long run consist of higher expected future income due to higher regular pay associated with promotions and due to higher expected bonuses which come with promotions and higher regular pay. In this paper, however, we focus on the cross-sectional relationship between the bonus-to-total pay ratio and worker qualifications at a point in time.

[16]An alternative interpretation to the negative (wrong-signed) age effect in the bonus equation for Japanese female workers (Table 1) is the following. More and more young college-educated Japanese women enter high wage occupation in contrast to older Japanese women who are mostly found in non-career track positions. If younger female workers are paid more bonuses, adjusted for their qualifications, than their older counterparts, then such demographic differences in our sample explain the observed negative sign. This alternative interpretation implies, among other things, that young female workers in Japan are subjected to wage profiles which are similar to those of male workers.

Bonuses which are only remotely correlated with individual workers' incentives may be better explained, for example, as a risk-sharing scheme between workers and employers by which both workers and employers absorb some of the business fluctuation risk in the form of flexible bonus payments in return for long-term employment[17]; or as some gift reflecting the goodwill of employers (Akerlof, 1982, 1984)[18]. It is possible that these alternative theories are more successful than the agency theory in explaining the empirical regularities in the bonus behaviour presented in this paper. A fuller analysis of these theories underlying our empirical results is left for future research.

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[17]Firms and workers may agree on how firms and workers share the risk of business fluctuations using bonus payments which fluctuate together with firms' sales revenues (Nakamura and Nakamura, 1991). It is also possible that Japanese bonus payments contain both incentive and risk-sharing effects. For example, less risk averse managers may be more willing to be paid larger portions of their pay in risky bonuses in return for their better chances for affecting the firm profit than their lower rank counterparts. Little is known, however, about the relative contributions of incentive and risk sharing effects to total compensation schemes.

[18]According to this theory, the employer can raise group work norm and average effort by paying workers a gift of wages (bonuses) in excess of the minimum required (regular pay), in return for their gift of effort above the minimum required.

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