UNIONIZATION AND THE INCIDENCE OF PERFORMANCE-BASED COMPENSATION IN CANADA

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ABSTRACT

We estimate probit models to investigate the determinants of the incidence of four performance-based compensation schemes -- employee share purchase plans, profit sharing, cash bonuses, and productivity gainsharing -- using a sample of private sector Canadian firms. Bivariate probit models are also estimated to examine the joint probability that both a cash-based and a share-based scheme will be offered. We find that the determinants of the probability that a firm would offer a scheme differed across schemes, and for a given scheme, often differed for the broad class of non-managerial workers and for production workers alone. Our primary focus is on the effect of unionizatioh on the incidence of the schemes. This reflects the widespread notion that unions oppose these sorts of performance based compensation plans. Except for productivity gainsharing and one instance of cash bonuses, we find that the effect of union density was negative as expected and often significantly so. The estimated probability effect is large for employee share purchase plans and profit sharing for production workers. In addition, unionization has a fairly substantial effect on the joint probability of the firm offering both a share-based and a cash-based incentive plan. Finally, we find some support for the notion that firms adopt these policies to reward past performance.

1. INTRODUCTION

Recently, alternative labor compensation schemes such as profit and value added sharing, employee share ownership plans, and productivity gainsharing which link part of employee compensation to the performance of the firm have received considerable attention by economists, labor relations specialists, and policy makers. Interest in these alternatives partly reflects the disappointing economic performance of some industrial nations during the past decade and a perception that many industries were losing their ability to compete with foreign firms. Performance-based compensation has been recommended as a remedy for these problems because it is viewed by its proponents as a means to enhance worker productivity.[1] While most empirical studies have found positive productivity effects of alternative compensation schemes,' for many incentive schemes the evidence is still preliminary and a strong case that all forms of performance-based compensation improve productivity does not yet exist.

Alternative compensation schemes have experienced rapid growth in the United States, Great Britain, and Canada in recent years and are now offered by a significant number of firms.' In Canada, which is the focus of this study, labor compensation practices were radically transformed by the 1981-82 recession (Booth (1987)). Prior to that recession, most firms used general pay increases rather than merit pay or group incentive systems. Now, the "dominant" practice in a majority of firms is to use a merit-only system to determine the compensation of nonunion workers (Booth (1987)). The use of group incentive schemes has also increased. In 1986 bonuses and profit sharing on average represented

3.1% of total payroll costs for Canadian firms, compared to 1 7% in 1984. Employee share ownership in Canada has also experienced rapid growth, and by July 1986, 23% of firms listed on the Toronto Stock Exchange offered their employees share purchase plans (Toronto Stock Exchange (1987)). The Canadian experience is particularly interesting because the "phenomenal growth" of these plans was not supported by the sort of tax incentives available to some U.S. employee stock ownership plans (ESOPs) and to some British share ownership schemes.

The purpose of this paper is to investigate the determinants of the incidence among Canadian firms of four incentive schemes: employee share purchase plans, profit sharing, cash bonus plans, and productivity gainsharing. For each plan, we use a sample of private sector Canadian firms to estimate probit equations for the probability that the firm offers its non-managerial workers the plan. In addition, we estimate separate probit equations for the firm's production workers. Finally, bivariate probit models are estimated to examine the joint probability that a firm offers its workers both a share purchase plan and a cash-based incentive scheme. We focus on the relationship between union density and the incidence of the plan because it is widely believed that unions oppose group incentive schemes. (For example, see Smith (1988), Mitchell (1987), and Gregg and Machin (1988)). In addition to being the first econometric study of the determinants of the incidence of these plans in Canada, this paper advances existing work by investigating this issue for production workers alone as well as for all non-managerial employees and by examining the joint incidence of cash-based and share-based schemes.

The plan of this paper is as follows. In the next section, we review some past research on performance-based compensation schemes. Section 3 contains a description of the data upon which the subsequent empirical analysis is based. In the following section, we specify the univariate and bivariate probit models used to investigate the incidence of different types of schemes. We present our empirical results in section 5 and offer concluding comments in section 6.

2. PERFORMANCE-BASED COMPENSATION

There has been little rigorous theoretical work on the incidence of group incentive schemes to guide our empirical work. Although the theoretical literature for individual incentives is considerably richer, its main relevance of our study is to suggest conditions under which a group incentive scheme might be adopted rather than an individual incentive scheme. We begin by outlining a framework to explain the firm's choice of compensation scheme and conclude this section with a review of some empirical work.

The decision of a firm to offer one or more performance-based compensation schemes can be viewed as the outcome of an explicit or implicit bargain between the firm and its employees or their union representatives. (For example, see Cable (1988) for a brief overview that includes an extension of this framework to include the degree of worker participation in decision making as well as the form of compensation.) The outcome of the bargain will reflect the objectives of employers and workers (or the union), the effects of the schemes on the economic performance of the firm and on the utility of its workers,

and the relative bargaining strength of the firm and its workers (or their collective voice -- the union). This sort of framework suggests that firm characteristics (e.g., the nature of the production process), worker characteristics (e.g., their skill levels) along with a measure of the relative strength of the firm and its workers would determine the probability that the firm offers its workers a performance-based compensation scheme.

The most often cited benefit to a firm for choosing a performance-based compensation scheme is that productivity will be enhanced. The reasons offered for a positive productivity effect are varied. They include: lower absenteeism and labor turnover, greater investment in firm-specific human capital, more individual effort, greater teamwork among workers, and a cooperative rather than adversarial relationship between workers and management. However, critics argue that group schemes will not induce greater effort unless the group is very small because each worker has an incentive to free ride.[4] Additionally, both individual and group incentives schemes impose costs on the firm that may outweigh the benefits from higher productivity. For example, both individual piece rates and merit pay involve monitoring costs (Brown (1989)). Group incentives such as profit sharing and productivity gainsharing require the firm to persuade its workers that the performance measure is fair and has not been tampered with by the firm. Finally, by linking part of a worker's income to either the individual's performance or that of the firm, incentive schemes increase the variability of income that may require the firm to pay a "compensating differential" (Seiler (1984)).

For those firms that decide to adopt performance-based compensation, there is also the choice of which scheme or schemes to use. For example, group incentives might be a substitute for individual incentives. In particular, group incentives such as profit sharing and productivity gainsharing might be used in place of an individual incentive when the cost of monitoring each worker's output is too high.

Empirical evidence on the incidence of performance-based compensation has yielded some conflicting results, including the effect of unionization. Gregg and Machin(1988) investigated the relationship between unionization and share ownership, profit sharing, and value added sharing in British establishments. Separate probit equations were estimated for each type of scheme. They found that unionization increases the probability of the establishment having profit sharing or share ownership, while reducing the probability of value added sharing. However, the positive effect on the probability of profit sharing and share ownership is smaller if the union is strong (proxied by whether some members are in a closed shop). In addition, the authors found that share ownership is largely determined by firm variables, while value added sharing is largely explained by establishment variables. Both types of variables explained profit sharing.

In a study of the effects of newly organized unions on labor practices and compensation, Freeman and Kleiner (1988), using a logit model, found that union organizing drives decreased the probability of an establishment offering its workers profit sharing. However, this effect was not significant for any of their measures of the outcome of the organization drive -- a union contract, a union victory in a NLRB

election without a contract, or a NLRB election defeat.

Conte and Svejnar (1989) use an unbalanced panel of 64 U.S. firms to estimate probit models to explain the incidence of profit sharing and both tax deduction and tax credit ESOPs. Unionized firms were less likely to offer tax deduction ESOPs and profit sharing plans; the effect of unionization on the incidence of tax credit ESOPs was insignificant. All three plans were inversely related to financial performance of the firm. Firm size increased the probability of a firm offering one of the ESOPs, while a low capital-labor ratio and high average pay (proxied by the industry average) increased the incidence of profit sharing.

Evidence on the incidence of two individual incentives -- merit pay and piece rates -- is provided in Brown (1989). He estimated regression models to explain the proportion of production workers paid by individual incentives (predominately piece rates) and by standard time rates using a sample of 3169 U.S. establishments in ten manufacturing industries. Coverage of workers by a union increased the proportion of workers paid by standard rates at the expense of workers paid under a merit system, reflecting the opposition of unions to discretionary pay systems. The size of an establishment increased the use of both individual incentives and standard rates, which is consistent with Brown's monitoring cost hypothesis.

3. DATA

The data used in this study are based on three surveys of Canadian companies conducted by a private research organization in the summers of 1985, 1986, and 1987. Our sample consists of 477 private sector firms'

-- 313 firms participated in the 1987 survey; the remaining 164 firms are from the 1986 survey.[6] None of these 164 firms participated in the 1987 survey. Although some of the 313 firms from the 1987 survey are repeats from the previous year's survey, we excluded the 1986 observations on these firms because two observations on the same firm are probably correlated, which would invalidate some of our statistical results.'

While the surveys lack information on characteristics of the firm's labor force such as education and skill levels, an important advantage of the data is that, most unusually, eligibility for performance-based compensation is reported separately by employee group (i.e., executives, managers and professionals, technical and supervisory, clerical and support, and production workers).[8] Our empirical work was confined to technical, supervisory, clerical, support, and production workers because these are the workers that most analysts of alternative compensation schemes seem to have in mind,

Moreover, five different performance-based compensation schemes were included in the surveys. One, stock options/stock grants, was largely limited to executives, managers and professionals, and consequently, was not investigated in this study. For each scheme, firms reported which employee groups were <u>eligible</u> for that scheme or if they plan to introduce the scheme soon. Since the 1986 survey did not distinguish between plans in existence and those that were to be implemented, a firm (from either survey) was considered to have a plan in either case.

To complement the information on features of the plans in the surveys, we will summarize some findings on performance-based compensation in Canadian companies reported by Booth (1987).[9] Profit sharing, cash bonuses, and productivity gainsharing are predominately cash-based schemes;" share purchase plans are, of course, share-based. The vast majority of firms that have either profit sharing or share purchase plans make all employees in an employee group eligible whenever the plan is offered to some members of that group. Universal eligibility is less common for productivity gainsharing (especially among production workers) and cash bonuses. Finally, share Purchase plans, profit sharing, and productivity gainsharing are incentive plans based on the performance of a group (e.g., company or production unit). Cash bonus plans may include an individual's performance as one of the performance measures and, therefore, may be more of an individual rather than a group incentive. But the surveys that were used in our study explicitly defined cash bonus plans to exclude merit and regular pay increases, and therefore, it is reasonable to assume that most of the cash bonus schemes in our study do have a group incentive component.

The degree to which eligibility within an employee group is universal is important because our unit of observation is the firm rather than the establishment. The relative widespread eligibility for both share ownership and profit sharing is consistent with the decision to offer these plans being made at the firm rather than at the establishment level." This suggests that the firm is perhaps the appropriate unit of analysis for these schemes,[12] and moreover, the use of establishment data that contains multiple establishments from the

same company might pose econometric problems arising from both the correlation of observations from the same firm and the omission of firm characteristics.[13]

Table 1 contains summary statistics for the variables used to estimate our probit models. (Detailed descriptions of the variables are given in the appendix.) Since small firms[14] are underrepresented in the sample, the summary statistics should not be interpreted as estimates of the corresponding parameters for the population of Canadian firms. (Most important, we are not aware of reasons why disproportionate sampling of larger firms should bias the probit estimates reported below.) Eligibility for employee share purchase plans (SP), profit sharing (PS), cash bonuses (CB), and productivity gainsharing (PG) is given for "non-managerial" employees (i.e., excluding executives, managers, and professionals) and for production workers separately (SP.PR, PS.PR, CB.PR, and PG.PR). We also report separate descriptive statistics for firms with and without a share purchase plan for its non-managerial workers and for firms with and without one of the three predominately cash-based plans (CASH1) for these workers.

Table 1 reveals a number of interesting characteristics of our sample of firms, First, eligibility for employee share purchase plans is quite prevalent; these plans are offered to workers at 37% of the firms. The incidence of profit sharing and cash bonuses is much more modest, while productivity gainsharing schemes are available at only 6% of the firms in our sample. Second, as expected, production workers are often not eligible for employee share ownership, profit sharing, and cash bonus plans even when these plans are available to technical,

supervisory, clerical or support workers. In contrast, productivity gainsharing is primarily aimed at production workers. The disaggregated data given in the last four columns indicate that firms that offer either a share-based or a cash-based plan differ from firms that do not have that type of plan. For example, firms that offer their non-managerial workers a share purchase plan are on average larger and less unionized. Firms that offer their non-managerial workers one of the three cash-based plans are on average smaller and less unionized.

In Table 2 we report summary information on the joint incidence of the four plans. (Additional descriptive measures are given in Table 8.) Most firms offer (some of) their non-managerial employees at least one of the four incentive plans. Multiple plans are offered to these workers at 16% of the firms. In light of the incidence of the individual plans, it is not surprising that the joint incidence of plans is lower for production workers than for other non-managerial workers.

4. EMPIRICAL SPECIFICATION

Since our dependent variables are dichotomous, we specify probit models for each of the four performance-based compensation schemes studied in the paper.[15] These models specify the probability that some non-managerial employees (or alternatively production workers) are eligible for the plan to be a function of a vector of firm characteristics. Specifically, let Y_{ij} be a binary variable that assumes the value of 1 if the i^{th} firm offers the j^{th} scheme, j = SP, PS, CB, and PG (or analogously for production workers). Thus, we assume for the i^{th} firm that

$$Pr(Y_{ij} = 1) = F(x_i'\beta_j) \qquad j=SP,PS,CB,PG \qquad (1)$$

where x_i' is a vector of explanatory variables; β_j is a vector of unknown coefficients, which are specific to the j^{th} scheme; and $F(.)$ is the standard normal cumulative distribution function. The interpretation of each of these probit equations is that it gives the marginal probability of the firm offering the scheme.

The probit specification implies that the (marginal) effect of the k^{th} explanatory variable, x_k, on the probability that the scheme will be offered is given by

$$\partial Pr(Y=1)/\partial x_k = f(x'\beta)*\beta_k \qquad (2)$$

where $f(.)$ is the density function of a standard normal variable and where we have suppressed the subscripts i and j to simplify the notation. One implication of (2) is that the β_k's only indicate the sign of the effect of the corresponding variable on the probability of the scheme. In addition, (2) implies that comparisons of coefficients either across specifications (choices of x) or across models of different schemes can give misleading results.

To examine the determinants of the joint probability that two schemes are simultaneously offered, we specify bivariate probit models. The bivariate probit specification is given by

$$Pr(Y_{ij} = 1 \text{ and } Y_{ih} = 1) = G(x_i'\beta_j, x_i'\beta_h, \rho) \qquad (3)$$

where G is the bivariate standard normal distribution function with correlation coefficient ρ.[16] Given that the marginal probabilities of Y_j and Y_h are specified by (1), the joint probability given by (3) is sufficient to determine the remaining three joint probabilities. The unknown coefficients, β_j and β_h, are the same as the corresponding coefficients in the univariate probit specifications given by (1). In general, this implies that estimating the bivariate probit models would yield estimators that are more (asymptotically) efficient than those obtainable by estimating the two univariate probit equations. However, when ρ is close to zero the univariate probit estimators of β_j and β_h are likely to be better than the bivariate probit estimators.

Since' it is computationally infeasible to estimate multivariate probit models that are more complicated that the bivariate model, we will focus on three sets of bivariate relationships.[17] One will be the joint probability of share ownership and profit sharing schemes. The other two involve aggregating the predominately cash-based schemes into one scheme and investigating the joint probability of the cash-based aggregate and the share ownership plan. Two alternative aggregates are used: CASH1 which aggregates all three cash-based plans and CASH2 which includes just profit sharing and cash bonuses.

For each scheme and for each type of worker (all non-managerial workers and production workers) we estimate four specifications. These specifications will allow us to explore alternative hypotheses as well as to *use* the maximum number of available observations to estimate each model. In choosing the explanatory variables we draw upon previous

empirical work, the information available in the surveys, and our theoretical preconceptions. The variables common to all specifications are union density (UNION), two measures of size (LN(LABOR) and NATION), BENEFIT, the capital-labor ratio (KLRATIO), and industry dummy variables. Since our data on assets for firms in the finance, insurance, and real estate industries (FIN) are not comparable to the asset data for the other firms in our sample, we imposed the constraint that the coefficient on KLRATIO is zero for FIN industry firms and included the FIN dummy variable to pick up some of the effects of the capital intensity of the industry. We also include dummy variables indicating if the firm is primarily in a manufacturing industry (MANUF) or in a service industry (SERV). The coefficients on these dummy variables are to be interpreted relative to firms in the OTHER industry. Since finance industry firms are part of the service industry, the coefficient on FIN indicates how FIN industry firms differ from other service industry firms as well as the effect of the firms' capital intensities.

Since unions are believed to oppose performance-based compensation, we expect that the coefficient on UNION will be negative. (However, as we noted above, the empirical evidence on this hypothesis is mixed.) An additional reason to expect this is that firms with low union density might offer these plans to discourage the growth of unionization. As Fiorito, Lowman, and Nelson (1987) argue, firms often adopt human resource policies as a substitute for unionization rather than attempt to suppress unions. Moreover, Kochan, McKersie, and Chalykoff (1986), claim that a firm is more likely to engage in union avoidance strategies

when it is not highly unionized.

There are three reasons to presume that the effect of firm size on the incidence of the group incentive plans to be positive. First, fixed administrative costs can be spread over more workers in larger firms.[18] Second, share ownership (and to a lesser extent other group incentives) might be a tool to engender company loyalty in large firms (Gregg and Machin (1988)). Finally, large firms and, perhaps more important, large establishments might substitute group incentives for a merit pay system when the cost of monitoring the individual worker is high. To help separate the effects of firm size and establishment size, we will use NATION in conjunction with firm employment to provide a crude measure of the average size of the firm's establishments. Specifically, we will assume that for a given level of firm employment, on average a national employer has smaller establishments than other firms.

The effects of the remaining variables are in general ambiguous. To the extent that KLRATIO represents machine-paced production methods, one might expect that both individual and group incentives are less important. However, as Brown (1989) discusses, this is one of a number of features of the firm's production process captured by a measure such as KLRATIO. BENEFIT is a crude proxy for the level of compensation and various worker characteristics. As a measure of compensation, it should have a positive effect on the incidence of performance-based pay if risk aversion declines with income. As a proxy for average worker skill level, it is not clear what sign should be expected.

In an attempt to improve upon BENEFIT as a measure of compensation, we augmented the first specification with SAL.[19] Unfortunately, salary

data are unavailable for many of the firms in the sample, and consequently, the addition of SAL reduces the *number* of observations available to estimate the probit equations Also, one might expect a potential simultaneity problem arising from SAL being reduced because of incentive payments: higher total compensation, but lower salaries. In practice, this may not be a serious problem because Booth (1987) reported that in her sample of firms the average incentive and bonus payments for non-managerial employees was 4% of compensation.

The third specification adds to the first model three measures of the state of the firm's labor relations (broadly defined) -- LABREL, TURNOVER, and PERFORM. Firms might view performance-based compensation as a remedy for unsatisfactory labor relations, high turnover, or unsatisfactory performance. Thus, one might expect positive coefficients on LABREL and TURNOVER and a negative coefficient on PERFORM. Alternatively, as indicated by the results of a survey of British employers on their employee share purchase schemes reported in Dewe, Dunn, and Richardson (1988), managers might introduce performance-based compensation schemes to reward good <u>past</u> performance, implying that the expected signs of the coefficients are opposite to those specified above. A second reason to expect that good labor relations will promote the adoption of these schemes is that their potential productivity effects are more likely to be realized in a cooperative rather than adversarial setting." Since the free rider problem of group incentive schemes is often diminished in a repeated game model, low turnover may increase the probability of adoption. In addition, low turnover should promote the greater use by employees of

employee share purchase schemes, and therefore, encourage its adoption. Since firms with union-management conflicts might be more likely to identify labor relations as a top priority, LABREL also serves as a second measure of union strength. Finally, it should be noted that insofar as these schemes lower turnover and improve labor relations and performance, there is a potential simultaneity problem.[21] Thus one should view the results of the specifications augmented with the labor relations variables with some caution.

The fourth and final specification is obtained from the third by adding SAL. As before, this reduces the number of observations available to estimate the probit models.

5. EMPIRICAL RESULTS

We begin with the maximum likelihood estimates of the univariate probit models, which are reported in Tables 3-6.[22] Our discussion of the determinants of the individual schemes are based on these results rather than the coefficient estimates of the bivariate probit models because we were never able to reject the hypothesis that $\rho = 0$ when the bivariate model was specified for two of the individual schemes.*' In Table 7, we report the effect of the union density variable on the probability that each performance-based compensation scheme is offered for each model. These probability effects are computed two ways. First, $\partial Pr/\partial UNION$, which is computed from (2) where the density function is evaluated at the mean values of the explanatory variables and β is replaced by its estimate. This strictly holds only for marginal changes in UNION. Consequently, we report a second measure, ΔPr, which is computed from

(1) by replacing β by its estimate and evaluating the expression first at the mean values of the explanatory variables and then at mean values of all variables except UNION which is set to zero. ΔPr is the difference of the two expressions.[24] All references in the text to probability effects refer to this second measure.

Two general conclusions emerge from Tables 3-6. First, different schemes appear to be affected by the factors under investigation in different ways. In particular, the sign and significance of the union density variable varies across schemes. In addition, the explanatory power of the model as measured by the model χ^2 statistic varies considerably across schemes." Second, the results for production workers alone often differs from the corresponding results for all non-managerial employees. If this finding generalizes to other data sets, one should be cautious in how one interprets the results of probit (or logit) estimates that aggregate all workers into one broad class such as non-managerial workers if one's interest is in a narrower group of workers.

We begin our discussion of the individual schemes with employee share purchase plans (Table 3). We find that union density has a negative and significant effect on the probability that the firm will offer the scheme to some of its non-managerial workers or to some of its production workers. Moreover, the estimated probability effect is fairly substantial (Table 7). If union density were to rise from zero to its sample mean, the probability of a share purchase plan is estimated to decrease by 8% to 18% for all non-managerial workers and by 9% to 15% for production workers.

Union density appears to be only one of the factors determining the incidence of share purchase plans. The size of the firm (proxied by LN(LABOR)) has a positive and significant effect in all eight probit equations. Given the administrative costs of the plan (Toronto Stock Exchange (1987)), this is not an unexpected finding. BENEFIT is positive and often significant at least at the 10% level; while SAL is uniformly insignificant.[26] For SP, KLRATIO is positive and significant in two of the four models; it is never significant when SP.PR is the dependent variable. The coefficients on the labor relations variables often enter with incorrect signs if these plans are viewed as remedies to less than acceptable labor relations. None of these coefficients is significant at the 10% level. Moreover, likelihood ratio tests for the joint significance of all three labor relations variables do not reject the null hypothesis for either dependent variable in any instance.[27]

The estimated probit models for profit sharing (Table 4) tell a different story than those for share purchase plans. If we consider the results for non-managerial employees when the labor relations variables are omitted, we find that none of the explanatory variables other than the industry dummy variables is individually significant and that a test of their joint significance does not reject the null hypothesis.[28] In particular, union density is not significant at conventional levels. However, the estimated probability effects are modest. When we augment the model with the three labor relations variables, the coefficients on TURNOVER and PERFORM are each significant at least at the 10% significance level when SAL is omitted. (In addition, they are jointly significant at the 10% level.)[29] However, the signs of the coefficients

on the three labor relations variables do not tell a consistent story. The coefficients on LABREL and TURNOVER are consistent with an explanation of profit sharing as a remedy for poor labor relations, while the coefficient on PERFORM suggests that profit sharing is introduced to reward the firm's workers if they are performing well.

A different picture emerges when we study the incidence of profit sharing among production workers (PS.PR) separately. In all four specifications, union density has a negative and significant effect on the probability that some production workers will have profit sharing. However, the magnitudes of the probability effects are fairly large relative to the proportion of firms that offer their production workers profit sharing (Table 7); if union density rises from 0 to its sample mean, the probability of adopting profit sharing decreases by 4.7% to 7.2% depending upon the specification. Among the remaining controls NATION, BENEFIT, KLRATIO, and PERFORM are often significant.[30] Again PERFORM has a positive coefficient, thereby suggesting that profit sharing is a reward for good performance. The coefficient on NATION is consistent with the hypothesis that larger establishments will substitute profit sharing for merit pay.

The results for cash bonuses are given in Table 5. The model χ^2 statistics are significant at the 10% level in only three of the eight cases. This may reflect that our unit of observation is the firm and that the decision to offer these bonuses are often made at the establishment level. Union density is not significant in any specification when the dependent variable is for non-managerial employees (CB). In fact, the point estimate is positive in the last

model. However, it is significant when we estimate the model for production workers and exclude SAL.[31] All probability effects of union density variables are small or modest. The probability of a cash bonus plan is inversely related to the size of the firm (LN(LABOR)) and this effect is significant when CB is the dependent variable. Since cash bonus may have an individual incentive component (see above), this inverse relationship may be consistent with the monitoring hypothesis for merit pay. The performance variables are neither individually nor collectively significant when CB is the dependent variable. For production workers, TURNOVER is the one significant labor relations variable; its coefficient is negative in both specifications.

The productivity gainsharing results are the least satisfactory (Table 6). Since only two firms in the service industry had gainsharing, we were able to estimate probit equations only for the subsample of firms excluding those in the service industry. The model χ^2 statistics are low and the null hypothesis of joint significance of the explanatory variables is never rejected in any case. Since the probit results are based on a sample in which at most 16 firms had productivity gainsharing plans, one cannot expect precise estimates of its determinants. In addition, the use of firm data rather than establishment data may be inappropriate here. Unlike most previous results, union density has a positive effect in three cases. However, it is significant only in the first model. The magnitude of the probability effect is small (Table 7). For the sort of exercise examined for the other schemes, the probability effect ranges between virtually *zero* and 2.8%.

Table 8 summarizes some of our findings from estimating bivariate probit models. First, the correlation coefficient, ρ, is significant only when the broadly defined cash-based aggregate (CASH1) is used and only for production workers.[32] This implies that in the other cases the joint probability of the cash-based and the share-based schemes is simply the product of the respective marginal probabilities. More precisely, a zero correlation coefficient implies that Y_j^* and Y_h^* (which are defined in footnote 16) are independently distributed random variables.

A second result that emerges from Table 8 is that the effect of unionization on the joint probability of the share-based and the cash-based schemes is fairly substantial relative to the modest actual joint incidence of these schemes. This probability effect, which is given by Δ_{Jt} Pr in Table 8, is computed from (3) by replacing β_j, β_h, and ρ by their estimates and evaluating the expression first at the mean values of the explanatory variables and then at mean values of all variables except UNION which is set to zero. Δ_{Jt} Pr is the difference of the two expressions.

6. SUMMARY AND CONCLUSION

This paper presents results on the determinants of the incidence of four performance-based compensation schemes -- employee share purchase plans, profit sharing, cash bonuses, and productivity gainsharing -- using a sample of private sector Canadian firms. We find that the determinants of the probability that a firm would offer a scheme differed across schemes, and for a given scheme, often differed for the

broad class of non-managerial workers and for production workers alone. Thus, aggregation across different employee groups might yield misleading results if one is interested in production workers.

Our primary focus is on the effect of unionization on the incidence of the schemes. This reflects the widespread notion that unions oppose these sorts of performance based compensation plans. Except for productivity gainsharing and one instance of cash bonuses, we find that the effect of union density was negative as expected and often significantly so. The estimated probability effect is large for employee share purchase plans and profit sharing for production workers. In addition, unionization has a fairly substantial effect on the joint probability of the firm offering both a share-based and a cash-based incentive plan. Finally, we find some support for the notion that firms adopt these policies to reward past performance.

APPENDIX

TABLE A1. Definitions of Variables

SP = employee share purchase plan dummy variable. (SP = 1 if some non-managerial employees are eligible to participate in the plan.)*

PS = profit sharing dummy variable. (PS = 1 if some non-managerial employees are eligible to participate in the plan.)*

CB = annual cash bonus (excluding merit and regular increases) dummy variable. (CB = 1 if some non-managerial employees are eligible to participate in the plan.) *

PG = productivity gainsharing dummy variable. (PG = 1 if some non-managerial employees are eligible to participate in the plan.)*

CASH1 = cash-based (broadly defined) dummy variable. (CASH1 = 1 if some non-managerial employees are eligible to participate in one of the three predominately cash-based plans -- profit sharing, annual cash bonus, or productivity gainsharing.) *

CASH2 = cash-based (narrowly defined) dummy variable. (CASH2 = 1 if some non-managerial employees are eligible to participate in either a profit sharing or an annual cash bonus plan.)*

SP.PR= employee share purchase plan for production workers dummy variable. (SP.PR = 1 if some production workers are eligible to participate in the plan.)*

PS.PR= profit sharing for production workers dummy variable. (PS.PR = 1 if some production workers are eligible to participate in the plan.) *

CB.PR= annual cash bonus (excluding merit and regular increases) for production workers dummy variable. (CB.PR = 1 if some production workers are eligible to participate in the plan.)*

PG.PR= productivity gainsharing dummy variable. (PG.PR = 1 if some production workers are eligible to participate in the plan.)*

CASH1.PR = cash-based (broadly defined) for production workers dummy variable. (CASH1.PR = 1 if some production workers are eligible to participate in one of the three predominately cash-based plans -- profit sharing, annual cash bonus, or productivity gainsharing.)*

CASH2.PR = cash-based (narrowly defined) for production workers

dummy variable. (CASH2.PR = 1 if some production workers are eligible to participate in either a profit sharing or an annual cash bonus plan.)*

MANUF = manufacturing industry dummy variable (MANUF = 1 if the firm is primarily engaged in manufacturing).

SERV = service industry dummy variable (SERV = 1 if the firm is primarily engaged in a service industry).

FIN = finance industry dummy variable (FIN = 1 if the firm is primarily engaged in finance, insurance, or real estate).

OTHER = other industries dummy variables (OTHER = 1 if the firm is primarily engaged in industries, such as agriculture, logging, or forestry, fishing, mining, transportation, construction, communication, telecommunication, or public utilities).

UNION = union density = (i.e., proportion of workers who are unionized) .*

LABOR= total employment (full and part-time workers) .*

NATION = national employer dummy variable (NATION = 1 if the firm is a national rather than a regional or provincial employer.)

BENEFIT = total benefit costs as a percentage of gross annual payroll.*

SAL = simple average of the average salary of (non-unionized) technical and supervisory workers and the average salary of (non-unionized) clerical and support workers in thousands of 1987 dollars.

KLRATIO = capital-labor ratio (total assets/labor) in millions of 1987 dollars per worker.*

LABREL = a labor relations dummy variable (LABREL = 1 if the firm identified labor relations as one of its top four human resource management priorities in 1987 or top three in 1986. There are 24 possible areas that could be selected in 1987 and 26 in 1986 including those related to compensation and benefits.)

TURNOVER = voluntary turnover rate (percent) .*

PERFORM = average performance of workers. (On the basis of a five level performance rating scale, the firm identified the proportion of its employees at each level. PERFORM is a weighted average of the firm's ratings. Note: 3 = satisfactory performance.)*

Notes: 1. For variables marked by an asterisk, when data were missing for 1987 or 1986, 1986 or 1985 data were used if available.
2. Non-managerial employees = technical, supervisory, clerical, staff, or production workers. (It excludes executives, managers, and professionals.)
3. A firm was considered to have a plan for a given type of worker if either that plan were available to those workers or if the firm was going to introduce the plan for those workers soon.
4. CASH1 was coded as 1 if either PS, CB, or PG were equal to 1. It was coded as 0 if PS = CB = PG = 0. In all other cases it was coded as missing. (CASH1.PR was coded in an analogous fashion.1
5. CASH2 was coded as 1 if either PS or CB were equal to 1. It was coded as 0 if PS = CB = 0. In all other cases it was coded as missing. (CASH2.PR was coded in an analogous fashion.)
6. All nominal variables for 1986 were converted to 1987 Canadian dollars using an index of industry selling prices. (Source: International Monetary Fund, International Financial Statistics, February, 1989.)
7. If salary data for an employee group were missing for 1987, data on 1988 planned compensation or data on 1987 planned compensation (from the 1986 survey) for that group were used as follows. When available, anticipated average 1988 base salary was deflated by the anticipated midpoint of the range of salary increases. If this data were missing, data from the 1986 survey on anticipated average 1987 salary were used.
8. If salary data for an employee group were missing for 1986, then data on anticipated 1987 average salary for that group were used.

FOOTNOTES

'Interest in profit sharing has also been stimulated by the work of Weitzman (e.g., 1984 and 1986), who argued that if profit sharing were widely adopted, the economy would exhibit a smaller employment response to aggregate demand and supply shocks.

[2]See Estrin, Grout and Wadhwani (1987), Weitzman and Kruse (1989), or Jones and Pliskin (1989) for surveys.

[3]For U.S. employee stock ownership plans (ESOPs), see Conte and Svejnar (1989); for British profit sharing, value added bonus plans, and share ownership schemes, see Blanchflower and Oswald (1988).

[4]For a contrasting view that emphasizes the role of peer group pressure to overcome the incentive to shirk, see Fitzroy and Kraft (1986,1987).

[5]The econometric results reported in Tables 3-8 are based on fewer firms because data are missing on some variables.

[6]Firms that appeared only in the 1985 survey were dropped because that survey did not include information on firms' assets which was needed to construct capital-labor ratios. Data from the 1985 survey were used for firms in the 1986 and 1987 surveys if 1987 or 1986 data were missing for certain variables.

'Our panel would be too short to estimate the panel data models described in Maddala (1987) or Amemiya (1985).

'Unfortunately many of the firm characteristics (e.g., employment and turnover) are not reported separately by employee groups.

'This study was based on a survey that was completed by 157 organizations that were selected because they were believed to have one or more incentive plans. Although the sample in the Booth study was not random, it is not obvious that characteristics of the plans in this sample would differ materially from those of the firms in our sample.

[10]The form of payments for both cash bonus and productivity gainsharing plans were exclusively cash-based, and in the vast majority of firms this payment was current rather than deferred. Of the firms with profit sharing, 92% were cash-based (62% were current and 1.5% were a combination of current and deferred payments); the remaining 8% paid workers their share of profits in the form of company stock.

[11]Since the median number of employees of the firms in Booth's sample was 2200 (the mean exceeded 5380 employees), many of these firms likely operate multiple establishments.

[12]Of course, this does not imply that average establishment characteristics are irrelevant to the firm's decision to offer one of the schemes.

[13]In contrast, the use of firm data to investigate cash bonuses and productivity gainsharing is more problematic.

[14]The median employment level is 1060 full and part-time workers.

[15]An alternative to probit is logit. Since the cumulative distribution functions underlying the probit and logit models are similar except at the tails of the distribution (Maddala (1983)), the two models typically yield similar results. Since some of our estimated probit models yielded for some observations estimated probabilities that were in the tail of the normal distribution, the choice between probit

and logit is potentially important. However, we found that for our main conclusions on the determinants of the incidence of the four schemes, the logit results did not differ from the probit results given in the paper.

[16]The relationship between the univariate probit equations (1) and the bivariate probit equation (3) can be best seen by assuming that there exist unobservable continuous variables Y_j^* and Y_h^* that measure the inclination of the firm to offer schemes j and h respectively. We observe $Y_j = 1$ if and only if $Y_j^* \geq 0$ and similarly for Y_h. Moreover, it is assumed that $Y_j^* = x'\beta_j + \varepsilon_j$ and $Y_h^* = x'\beta_h + \varepsilon_h$, where ε_j and ε_h are bivariate standard normal random variables with correlation coefficient ρ.

[17]The bivariate probit model involves double integrals: a higher order model involves at least triple integrals.

[18]For share purchase plans, see Toronto Stock Exchange (1987).

[19]The sample correlation between BENEFIT and SAL is only about .20, which suggests that the former is not a strong proxy for the latter.

[20]Poole (1988) found that financial participation by employees was greater if the firm had a "consultative" industrial relations style. We suspect that this sort of firm would be unlikely to have serious labor relations difficulties.

[21]Ideally, one would want to use the values of LABREL, TURNOVER, and PERFORM prior to the firm adopting the schemes or adjusted for the effects of the schemes by estimating a simultaneous equation model which includes equations for LABREL, TURNOVER, and PERFORM. Data are not available for the former, and it is not clear that we can specify

equations for LABREL, TURNOVER, and PERFORM so that we would have instrumental variables that can be used to correct for the simultaneity problem.

[22]For each scheme except productivity gainsharing, we have reported the results for both non-managerial employees and for production workers alone. We are unable to do so for productivity gainsharing because each firm that had complete data on the explanatory variables and that had a gainsharing plan, offered this plan to its production workers.

[23]An additional and clearly a secondary reason for us to prefer the univariate results is that missing data implies that the univariate probit models are estimated over (a few) more observations than the bivariate models. Given the insignificance of ρ, it is not surprising that we often obtained estimated standard errors for the bivariate probit models that were larger than the corresponding estimated standard errors for the univariate probit specifications.

[24]For both measures, we use the variable means for the sample used to estimate the model. Although these means differ slightly across models, the effects of these differences on the two measures is small.

[25]The model χ^2 statistic tests if all explanatory variables are jointly significant. The model χ^2 statistic corresponds to the widely reported F statistic of the conventional multiple regression model.

[26]When the probit equations were estimated over the subsample excluding service industry firms, the t statistic on the coefficient or BENEFIT typically rose. When we substituted the average salary of technical and supervisory workers for SAL in the equations for SP, we found that in the equation that omits the labor relations variables, the

coefficient on salary was significant at the 5% level. This was the only instance in both reported and unreported estimated models when a measure of salary was significant.

[27]For SP the χ^2 statistics are 1.58 and 3.56 and for SP.PR the statistics are 3.08 and 3.64. The critical values of the statistic with three degrees of freedom is 6.25 at the 10% significance level and 7.82 at the 5% level.

[28]The model χ^2 statistics are significant because of the industry dummies.

[29]The χ^2 statistic is 5.70 and the critical value with two degrees of freedom is 4.605 at the 10% level.

[30]In Table 4 BENEFIT is significant at the 10% level for two of the four models of PS.PR (i.e., the two that omit SAL). If the four specifications are estimated over the subsample that excludes firms in the service industry, BENEFIT is significant at the 10% level in all four cases and at the 5% level for the two that omit SAL.

[31]When the probit equations were estimated over the subsample excluding service industry firms, UNION became insignificant. In most specifications, LNLABOR was significant (at least at the 10% level).

[32]The correlation coefficient was also insignificant when we considered the joint probability of share ownership and cash bonus as well as the joint probability of profit sharing and cash bonuses. However, in some instances the estimated value of ρ was over .20.

TABLE 1. SUMMARY STATISTICS (BEANS AND STANDARD DEVIATIONS)

	All FIRES	SP = 0	SP = 1	CASH1 = 0	CASH1 = 1
SP	.37 (.48)	0 (0)	1 (0)	.36 (.48)	.37 (.48)
PS	.15 (.36)	.15 (.36)	.14 (.34)	0 (0)	.45 (.50)
CB	.20 (.40)	.20 (.40)	.18 (.39)	0 (0)	.59 (.49)
PG	.06 (.24)	.05 (.22)	.07 (.26)	0 (0)	.19 (.39)
SP.PR	.26 (.44)	0 (0)	.71 (.46)	.25 (.44)	.26 (.44)
PS.PR	.08 (.27)	.08 (.27)	.08 (.27)	0 (0)	.24 (.43)
CB.PR	.07 (.25)	.06 (.24)	.07 (.25)	0 (0)	.19 (.40)
PG.PR	.05 (.23)	.05 (.21)	.07 (.25)	0 (0)	.17 (.37)
MANUF	.56 (.50)	.55 (.50)	.57 (.50)	.59 (.49)	.53 (.50)
SERV	.29 (.45)	.31 (.46)	.26 (.44)	.25 (.43)	.34 (.48)
FIN	.14 (.34)	.14 (.35)	.14 (.34)	.13 (.34)	.13 (.33)
OTHER	.16 (.36)	.14 (.35)	.17 (.38)	.16 (.37)	.13 (.33)
UNION	.35 (.33)	.36 (.32)	.32 (.33)	.38 (.32)	.30 (.32)
LABOR	3169 (8217)	2463 (8363)	4602 (8227)	3581 (9418)	2231 (4704)
NATION	.67 (.47)	.64 (.48)	.70 (.46)	.66 (.47)	.66 (.48)
BENEFIT	24.7 (8.8)	24.1 (8.4)	25.5 (8.8)	24.6 (8.7)	24.6 (8.9)
SAL	29.7 (5.6)	29.0 (5.4)	30.9 (5.9)	29.8 (5.3)	29.8 (6.1)
RLRATIO	.61 (2.2)	.45 (1.8)	.69 (1.8)	.68 (2.4)	.53 (2.1)
LABREL	.28 (.45)	.29 (.46)	.25 (.43)	.29 (.46)	.27 (.44)
TURNOVER	8.6 (8.5)	9.0 (8.4)	7.8 (6.5)	8.2 (6.9)	8.8 (8.5)
PERFORM	3.2 (.24)	3.2 (.26)	3.2 (.22)	3.2 (.24)	3.2 (.26)
N_{max}	477	288	170	292	158

Notes: 1. All variables are defined in the Appendix.
2. N_{max} is the maximum number of firms used to compute the descriptive statistics. For some variables, the statistics are based on fewer observations because of missing data.
3. The figures for KLRATIO exclude firms in the finance, real estate, and insurance industries.

TABLE 2. Joint Incidence of Plans

Number of Plan types	Percentage of Firms: All Non-managerial Workers	Percentage of Firms: Production Workers
0	43%	64%
1	41	28
2	14	7
3	2	1
4	0	0

Note: Percentages are based on the 433 firms which had complete data on eligibility for all four types of plans.

TABLE 3. PROBIT ESTIHATES OF THE EMPLOYEE SHARE PURCHASE EQUATIONS

INDEPENDENT VARIABLE	SP	SP	SP	SP	SP.PR	SP.PR	SP.PR	SP.PR
CONSTANT	-2.61 (5.42)	-3.50 (4.64)	-3.86 (3.15)	-3.82 (2.48)	-2.23 (4.48)	-2.84 (3.73)	-2.87 (2.28)	-1.62 (1.03)
MANUF	.19 (.95)	.34 (1.32)	.16 (.71)	.21 (.75)	.23 (1.10)	.30 (1.13)	.13 (.58)	.15 (.54)
SERV	-.10 (.37)	.05 (.15)	-.15 (.45)	-.12 (.33)	-.36 (1.23)	-.29 (.80)	-.62 (1.71)	-.62 (1.51)
FIN	-.06 (.24)	-.05 (.17)	.05 (.19)	-.0005 (.001)	-.13 (.43)	-.23 (.64)	.18 (.52)	-.02 (.06)
UNION	-.62 (2.33)	-.99 (2.91)	-.81 (2.52)	-1.45 (3.55)	-.80 (2.90)	-1.20 (3.44)	-.81 (2.49)	-1.38 (3.32)
LN(LABOR)	.31 (5.59)	.28 (4.26)	.35 (5.48)	.39 (4.84)	.26 (4.68)	.27 (3.89)	.28 (4.27)	.35 (4.20)
NATION	.04 (.27)	.16 (.82)	.09 (.53)	.10 (.45)	-.26 (1.56)	-.21 (1.02)	-.25 (1.34)	-.38 (1.70)
BENEFIT	.01 (1.29)	.02 (2.29)	.02 (2.21)	.02 (2.12)	.007 (.78)	.02 (1.80)	.02 (1.82)	.02 (1.75)
SAL		.02 (1.18)		.004 (.21)		.008 (.46)		-.01 (.48)
KLRATIO	.09 (2.10)	.05 (.99)	.08 (1.98)	.05 (1.03)	.05 (1.27)	-.0002 (.003)	.05 (1.10)	.009 (.16)
LABREL			.02 (.11)	.17 (.70)			-.31 (1.41)	-.40 (1.49)
TURNOVER			-.01 (.87)	-.03 (1.51)			-.01 (.91)	-.02 (1.17)
PERFORM			.26 (.80)	.19 (.48)			.15 (.46)	-.21 (.49)
N	358	246	304	225	358	246	304	225
MEAN OF DEPENDENT VARIABLE	.40	.41	.41	.42	.28	.28	.28	.28
LOG OF TEE LIKELIHOOD FUNCTION	-219.17	-146.53	-180.83	-128.78	-194.74	-129.65	-158.16	-110.81
MODEL χ^2	44.17	40.05	50.14	48.24	36.51	34.52	42.05	45.20

NOTE: Figures in parentheses are the absolute values of the (asymptotic) t statistics.

TABLE 4. PROBIT ESTIMATES OF THE PROFIT SEARING EQUATIONS

INDEPENDENT VARIABLE	PS	PS	PS	PS	PS.PR	PS.PR	PS.PR	PS.PR
CONSTANT	-.52 (1.02)	-.26 (.35)	-3.12 (2.31)	-2.98 (1.73)	-.79 (1.22)	-1.07 (1.24)	-4.06 (2.49)	-4.15 (2.19)
MANUF	.35 (1.31)	.31 (1.00)	.33 (1.10)	.46 (1.31)	.67 (1.78)	.55 (1.35)	.41 (1.04)	.40 (.95)
SERV	.67 (2.10)	.67 (1.81)	.65 (1.76)	.69 (1.64)	.33 (.79)	.36 (.79)	.17 (.35)	.13 (.27)
FIN	-.a5 (2.92)	-1.12 (3.00)	-1.17 (3.47)	-1.35 (3.26)	-1.01 (2.59)	-.98 (2.33)	-1.10 (2.57)	-1.03 (2.29)
UNION	-.49 (1.55)	-.56 (1.47)	-.42 (1.10)	-.63 (1.38)	-1.33 (3.23)	-1.48 (3.13)	-1.65 (3.23)	-1.79 (3.19)
LN(LABOR)	-.04 (.72)	-.04 (.63)	-.02 (.28)	.01 (.17)	.09 (1.28)	.05 (.67)	.11 (1.41)	.09 (.98)
NATION	-.14 (.78)	-.15 (.69)	-.17 (.86)	-.16 (.69)	-.54 (2.39)	-.35 (1.37)	-.52 (2.03)	-.38 (1.36)
BENEFIT	-.01 (1.07)	-.006 (.51)	-.007 (.66)	-.002 (.15)	-.03 (2.25)	-.02 (1.27)	-.02 (1.76)	-.01 (.89)
SAL		-.ooa (.41)		-.01 (.66)		.01 (.65)		-.003 (.14)
KLRATIO	-.005 (.13)	.002 (.05)	-.02 (.53)	-.01 (.25)	-.93 (2.17)	-.91 (1.95)	-1.09 (2.33)	-1.06 (2.11)
LABREL			.17 (.70)	.23 (.81)			.30 (.98)	.23 (.68)
TURNOVER			.02 (1.71)	.02 (1.21)			-.ooa (.40)	-.009 (.43)
PERFORM			.69 (1.94)	.68 (1.47)			1.05 (2.36)	1.13 (2.17)
N	357	245	305	224	357	245	305	224
MEAN OF DEPENDENT VARIABLE	.16	.la	.16	.17	.09	.11	.09	.11
LOG OF THE LIKELIHOOD FUNCTION	-147.68	-105.16	-122.04	-93.17	-88.54	-72.65	-73.97	-63.95
MODEL x^2	la.17	17.29	24.77	20.79	33.66	24.70	34.52	28.83

NOTE : Figures in parentheses are the absolute values of the (asymptotic) t statistics.

TABLE 5. **PROBIT** ESTIMATES OF THE CASE BONUS EQUATIONS

INDEPENDENT VARIABLE	CB	CB	CB	CB	CB.PR	CB.PR	CB.PR	CB.PR
CONSTANT	-.47 (.94)	-.a7 (1.11)	.30 (.24)	-.a4 (.50)	-.19 (.27)	-.83 (.76)	-1.77 (.91)	-2.53 (.93)
MANUF	.09 (.38)	.10 (.36)	.22 (.79)	.27 (.83)	-.14 (.40)	-.09 (.22)	.06 (.13)	.26 (.48)
SERV	.37 (1.21)	.51 (1.40)	.71 (2.00)	.78 (1.90)	-.18 (.41)	-.31 (.56)	.53 (.95)	.63 1.83)
FIN	-.11 (.42)	-.36 (1.07)	-.25 (.89)	-.37 (1.05)	-.53 (1.23)	-.33 (.56)	-.76 (1.42)	-.45 (.66)
UNION	-.41 (1.31)	-.10 (.27)	-.27 (.75)	.25 (.57)	-.80 (1.65)	-.51 (.88)	-1.24 (2.13)	-.87 (1.25)
LN(LABOR)	-.12 (2.09,	-.15 (2.15)	-.12 (1.82)	-.17 (2.04)	-.23 (2.57)	-.26 (2.33)	-.16 (1.63)	-.16 (1.24)
NATION	.14 (.79)	.10 (.51)	.11 (.60)	.14 (.64)	.30 (1.11)	.15 (.46)	.49 (1.56)	.27 (.76)
BENEFIT	.01 (1.15)	.01 (1.10)	.01 (.96)	.02 (1.53)	.01 (1.03)	.01 (.88)	.03 (1.55)	.03 (1.42)
SAL		.02 (.95)		.03 (1.36)		.03 (1.03)		.009 (.29)
KLRATIO	.009 (.26)	.01 (.39)	.007 (.19)	.02 (.47)	-.12 (.91)	-.19 (.93)	-.17 (.90)	-.19 (.81)
LABREL			-.12 (.52)	-.12 (.46)			-.04 (.11)	-.05 (.11)
TURNOVER			-.01 (.85)	.01 (.81)			-.13 (3.15)	-.12 (2.16)
PERFORM			-.24 (.73)	-.21 (.50)			.46 (.92)	.49 (.74)
N	359	246	307	225	359	246	307	225
MEAN OF DEPENDENT VARIABLE	.19	.20	.20	.21	.05	.05	.06	.05
LOG OF THE LIKELIHOOD FUNCTION	-165.34	-119.04	-147.19	-110.59	-66.83	-45.63	-53.88	-38.65
MODEL χ^2	14.88	10.32	14.52	12.07	14.99	10.49	29.27	16.39

NOTE: **Figures** in parentheses are the absolute values of the (asymptotic) t statistics.

TABLE 6. PROBIT ESTIMATES OF THE PRODUCTIVITY GAINSHARING EQUATIONS

	PG	PG	PC	PC
CONSTANT	-3.26 (3.14)	-4.59 (2.961	-1.93 (.86)	-4.58 (1.51)
MANUF	.26 (.76)	.54 (1.12)	.40 (.96)	.68 (1.26)
SERV				
FIN				
UNION	.88 (1.78)	.24 (.40)	.49 (.85)	-.47 t.63)
LN(LABOR)	.10 (.95)	.13 (.96)	.13 (1.12)	.18 (1.22)
NATION	-.16 (.57)	.08 (.20)	-.29 (.91)	.04 (.10)
BENEFIT	.02 (1.19)	.04 (1.66)	.008 (.42)	.03 (1.12)
SAL		.02 (.68)		.03 (.77)
KLRATIO	-.15 (.53)	-.64 (.94)	-.22 (.63)	-.87 (.98)
LABREL			.36 (1.20)	.81 (2.04)
TURNOVER			-.003 (.07)	.03 (.86)
PERFORM			-.35 (.54)	-.17 (.20)
N	248	169	210	154
MEAN OF DEPENDENT VARIABLE	.07	.07	.07	.07
LOG OF THE LIKELIHOOD FUNCTION	-57.26	-38.33	-49.13	-32.82
MODEL x^2	9.41	9.96	9.81	13.63

NOTE: Figures in parentheses are the absolute values of the (asymptotic) t statistics.

TABLE 7. EFFECT OF UNION DENSITY ON THE PROBABILITY OF THE PLAN

Dependent Variable	Model	∂Pr/∂UNION	ΔPr
SP	1	-.24	-.078
SP	2	-.38	-.123
SP	3	-.31	-.097
SP	4	-.56	-.176
SP.PR	1	-.26	-.089
SP.PR	2	-.39	-.135
SP.PR	3	-.26	-.085
SP.PR	4	-.43	-.148
PS	1	-.11	-.040
PS	2	-.14	-.047
PS	3	-.09	-.031
PS	4	-.15	-.050
PS.PR	1	-.10	-.047
PS.PR	2	-.14	-.066
PS.PR	3	-.10	-.050
PS.PR	4	-.14	-.072
CB	1	-.11	-.036
CB	2	-.03	-.009
CB	3	-.07	-.023
CB	4	+.07	+.021
CB.PR	1	-.06	-.026
CB.PR	2	-.04	-.014
CB.PR	3	-.06	-.026
CB.PR	4	-.04	-.016
PG (PG.PR)	1	+.09	+.028
PG (PG.PR)	2	+.01	+.005
PG (PG.PR)	3	+.05	+.016
PG (PG.PR)	4	-.02	-.00a

Notes:

(1) The explanatory variables of model 1 are MANUF, SERV, FIN UNION, LN(LABOR), NATION, BENEFIT, and KLRATIO. The additional explanatory variables of models 2, 3, and 4 are: model 2-- SAL; model 3-- LABREL, TURNOVER, PERFORM; model 4-- SAL, LABREL, TURNOVER, PERFORM

(2) ∂Pr/∂UNION is computed from equation 2 of the text where the density function is evaluated at the mean values of the explanatory variables (for that specification) and the probit estimates are used in place of the unknown parameters.

(3) ΔPr is the estimated effect on the probability that the plan is offered when union density rises from zero to its sample mean. (See the text for details.)

TABLE 8. EFFECT OF UNION DENSITY ON THE JOINT PROBABILITY OF PLANS

PLAN#1	PLAN#2	MODEL	N	$\hat{\rho}$	$\hat{\beta}_1$	$\hat{\beta}_2$	Jt Pr	ΔJt Pr
SP	CASH1	1	345	-.02	-.62	-.19	.14	-.039
				(.17)	(2.35)	(.67)		
SP	CASH1	2	238	-.03	-1.02	-.16	.14	-.059
				(.30)	(2.97)	(.44)		
SP	CASH1	3	295	-.002	-.81	-.14	.15	-.045
				(.02)	(2.54)	(.41)		
SP	CASH1	4	218	-.06	-1.44	-.12	.15	-.077
				(.52)	(3.47)	(.28)		
SP.PR	CASH1.PR	1	344	.24	-.82	-.55	.07	-.037
				(2.15)	(3.03)	(1.66)		
SP.PR	CASH1.PR	2	237	.25	-1.30	-.90	.07	-.063
				(1.86)	(3.58)	(2.00)		
SP.PR	CASH1.PR	3	294	.24	-.84	-.94	.07	-.049
				(1.93)	(2.63)	(2.28)		
SP.PR	CASH1.PR	4	217	.23	-1.42	-1.25	.07	-.072
				(1.48)	(3.24)	(2.35)		
SP	CASH2	1	347	-.05	-.64	-.47	.11	-.050
				(.55)	(2.44)	(1.60)		
SP	CASH2	2	239	-.07	-1.03	-.29	.13	-.062
				(.60)	(2.98)	(.80)		
SP	CASH2	3	297	-.05	-.82	-.36	.12	-.053
				(.49)	(2.60)	(1.03)		
SP	CASH2	4	219	-.09	-1.44	-.19	.13	-.076
				(.72)	(3.48)	(.44)		
SP.PR	CASH2.PR	1	346	.10	-.81	-1.20	.04	-.045
				(.78)	(3.03)	(3.17)		
SP.PR	CASH2.PR	2	238	.11	-1.27	-1.25	.05	-.062
				(.75)	(3.53)	(2.59)		
SP.PR	CASH2.PR	3	296	.08	-.84	-1.53	.04	-.050
				(.54)	(2.67)	(3.21)		
SP.PR	CASH2.PR	4	218	.09	-1.42	-1.47	.05	-.068
				(.55)	(3.24)	(2.55)		
SP	PS	1	350	-.06	-.64	-.48	.06	-.029
				(.50)	(2.45)	(1.52)		
SP	PS	2	241	-.01	-1.02	-.52	.06	-.041
				(.51)	(3.03)	(1.26)		
SP	PS	3	298	-.04	-.82	-.41	.06	-.028
				(.27)	(2.62)	(1.02)		
SP	PS	4	220	-.08	-1.45	-.61	.06	-.053
				(.56)	(3.50)	(1.13)		
SP.PR	PS.PR	1	350	.12	-.80	-1.36	.03	-.026
				(.80)	(3.00)	(3.10)		
SP.PR	PS.PR	2	241	.10	-1.22	-1.53	.04	-.043
				(.58)	(3.44)	(2.71)		
SP.PR	PS.PR	3	298	.12	-.84	-1.63	.03	-.026
				(.69)	(2.68)	(2.60)		
SP.PR	PS.PR	4	220	.09	-1.42	-1.81	.04	-.045
				(.44)	(3.23)	(2.58)		

Notes to table 8:
(1) Figures in parentheses are the absolute values of the (asymptotic) t statistics.
(2) Yodels 1-4 are described in Note 1 of Table 7.
(3) $\hat{\beta}_1$ and $\hat{\beta}_2$ are the bivariate probit maximum likelihood estimates of the coefficients on UNION for plan #1 and plan #2 respectively.
(4) Jt Pr is the proportion of the firms in the sample used to estimate the bivariate probit model that offered both plans.
(5) ΔJt Pr is the estimated effect on the joint probability of both plans being offered when Union density rises from zero to its sample mean. (See the text for details.)

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