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Performance Measure Properties and the Effect of Incentive Contracts

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ABSTRACT: Using data from a third-party survey on compensation practices at 151 Dutch firms, we show that less noisy or distorted performance measures and higher cash bonuses are associated with improved employee selection and better-directed effort. Specifically, (1) an increase in the cash bonus increases the perceived selection effects of incentive contracts, but does not independently affect the perceived amount and direction of effort that employees deliver, and (2) performance measure properties directly impact both effort and the selection functioning of incentive contracts. These results hold after controlling for an array of incentive contract design characteristics and for differences in organizational context. Our estimation procedures address several known problems with using secondary datasets.

Keywords: *incentive pay; effort and selection effects; performance measure properties; cash bonus.*

JEL Classification: *J330; M520.*

Data Availability: *The data are from a proprietary source and cannot be shared without the owner's consent.*

INTRODUCTION

While the choice of which performance measures to use in incentive contracts is a key concern to management accountants, little is known empirically about how performance measure properties affect the functioning of incentive contracts. The issue is important, however, because merely adopting an incentive pay scheme may not be sufficient to achieve better organizational performance. Indeed, poor performance measures may make incentive contracts ineffective; alternatively, improving performance measures can help to achieve a given level of incentive effects at lower costs. Thus, the role of performance measures in incentive contracts must be understood before one may reasonably expect positive outcomes.

Agency models predict that when performance measures are less noisy and/or distorted, the equilibrium compensation plan is more incentive-intensive (more pay is offered per unit

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of measured performance) and thus the plan can be more effective in eliciting desired behavior from the agent (e.g., Feltham and Xie 1994). Empirical evidence for these predictions is mixed. On the one hand, empirical research, mostly on executive compensation, has provided considerable evidence that the adoption of incentive plans (presumably resulting in higher incentive intensity than salary-only compensation) is positively associated with firm performance, indicated by stock returns (Larcker 1983; Brickley et al. 1985; Tehranian and Waegelein 1985) or accounting measures (Leonard 1990; Banker et al. 1996; Banker et al. 2001). On the other hand, evidence on the relation between performance measure noise and actual incentive intensity is mixed (Prendergast 2002); and there is relatively little systematic evidence on the effects of performance measure noise or distortion on desired outcomes (e.g., performance), particularly at lower levels of the firm (see the reviews by Prendergast [1999] and Bushman and Smith [2001]).

Economic theory suggests that the beneficial effect of incentives on performance is due to two separate forces (Milgrom and Roberts 1992; Prendergast 1999; Bonner and Sprinkle 2002). First, incentive contracts motivate employees to exert effort in a way that is consistent with the objectives of the owners of the firm (*effort effect*). Second, these contracts can be structured so that more productive employees self-select into the firm (*selection effect*).

Much of the agency literature in accounting focuses on effort effects. Banker et al. (2001) observe that few studies examine the effect of pay-for-performance on the attraction and retention of high-performance employees below the level of chief executive. However, using data from a single retail firm, Banker et al. (2001) show that a performance-based compensation plan has a larger impact on the firm's performance through the selection than through the effort effect. These results suggest the importance of the selection effect, but much remains unknown: for example, how generalizable these results are, how important managers believe the selection effect is, and how selection effects vary with the quality of performance measurement.

In this paper, we use data from a third-party survey on compensation plans covering a relatively broad range of employees at 151 Dutch firms in a variety of industries. Our analysis of this data, using partial least squares, shows that when performance measures are less noisy and distorted, managers believe the incentive plans result in a positive selection effect and overall better employee performance. Higher maximum cash bonuses are also positively associated with the selection effect but have no independent association (other than through selection) with the overall performance effect of the incentive plans. Our results are robust to controlling for a number of variables that proxy for differences in incentive contract specifics and organizational context.

The paper is structured as follows. The next section reviews the literature on incentive contracts in relation to performance measurement properties and the size of cash bonus pay. We then describe our sample, variable measurement, and the econometric procedures used to estimate the model. Next, we report the results of the study and provide a discussion of our findings. We conclude with some final remarks and suggestions for future work.

DEVELOPMENT OF EMPIRICAL PREDICTIONS

A fundamental insight of agency theory and much of the empirical work on compensation practices is that the intensity of incentives (the magnitude of pay contingent on measured performance) is positively associated with employee contributions to firm performance (Milgrom and Roberts 1992; Milkovich and Newman 2002). However, the equilibrium level of incentive intensity depends on the properties of performance measures. In the following subsections we develop two sets of hypotheses. The first set is about the influence of performance measure properties on the effectiveness of incentive plans—an

influence assumed to occur because better performance measures results in higher incentive intensity. The second set directly addresses the influence of cash bonus magnitude (the imperfect but measurable proxy for incentive intensity) on the effectiveness of incentive plans.

Performance Measure Properties

Many authors point out that the design of incentive systems is ''intimately linked'' (Milkovich and Newman 2002) with the properties of performance measures (Waller and Chow 1985; Tsui et al. 1997; Bloom and Milkovich 1998; Bushman and Smith 2001). With respect to what constitutes the ideal nature of these properties, the literature has not yet achieved consensus. Some authors stress that performance measures need to be fair and equitable (Bretz et al. 1992; Foster and Ward 1994). Others highlight objectivity and accuracy as desirable properties (Waller and Chow 1985; Prendergast 2002; Gibbs et al. 2004), while still others hold that measures should be stable or reliable (Heneman 1986; Campbell 1990; Milkovich and Newman 2002).

Agency theory offers an elegant framework in which to investigate the influence of performance measurement properties on the efficacy of incentive contracts. Models based on agency theory suggest that it is through their effect on incentive intensity that performance measures impact the functioning of incentive contracts. Two properties are deemed to be important: (1) noise, and (2) distortion (Baker 2000, 2002). Imprecise (noisy) performance measures impose undesired risk on agents and reduce the efficacy of incentives (Holmstrom 1979; Banker and Datar 1989; Feltham and Xie 1994; Gibbons 1998; Indjejikian 1999). In addition, if management is unaware of the differences in noise level in multiple measures, they may overcompensate agents for some activities and undercompensate them for other activities. In sum, when measures are less noisy the costs of increasing incentive intensity will be lower since the risk imposed on agents is smaller.

Several recent papers draw attention to the possibility that performance measures are subject to distortion. Distortion in performance measures occurs when these measures incentivize managers to take actions that are not congruent with corporate goals (Hopwood 1974; Baker 2000; Bushman et al. 2000; Baker 2002). Thus, when measures are distorted, it might be best to ''mute'' incentives instead of rewarding measured performance (Holmstrom and Milgrom 1991). Indeed, reducing incentive intensity mitigates the risk that agents provide misdirected effort in response to a given set of incentives.

While noise and distortion are separate properties in principle, they have similar effects on the efficacy of performance measures.[1] Both noise and distortion are expected to result in lower-powered (less intense) incentives in equilibrium, and low-powered incentives are expected to elicit relatively low levels of effort. Noise and distortion also have selection effects, because employees care about the way their performance is measured. Foster and Ward (1994) argue that the properties of the performance measurement system are likely to affect the composition of the workforce. Waller and Chow (1985) show experimentally that more skilled employees prefer to work under more incentive-intensive contracts, and the correlation between contract choice and skill is stronger when the performance measure is less noisy (see also Shields and Waller 1988). Prospective employees form expectations

[1] We analyze the properties of performance measures on an aggregated level. In cases in which a firm uses multiple measures, we study the ''grand'' properties of the complete set of performance measures used in an incentive contract. In other words, we refer to the noise and distortion in all performance measures together. Note that while noise and distortion are both undesirable performance measurement properties, they are unlikely to move together. In fact, most theoretical studies (e.g., Baker 2000) suggest that there is a tradeoff between noise and distortion.

about how well their effort will be reflected in performance measures and base their decision to join the firm on these expectations (Milgrom and Roberts 1992). Other things equal, more skilled employees, who believe they can earn high performance-dependent pay, are more likely to join an incentive-intensive firm than low-skilled employees are, especially if they believe that the performance measures will accurately capture their contributions to the firm.

More formally, we hypothesize the following relations between performance measure properties and the effort and selection effects of incentive contacts, stated in alternative form.

Hypothesis 1a: There is a negative relation between the amount of noise and/or distortion in performance measures and the *effort* effect of incentive contracts.

Hypothesis 1b: There is a negative relation between the amount of noise and/or distortion in performance measures and the *selection* effect of incentive contracts.

Observation: Since we expect both the effort and selection effects to decrease with increased noise and distortion, noisy or distorted performance measures should reduce the total effect (i.e., sum of selection and effort effects) of incentives.

Cash Bonus Pay

Lower noise and distortion in performance measures enable firms to offer more intense incentives but do not guarantee that they will do so or that more intense incentives will have the desired effect on employee behavior. We therefore hypothesize and test directly for effects of the magnitude of cash bonuses (an imperfect proxy for incentive intensity) on employee effort and selection.

Considerable evidence suggests that performance-dependent cash bonuses have a beneficial effect on employee productivity. For a panel of Japanese firms, Jones and Kato (1995) document a 1 percent annual productivity gain the year following a 10 percent increase in the level of bonus per employee. Enis (1993) investigates the consequences of adopting a bonus plan in firms in the U.S. motor carrier industry. Using a matched-sample design Enis (1993) finds that adopters earn significantly higher profits than nonadopters. Rajagopalan (1996) documents positive effects of annual bonus plans on the performance of U.S. electric utility firms. In two related studies, Banker et al. (1996, 2001) show the effects of introducing a sales-based bonus plan on sales in a chain of retail stores. Sales persistently increase over a five-year period after implementation of the plan and a substantial part of the total increase in productivity of each store is due to improved effort by existing and new employees. Note that the evidence is not limited to for-profit firms only. Baber et al. (2002) show that bonuses can be used to motivate managers of charities to increase the efficiency of their fund-raising activities.

Other work suggests that (annual) bonuses not only increase the effort that agents supply, but also attract more productive agents to the firm (Baker et al. 1988), thereby changing the composition of its labor force. Gibbs (1995) and Lazear (1986) show that performance-contingent pay such as bonuses attracts higher quality employees since more able employees will benefit more from cash bonuses than will weaker employees. Moreover, Gibbs (1995) documents that employees who have received bonuses in the past have a better chance of promotion—suggesting these employees are of high ability. Kahn and

Sherer (1990) provide evidence that, in the company they study, the bonus system is directed toward selecting a group of high performance managers. Bloom and Michel (2002) and Banker et al. (2001) show that employee turnover rates are higher in firms with bonus plans, which is consistent with a selection effect in relation to bonuses.

In sum, higher cash bonuses increase the effort effect of incentive plans, *ceteris paribus*. Higher available bonuses will also change the composition of the workforce in such fashion that more productive employees will join the firm (and unproductive workers will exit). In turn, these more productive workers will increase delivered effort and this effort should be more effective. This suggests the following hypotheses, again in alternative form.

Hypothesis 2a: There is a positive relation between cash bonuses and the *effort* effects of incentive contracts.

Hypothesis 2b: There is a positive relation between cash bonuses and the *selection* effect of incentive contracts.

Observation: Since cash bonuses improve both the effort and selection effects associated with incentives, we expect the total effect of incentive contracts to be increasing in cash bonus size.

Control Variables

Earlier studies suggest that the effect of incentive plans depends on organizational characteristics of the firm (Gerhart and Milkovich 1990) and on design choices within the incentive plan (Bonner and Sprinkle 2002). Here, we also allow these factors to influence the size of the cash bonus under the plan. Specifically:

Organizational Characteristics of the Firm

We include industry membership and firm size to characterize the organizational structure of firms. We expect the effect of incentive contracts to be different for manufacturing, service, not-for-profit, and government agencies (Ittner et al. 2002) and for larger and smaller firms. Industry membership and firm size also influence the cash bonus under the contract. Earlier work shows, for example, that new-economy firms tend to use more stock option plans and other incentive schemes (Ittner et al. 2002).

Prior research also shows that the postadoption success of a new management tool depends on the support its adoption receives from both (middle) management and employees at large (Shields 1995). Moreover, when incentive contracts are widely supported, it might be easier to increase the variable pay (i.e., available cash bonus) specified therein. We therefore include (1) management support and (2) employee support as control variables.

Design of the Incentive Plan

Firms that are more experienced in using incentive plans might be more successful (if only because we expect firms to rescind these plans if they experience long-term problems). On the other hand, the performance effect of incentive contracts may taper off over time (Banker et al. 2001). We control for the time a firm has been using incentive contracts without making specific predictions as to its association with the effort effect or selection effect of the plan. More experienced firms may be likely to adopt plans with higher available cash bonuses. We therefore allow plan experience to impact the available cash bonus. The percentage of employees in a firm who are covered under an incentive contract is likely to affect its performance (Ittner and Larcker 2002). The incentive contract's selection function

will be extended to a greater number of jobs if the plan covers more employees. Likewise, more employees will be motivated to choose their actions in a manner consistent with the interests of the owners if coverage of the incentive contract is extended. On the other hand, making pay more contingent on performance may be less efficient if such incentives are imposed on lower-level workers who find it more difficult to deal with the implied income risk. Extended incentive plans may then negatively impact the optimal pay variability (cash bonus) in the contract. We therefore include plan coverage in our analysis without making specific predictions as to its sign.

SAMPLE, MEASURES, AND MODEL SPECIFICATION

In this section we begin by describing the data collection procedure and discussing details about the final sample. We then define the variables and their measurement. The translation of theoretical constructs to measurable variables is often not easy in organizational studies (Ittner and Larcker 2001; Luft and Shields 2003). We therefore employ several procedures to investigate the reliability and validity of our empirical measures. In particular, following Ittner and Larcker (2001) we use a latent variable model to deal with measurement error and to provide evidence on construct validity as recommended.

Sample and Descriptive Statistics

We use a proprietary dataset based on a KPMG Consulting/People Solutions 2001 survey of incentive pay plans in Dutch firms. The survey provides information on plan design (available cash bonus, employee coverage, experience with incentive plans), preadoption plan objectives, postadoption achievement of these objectives, and organizational context information (size, industry, management, and employee support of the plan). KPMG distributed the survey to approximately 2,200 organizations with more than 100 employees. Addresses were obtained from an outside vendor of corporate data; the survey was therefore not sent to KPMG clients per se. The survey was addressed to the firm's CEO and/or chief human resources officer. The survey was returned by 234 firms. Among these respondents were 151 firms who had an incentive pay plan in place at the time of the survey. Data from these 151 firms are used to test the hypotheses. The remaining 83 firms (those that had not adopted an incentive pay plan) were asked only about their size and industry. Analysis shows that both groups are of similar size, but that relatively more nonadopters were not-for-profit firms or government agencies.[2]

Ittner and Larcker (2001) enumerate some of the difficulties associated with the use of survey data collected by a third party. The most severe of these include (1) the difficulty in assessing sample selection biases, (2) poor construct properties, and (3) common rater bias. Our data suffer from these problems as well. We are limited in terms of addressing sample selection biases or combining survey data with data from public sources since the surveys were returned anonymously. Fortunately, the questionnaire includes questions about

[2] The mean and median size of nonadopters is not significantly different from those of adopting firms. However, 48 percent of the nonadopters were not-for-profit firms or government agencies, whereas only 17 percent of the adopters were in this industry. This difference is significant at the 1 percent level using both a t-test for means and a nonparametric Wilcoxon test. We use this information to conduct additional empirical analyses to evaluate the severity of potential selection biases. Selection biases may arise because we observe the performance effect of incentive contracts only when firms report having adopted an incentive pay plan. Firms will adopt such a plan when the expected net benefits of adoption are positive. We observe only the outcome of the adoption decision (adopt or not adopt) and not this selection variable (expected net benefits of adoption). We use a Heckman (1979) regression to assess whether our sample suffers from this incidental truncation problem (Greene 2000). Unreported results (available upon request) suggest that our inferences are unaffected by neglecting the potential selection bias and that ordinary least squares provides consistent estimates of the parameters of interest.

organizational practices that likely influence incentive contracts and they usually have more than one indicator per construct (two features that are often absent in third-party surveys). The questions asked, however, are sometimes ''double-barreled.'' Moreover, the questionnaire uses a four-point Likert scale, instead of the more usual five- or seven-point scales. Also, only one respondent answers all questions, which probably increases the likelihood of there being some measurement error in our variables. This renders our analysis vulnerable to a common rater bias. While we fully acknowledge these limitations of our dataset, we also take care to address explicitly measurement error in our estimation procedure and we test for common rater bias. We discuss this more fully below.

Table 1 provides details on the sample firms. Roughly one-third of the sample consists of firms from manufacturing, and another third of firms are from wholesale, retail, transportation, and other services. Approximately 17 percent of the respondents are from government agencies (municipal and federal) or not-for-profit firms. The remaining 19 percent of respondents represent a ''knowledge intensive'' service industry. Firm sizes vary from less than 100 to over 1,000 employees. About 45 percent of the firms have fewer than 500 employees, and approximately 30 percent have over 1,000. Most firms that adopted an incentive plan have considerable experience with these plans (over three years). In almost half of these firms, more than 50 percent of the employees are covered under the plan. Although the maximum cash bonus that can be earned appears to be modest for most firms (65 percent receive at most 16 percent of their annual salary as cash bonus), a substantial amount (13.1 percent) of respondents report that in their firm, available bonuses are over 24 percent of annual salary.[3]

Measures

In this section, we discuss the measurement and psychometric properties of each construct. The items that comprise each construct, together with their descriptive statistics are in Table 2. We assess the composite reliability of each of the constructs with a composite reliability index proposed by Fornell and Larcker (1981). This index is analogous to Cronbach's alpha and reflects the internal consistency of the indicators measuring a given construct. For all of our constructs we find that composite reliability is good (above 0.80). We also compute estimates of the variance extracted (Fornell and Larcker 1981). This statistic measures the amount of variance that is captured by an underlying factor in relation to the amount of variance due to measurement error. Estimates of 0.50 or higher are desirable. We find that the amount of measurement error in our constructs is limited; in all cases the average variance extracted is above 0.50. We also use this statistic to assess the discriminant validity of our constructs. For any two constructs, the square root of the variance extracted estimate should be greater than the simple correlation between these constructs. Table 3 provides details and contains the simple correlations between the constructs. The highest correlation is that between the constructs ''employee support'' and ''top management support'' (corr. = 0.610). This correlation is substantially lower than the smallest estimate of the square root of the variance extracted (0.727 for ''total effect of incentive plan''). We conclude that discriminant validity is established in all cases.

[3] In our sample, cash bonus pay is based on individual performance (4.0 percent), team performance (56.5 percent), firm performance (22.6 percent), or otherwise (16.9 percent).

TABLE 1
Sample Descriptive Statistics

	Measure/category						
		<100	100–250	250–500	500–750	750–1000	>1000
Size (%)	Number of employees	8.8	12.2	24.5	15.0	10.2	29.3
		about 1 year	1–2 years	2–3 years	> 3 years		
Experience with incentive contracts (%)	In years	3.4	5.4	14.8	76.4		
		Manufacturing	Municipal government	Federal government	Not-for-profit organizations	Wholesale, retail, transportation, and other services	Knowledge intensive service firms
Industry (%)		32.5	12.6	3.3	0.7	31.7	19.2
		at most 1 monthly salary (8%)	at most 2 monthly salaries (16%)	at most 3 monthly salaries (24%)	more than 3 monthly salaries		
Incentive power (%)	Ratio of variable to fixed pay	34.9	30.1	21.9	13.1		
		<5	5–25	25–50	>50		
Plan coverage (%)	Percentage of employees covered by incentive contracts	16.0%	29.2%	6.3%	48.5%		

Based on 151 observations. Respondents are CEOs of Dutch firms. The data come from the KPMG People Solutions 2001 Compensation Practices Survey.

TABLE 2
Descriptive Statistics for the Endogenous and Exogenous Indicators Used in the Partial Least Squares Estimation Models (n = 151)

Construct	Items	Mean	Std.	10th Pctl	Median	90th Pctl
	The actual consequences of implementing a variable pay scheme in our organization is such that:					
Total effect of incentive contracts	The entrepreneurial spirit of employees has clearly improved.	2.43	0.60	2.00	2.00	3.00
	The performance of a substantial group of employees has improved.	2.59	0.59	2.00	3.00	3.00
	Our organization clearly knows in which direction to steer the effort of employees.	2.39	0.67	2.00	2.00	3.00
	More than in the past, guiding employees toward desired behavior has been successful.	2.43	0.63	2.00	2.00	3.00
	Contingent pay positively contributed to our firm's culture. Attaining better results and providing more effort is now perceived as important.	2.23	0.59	2.00	2.00	3.00
	The actual consequences of implementing a variable pay scheme in our organization is such that:					
Selection effect of incentive contracts	We are a more attractive employer on the market.	2.51	0.62	2.00	3.00	3.00
	We recruited personnel whose attitude better fitted the organization.	2.46	0.66	2.00	2.00	3.00
	Our annual wage expense is better linked to the performance of the organization.	2.52	0.76	2.00	3.00	3.00
Performance measure properties	It is difficult to measure the performance of employees.	2.68	0.73	2.00	3.00	4.00
	The probability of arbitrary performance evaluation is high.	2.55	0.70	2.00	3.00	3.00
	The relation between organizational outcome and employee effort is difficult to establish.	2.73	0.76	2.00	3.00	4.00
Support of top management	Management is troubled by the implementation of the contingent pay plan or does not support it sufficiently.	2.70	0.78	2.00	3.00	4.00
	Management finds it difficult to distinguish between employees when evaluating performance.	2.28	0.77	1.00	2.00	3.00
Support of employees	Most of the employees do not support the incentive plan.	2.92	0.68	2.00	3.00	4.00
	The incentive plan is much debated by employees and does not help to improve performance.	2.95	0.62	2.00	3.00	4.00
	The incentive plan does not fit in the organization's culture.	3.05	0.63	3.00	3.00	4.00

TABLE 3
Pearson Correlations between Latent Variables and Average Variance Extracted Estimates

	Composite Reliability Index	1	2	3	4	5	6	7	8	9	10
(1) Total effect of incentive contracts	0.848	**0.727**									
(2) Selection effect of incentive contracts	0.833	0.554	**0.791**								
(3) Cash bonus pay	—	0.175	0.348	**—**							
(4) Performance measure properties	0.814	0.438	0.406	0.228	**0.771**						
(5) Size	—	−0.037	−0.016	−0.086	−0.173	**—**					
(6) Plan coverage	—	0.133	0.298	−0.030	0.075	−0.137	**—**				
(7) Support of top management	0.885	0.392	0.419	0.290	0.544	−0.186	0.093	**0.891**			
(8) Support of employees	0.866	0.451	0.466	0.255	0.384	−0.058	0.196	0.610	**0.827**		
(9) Experience with plan	—	0.070	0.069	−0.040	0.035	0.217	−0.022	−0.104	0.013	**—**	
(10) Industry dummy	—	0.182	0.281	0.338	0.115	−0.098	0.390	0.262	0.285	−0.043	**—**

Based on 151 observations. Diagonal entries (in bold) are the square root of the average variance extracted. For adequate discriminant validity, diagonal entries should be greater than the corresponding off-diagonal entries. Composite reliability is a measure of internal consistency developed by Fornell and Larcker (1981) and is similar to Cronbach's alpha. Correlations above 0.16 are significant at the 5 percent level.

We investigate the potential for common rater—common method bias using Harman's (1967) single-factor test.[4] The results show that common rater bias is unlikely to be severe in this dataset.

Our estimation procedure requires that all constructs be standardized to zero mean with standard deviation of unity. All constructs are also coded such that higher values indicate larger effects.

Total Effects of Incentive Plan

Respondents are asked to indicate the effect of the incentive pay plan along a number of dimensions (including stimulating entrepreneurial spirit, improving performance of a substantial group of employees, and guiding employees toward desired behavior). These dimensions are similar in the sense that all capture performance improvements due to the incentive plan. We label the underlying construct ''total effects of incentive contracts.'' The survey questions use a four-point, fully anchored Likert scale (completely agree, agree, disagree, completely disagree).

Selection Effects of Incentive Plan

The selection effect of incentive contracts is measured by three questions that relate to the success of using an incentive plan in hiring and attracting high quality employees. Respondents rate success on a four-point, fully anchored Likert scale. Specifically, the questions ask whether the firm is a more attractive employer on the market, whether the recruitment of employees is improved and, finally, whether the wage expense is better linked to the performance of the firm.[5]

Cash Bonus

We measure the cash bonus available under the incentive plan as the additional monthly wages *at most* that can be earned each year.[6] Answer possibilities are (1) one monthly salary (8 percent), (2) two monthly salaries (16 percent), (3) three monthly salaries (24 percent), and (4) more than three monthly salaries. We transform these categorical responses into a ratio scale, where answers of more than three monthly salaries are transformed to a maximum cash bonus of 50 percent, and the other answers are transformed into the percentages mentioned in parentheses.[7]

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[4] If a substantial amount of variance is caused by the same respondent answering all questions, then either a single factor will emerge from this test or one general factor will account for the majority of the covariance among the variables (Abernethy et al. 2004). The test statistic is significant ($\chi^2 = 853.36$, d.f. = 350, p-value < 0.0001), strongly rejecting the null that one single factor accounts for the covariance among the variables. We conclude that common rater bias is unlikely to unduly influence our results.

[5] We obtain similar results if we exclude the item that asks about the linkage between wage expense and the performance of the firm. However, since the results of an exploratory factor analysis suggest that this item captures the same underlying construct as the two other items mentioned we retain it in our reported results.

[6] This measure is somewhat problematic. In order to provide some assurance that maximum cash bonus is a reasonable proxy for incentive intensity, we need to demonstrate that a higher maximum cash bonus tends to be associated with higher actual bonuses on average. There is no information about this issue in our dataset. Instead, we use information provided by the Dutch branch of Towers Perrin. This firm conducted a compensation practices survey in 2004. In a sample of 99 firms (with an industry distribution similar to our sample), Towers Perrin found that in 57 percent of the sample firms the maximum bonus is *equal* to the actual bonus, which happens because many of the compensation schemes appear to have a design that features a performance threshold. Once employees exceed the threshold performance they qualify for the maximum bonus. In addition, the Towers Perrin survey reports that the average actual bonus (in percentage of salary) for their sample is 10.7 percent. In our dataset the average *maximum* bonus is about 15 percent. Although caution should be exercised when comparing these numbers, this suggests that a substantial amount of the maximum bonus is indeed ''realized'' as actual bonus (Towers Perrin 2005).

[7] Results are robust against other reasonable choices with regard to the transformation of the category ''more than three monthly salaries,'' including 75 percent and 100 percent.

Performance Measure Properties

We are interested in measuring whether performance measures used in firms are noisy and/or distorted. Respondents' answers to three questions are used to assess the properties of the performance measures used in incentive contracts. These questions include the extent to which the performance of employees is measurable, the congruence between the performance of the firm and the measures used to evaluate employees, and the probability that measures expose employees to arbitrary evaluations. Our variable seeks to capture a mix of (un)desirable performance measure properties that can be expected to make the plan less useful, although the survey items do not clearly separate the elements of the mix into either distortion or noise. The variable is coded such that higher values indicate better properties (less noise or distortion).

Control Variables

We include the following variables to control for various organizational characteristics and incentive plan design differences: (1) support from top management, (2) support among nonmanagement employees, (3) incentive plan coverage, (4) firm size, (5) experience with the plan, and (6) industry.[8]

Two survey questions are related to the support top management provides to the use of incentive plans. Three survey questions capture nonmanagement employee support for the incentive plan. The common denominator of these questions is whether the plan is contentious among employees. Incentive plan coverage is measured by a categorical survey variable. Respondents are asked to indicate if (1) less than 5 percent, (2) 5–25 percent, (3) 25–50 percent, or (4) more than 50 percent of the employees are covered under the incentive plan. We transform these answers to a ratio scale variable with values of 2.5 percent, 15 percent, 38 percent, or 75 percent, respectively.[9] Firm size is measured with a categorical question using six possible answers (1) less than 100 employees, (2) 100–250, (3) 250–500, (4) 500–750, (5) 750–1,000, and (6) more than 1,000. We also transform these answers to a ratio scale variable with values of 50, 175, 375, 625, and 1,000 employees. We then take the natural logarithm to reduce scale problems. A firm's experience with incentive plans can be (l) less than one year, (2) 1–2 years, (3) 2–3 years, or (4) longer than three years. Instead of using ordinal variables, we transform the answers to a ratio scale with values of 1, 1.5, 2.5, and five years. Finally, we include an indicator variable that takes the value of unity if the firm is in a traditional manufacturing industry and zero otherwise.[10]

Model Specification and Econometric Issues

Specification

We have two variables that measure the effects of incentive contracts: (1) total effect, i.e., the sum of effort and selection effects, and (2) selection effect. In our estimation, we regress the total effect on our key independent variables (available cash bonus and performance measure properties) while controlling for the selection effect. The coefficients on the cash-bonus magnitude and performance measure properties in this regression capture effects of these variables that are neither selection effects nor effort effects correlated with

[8] We also investigate the consequences of including the following incentive plan characteristics: (1) an indicator variable for whether the plan covers top management only, (2) an indicator for whether the plan covers top and middle management positions, (3) an indicator for those plans that cover predominantly sales employees, and (4) a categorical variable for the level at which the size of the bonus is determined at the organization-wide, team, and individual levels. Inclusion of these variables or combinations thereof does not change the results.

[9] However, results are robust to other reasonable transformation schemes.

[10] We use this relatively crude industry control to save degrees of freedom in our model estimation.

selection.[11] At the same time, the coefficient on the selection effect variable in this regression indicates whether the total effect of incentive contracts increases as the selection functioning improves. This is by no means a mechanical relation because it is *a priori* unclear what happens to the effort provided under the contract when the selection effect increases.

Estimation

We estimate our latent variable model using partial least squares (PLS). In PLS the measurement model (which relates the latent constructs and their observed indicators) and the structural model (which specifies the relations between latent constructs) are estimated together. To achieve this, the measurement and structural parameters of the model are estimated in an iterative fashion using simple and multiple ordinary least squares regressions (Barclay et al. 1995, 292).[12] PLS avoids assumptions that observations follow a specific distribution (e.g., multivariate normal) and that they are independently distributed. As such, PLS is a particularly useful estimation method for smaller samples and for situations in which specific distributional requirements are less appropriate (Chin and Newsted 1999). Because the variables are standardized, the structural equation parameters are standardized regression coefficients and the measurement model parameters are correlations between the latent variable and its observed indicators. We provide measurement model results in Table 4.[13] Bootstrapping is then used to evaluate the statistical significance of the path coefficients. Specifically, we generate 1,000 random samples of 151 observations (with replacement) and use the resulting empirical distribution of the parameter estimates to compute bootstrap t-statistics and standard errors. Earlier applications of PLS in accounting include Ittner et al. (1997) and Anderson et al. (2002).

Endogeneity Bias

Whenever researchers regress performance on variables that represent (design) choices to the firm, there is a potential for endogeneity bias. One particular concern in this regard is that some factor has been omitted from the model, which affects both firm performance as well as the included explanatory variables. It is well known that OLS provides biased and inconsistent estimates in such a case (Wooldridge 2002).[14] Our dependent variable,

[11] If the selection effect includes selection of employees who are able and willing to exert more effort, then selection and effort effects are correlated, and controlling for the selection effect means that we capture only the portion of the effort effect that is independent of selection. Thus our procedure will underestimate the effort effect when effort and selection are correlated, and will find no effort effect if effort and selection effects are perfectly correlated. Respondents to the survey appear to identify some effort effects that are independent of selection effects, however: the correlation between the total-effect and selection-effect variables was only 0.55 (see Table 2).

[12] See Chin and Newsted (1999) or Wold (1982) for a detailed description of the estimation procedure.

[13] To provide further assurances with regard to the psychometric properties of our constructs, we also conduct an exploratory factor analysis in which we include all indicators for all constructs. We obtain a ''clean'' structure for the factor loadings that corresponds to the way the indicators are assigned to the latent variables in the PLS estimation, with two exceptions. First, the indicator variables for support from top management and for support among nonmanagement employees load onto one factor (which we label ''support for the incentive plan''). Second, the indicators for incentive plan coverage and for cash bonus available under the contract also load onto one factor (which we label ''cash incentives''). We rerun all analyses using the two alternative variables (cash incentives and support for the incentive plan). The results remain qualitatively unchanged, i.e., the effect size of cash incentives on the selection effect increases but it is unchanged for the total effect of incentives. The support for the incentive plan variable is positively associated with both total and selection effects of incentives, but not with cash incentives.

[14] Recent studies nevertheless suggest that ordinary least squares (OLS) estimation is often preferred in the presence of endogeneity, since available alternative estimators usually rely on instrumental variables that typically are too weak to improve estimation results over OLS (Larcker and Rusticus 2004; Nikolaev and van Lent 2005). It would seem that in many management accounting settings this conclusion is valid (Ittner and Larcker 2001).

TABLE 4
Measurement Model Results for Multi-Item Measures

Latent Variable: Indicators	Total Sample (n = 151) Standardized Loading
Total effect of incentive contracts	
The entrepreneurial spirit of employees has clearly improved.	0.2503***
The performance of a substantial group of employees has improved.	0.2662***
Our organization clearly knows in which direction to steer the effort of employees.	0.1875***
More than in the past, guiding employees toward desired behavior has been successful.	0.2937***
Contingent pay positively contributed to our firm's culture. Attaining better results and providing more effort is now perceived as important.	0.3595***
Selection effect of incentive contracts	
We are a more attractive employer on the market.	0.3740***
We recruited personnel whose attitude better fitted the organization.	0.4080***
Our annual wage expense is better linked to the performance of the organization.	0.3798***
Performance measure properties	
It is difficult to measure the performance of employees. [Note: noise]	0.4116***
The probability of arbitrary performance evaluation is high. [Note: noise]	0.4595***
The relation between organizational outcome and employee effort is difficult to establish. [Note: distortion]	0.4281***
Support of top management	
Management is troubled by the implementation of the contingent pay plan or does not support it sufficiently.	0.6204***
Management finds it difficult to distinguish between employees when evaluating performance.	0.4988***
Support of employees	
Most of the employees do not support the incentive plan.	0.4424***
The incentive plan is much debated by employees and does not help to improve performance.	0.3432***
The incentive plan does not fit in the organization's culture.	0.4213***

*** denotes significance at the 0.01 level (two-tailed).
Based on 151 observations estimated with PLS. t-statistics in parentheses are based on bootstrapping (1000 samples with replacement).

however, is *not* firm performance, but the perceived effect of the incentive plan on firm performance, separate from the effect of other factors on firm performance. In a sense, the survey asks respondents to ''solve'' the endogeneity problem and eliminate the effect of factors other than the incentive plan on firm performance. We are therefore only concerned about omitted factors that influence both incentive-design choice and incentive-plan effects (Wooldridge 2002). For example, an incentive plan that is strongly supported by top management is likely to offer bigger cash bonuses *and* to have stronger effects on performance. Similarly, the percentage of firm employees covered by the incentive plan will affect both

the magnitude of the bonuses and the magnitude of their effect. By including the determinants of the available cash bonus as control variables when estimating the relation between cash bonus and incentive-plan effects, the potential endogeneity bias should be relatively small.

RESULTS

Table 3 provides a Pearson correlation matrix across variables. As expected, we find significant positive correlations ($p < .05$) between the total effect of incentive contracts and its associated variables, available cash bonus, and performance measure properties. We find strong evidence ($p < .01$) that available cash bonus and performance measure properties are associated with the selection effect of incentive contracts. Finally, we document a strong positive association between the selection effect and the total effect of incentive contracts, indicating that selection is an important factor in explaining the overall impact of incentive contracts. Most control variables are significant, with relations in the expected direction *vis-à-vis* the selection and total effects of incentive contracts. We do not find, however, that firm size or experience with incentive plans are correlated with either the total or selection effects of incentive contracts. The available cash bonus is positively and significantly related to the properties of performance measures, the amount of support for the incentive plan, and the dummy variable for the traditional manufacturing industry.

Results of the PLS regressions are shown in Table 5. Hypotheses 1a and 1b predict that performance measure properties will have a positive impact on the effort and selection effects of incentive contracts. Our evidence strongly supports these hypotheses. The coefficient value on performance measure properties in the path to the total effect of incentive contracts is 0.209 ($t = 2.60$). Since we control for the effect due to selection (the coefficient on the path between selection and total effects is 0.406, $t = 4.44$), this suggests that better performance measure properties have a positive effect on effort that is independent of the selection effect. We also find evidence that performance measure properties impact the selection effect of incentive contracts. The coefficient value of performance measure properties in the path to the selection effect of incentive contracts is 0.206 ($t = 2.29$). Together these findings suggest that the total effect of incentive contracts increases with better performance measure properties since both effort and selection effects are larger.[15]

Hypothesis 2a examines the effect of cash bonuses on the effort effect of incentive contracts, independent of selection effects. We find no support for the idea that larger available bonuses are associated with higher effort effects, holding performance measure properties and selection effects constant. The coefficient value on available cash bonus in the path to the total effects of incentive contracts is –0.081 ($t = 0.91$). Since we control again for selection, this implies that we cannot establish that cash bonuses have an effort effect. However, we find considerable evidence supporting an available cash bonus effect on the selection effect of incentives (Hypothesis 2b). The coefficient value of the path connecting these two constructs is 0.231 ($t = 2.78$). Together these associations suggest that available cash bonuses improve the functioning of incentive contracts largely due to the benefits of improved selection of employees.

The results also suggest that the effort effect of incentive contracts depends on the amount of support the incentive plan has garnered among employees. The coefficient value

[15] The results of the correlation analysis suggest the existence of a path between performance measure properties and available cash bonus. We estimate a version of the model in which this path is not restricted to zero. The resulting coefficient on the path is not significant, however, and the other relations are unaffected. Since we do not have substantive reasons for keeping the path in the model, we drop it in our further analyses.

TABLE 5
Results of Partial Least Squares Analysis

	Predicted Sign	Path to: Total Effect of Incentive Contracts (Multiple R^2 = 0.3887)	Selection Effect of Incentive Contracts (Multiple R^2 = 0.3956)	Cash Bonus Pay (Multiple R^2 = 0.1957)
Path from:				
Test variables:				
1. Selection effect of incentive contracts	+	0.406 (4.44)***		
2. Cash bonus pay	+, +	−0.081 (0.91)	0.231 (2.78)***	
3. Performance measure properties	+, +	0.209 (2.60)***	0.206 (2.29)**	
Control variables:				
5. Size		0.001 (0.01)	0.092 (1.35)	−0.046 (0.49)
6. Plan coverage		−0.059 (0.67)	0.249 (3.31)***	−0.204 (2.35)***
7. Support of top management		0.011 (0.11)	0.106 (1.22)	0.145 (1.37)
8. Support of employees		0.195 (2.05)**	0.218 (2.23)**	0.106 (0.96)
9. Experience with plan		0.030 (0.42)	0.065 (0.94)	−0.006 (0.07)
10. Industry dummy		0.037 (0.50)	0.004 (0.05)	0.344 (5.40)***

** and *** denotes significance at 0.05 and 0.01 levels, respectively (two-tailed).
Based on 151 observations. t-statistics in parentheses are based on bootstrapping (1000 samples with replacement).

of this variable in the causal link with the total effect is 0.195 (t = 2.05). The other control variables are not significantly associated with the total effect of incentive contracts. On the other hand, we find that employee support and plan coverage of employees are positively and significantly associated with the selection effect of incentive contracts. We also find that plan coverage is negatively and significantly associated with the available cash bonus. The industry dummy variable is significantly and positively associated with the available cash bonus, suggesting that firms in the traditional manufacturing industry have plans with higher cash bonuses.

Our model explains about 38 percent of the variance in the total and selection effects of incentive contracts. We are less able to explain the variation in available cash bonuses, but the multiple R^2 of about 20 percent is well within acceptable bounds.

Additional Analysis

We use an intentionally biased subsample of firms to further test our interpretation of the selection effect of incentive plans. We identify a group of 32 firms that report that the hiring and retaining of employees is a major objective of their incentive plan.[16] We expect to be able to replicate the results of the main model with respect to the selection effect for this subsample. Furthermore, we expect that firms in this subsample will report higher selection effects (but not necessarily total effects) than the remaining firms. We are able to estimate our full model, even using this small sample, due to the estimation approach of partial least squares (Chin and Newsted 1999). For brevity, we summarize our findings but do not tabulate the details. As before, we find that available cash bonus and performance measure properties are positively associated with the selection effect. We also find that the mean and median selection effects are significantly higher (p-value < 0.01) in the subsample of firms in which the hiring and retaining of employees is a major objective than in the subsample of remaining firms. The mean and median total effects of incentive contracts do not differ between the two subsamples.

CONCLUSIONS

In this study we examine how performance measure properties and available cash bonuses impact the efficacy of incentive contracts in selecting a qualified workforce and motivating employees to provide goal-congruent effort. Theory predicts that precise, nondistorted performance measures are associated with more intense incentives, and that higher incentive intensity increases the effort provided under the contract and the selection of better employees. Our empirical evidence generally supports these predictions. We find that less noisy or distorted performance measures are positively related to the nonselection effect of incentive contracts. We do not find that available cash bonuses (an imperfect proxy for actual incentive intensity) influence the effect of incentives, independently of the selection effect and performance measures properties. Instead, our findings indicate that much of the effect of incentive contracts arises through their ability to select better employees. The selection of better employees is enhanced if the incentive contract that new hires are offered features a high available cash bonus and, more importantly, if the contract has defined performance measures with little noise or distortion. Our study emphasizes the importance of getting performance measures right in incentive contracts. Not only can good measures increase the efficacy of incentive contracts in motivating effort, but they also will help to enhance the selection of employees.

[16] We use survey questions about the objective of the plan at the time of its adoption.

There are several limitations to our study. First, the psychometric properties of some of our measures are difficult to assess. For example, the survey we use employs four-point Likert scales, i.e., scales without a natural midpoint. Some of the questions in the survey are ''double barreled'' and some constructs are measured with just one indicator. In addition, the possibility of a common rater bias exists since all firm's observations are gathered from the same respondent. To some extent these problems are inherent to the use of a secondary dataset. It should be noted that the PLS estimation procedure admits an assessment of the validity and reliability of our constructs. We also test for the severity of the common rater bias. Overall the statistics suggest that the constructs in this study are reliable, with modest amounts of measurement error, and they pass the tests for discriminant validity. Recall that PLS explicitly models and isolates sources of measurement error and allows relations to be adjusted for these errors. Nonetheless, we acknowledge that the results should be interpreted with these data limitations in mind.

Second, the survey measures the perceptions of the respondents about organizational practices and incentive contract effects. To some extent it might be preferable if we could validate these perceptions with ''harder'' data. We cannot, however, since the dataset we use does not allow us to establish the identity of the firms in the sample. Concerns about measurement error in perceptual constructs are at least somewhat mitigated by the PLS estimation procedures. A related concern is that perceptual satisfaction or outcome measures of organizational innovations need not translate into better stock market performance or increased profitability (Ittner et al. 2003). While we are unable to verify whether this holds true in our sample—due to the anonymity of the firms—we also think that there is some value in learning about the beliefs of managers with regard to how performance measure properties and cash bonuses affect the functioning of incentive contracts. Finally, while our research design should limit the potentially deleterious effects of simultaneity bias on our findings, we cannot exclude the possibility that it impacts our results. However, in small sample settings least squares estimation usually is quite robust in the presence of simultaneity.

We leave for future research the development of theory and the provision of empirical evidence on the properties of the performance measures examined here. For instance, we cannot disentangle the separate influence of distortion or noise in performance measures on incentive contracting nor do we explicitly address the issue of using multiple measures (each with its own characteristics). There is no doubt that a more detailed examination of these properties will lead to additional insights that enable improved design of performance measures for use in incentive contracts.

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