EFFORT AND SELECTION EFFECTS OF INCENTIVE CONTRACTS

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December 2003

CentER

Discussion Paper

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Effort and Selection Effects of Incentive Contracts[†]

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Abstract

We show that the improved effort of employees associated with incentive contracts depends on the properties of the performance measures used in the contract. We also find that the power of incentives in the contract is only indirectly related to any improved employee effort. High powered incentive increase the selection effect of the incentive contract and attract better employees to the firm. The selection effect of the incentive contract depends, in turn, on the (perceived) properties of the performance measures specified in the contract. These results hold after controlling for an array of incentive contract design characteristics and for differences in organizational context. Data is from a third party survey on compensation practices among Chief Executive Officers. Our estimation procedures address several known problems with using secondary datasets.

JEL classification: J330; M520
Keywords: incentive pay plans, effort effect, selection effect, performance measure properties

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1. Introduction

Incentive contracts have both a selection effect and an effort effect (Milgrom and Roberts, 1992). These contracts motivate employees to work according to the desires of the owners of the firm through linking their compensation to measured performance (the effort effect). If structured in a way that is attractive to individuals with certain traits, but unattractive to employees without these traits, incentive contracts can be used to select appropriate people to the job (the selection effect). These properties of incentive contracts are well-described in traditional economic models. The same models also clarify the key role of the incentive power offered in the contract with regard to both selection and effort effects (Gibbons, 1998). Incentive power is defined as the ratio of contingent to fixed pay. Relatively little attention, however, has been paid to the properties of performance measures used in incentive contracts. Specifically, few studies address the question how the properties of performance measures impact on the selection and effort effects of incentive contracts and whether the impact of performance measures properties depends on the incentive power in the contract. Earlier studies have addressed the influence of controllability filters on the selection and effort effects of incentive contracts (Waller and Chow, 1985; Shields and Waller, 1988) in an experimental setting. A growing literature has documented how performance measure properties influence their (relative) weight in incentive contracts (Ittner and Larcker, 2001). What remains unaddressed is how the selection and effort effects depend on performance measure properties and whether this relation in turn depends on the power of incentives provided in the contract. Our study uses data from a third party survey on compensation practices among 151 Chief Executive Officers to answer these questions. All surveyed companies have incentive contracts in place, but vary in terms of contract design and organizational context.

Our results confirm earlier findings that the effort and selection effects of incentive contracts are interdependent. We show that more high-powered incentives attract better employees, who, in turn, provide more effort. We also show that high-powered incentives do not affect effort directly; it is only through their impact on selection that effort increases. However, we do find strong evidence that performance measures with desirable properties increase the effort provided under incentive contracts *and* positively affect the selection via incentive contracts. The impact of performance measure properties does not appear to be moderated by the incentive power provided in the contract. Together these findings speak strongly about the importance of the role performance measures have in incentive contracts. Our findings are robust when controlling for an array of variables that proxy for differences in incentive contract specifics and organizational context.

We estimate our model using partial least squares. Partial least squares estimation allows us to jointly assess the structural and measurement attributes of the model, while it avoids stringent assumptions about the (normal) distribution of variables that are usual in other latent variables estimation procedures. As such, it is very suitable for relatively small samples. What's more, in cases where explicitly accounting for potentially deleterious effects of the errors-in-variables problem is called for, partial least squares allows a more accurate assessment of the relations among variables than simple OLS. Survey data, especially when it is collected by a third (i.e., non-academic) party, is often criticized for containing measurement error (although it is not clear that the error in this type of data is any greater than in other --publicly available-- data). We acknowledge this problem and deal with it through our estimation procedure.

This paper proceeds as follows. The next sections reviews the literature on incentive contracts in relation with performance measurement properties and incentive power. We then describe our sample, variable measurement and 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.

2. Development of empirical predictions

While the accounting literature has recognized early on that the selection and effort effects of incentive contracts are affected by the properties of the measure of performance specified in the contract (Waller and Chow, 1985, Chow, 1983), relatively little attention has to date been paid to exploring the exact nature of the relation between performance measure properties and incentive contract effects. Bonner and Sprinkle (2002) argue that the effort effects of incentive contracts are a function of (1) personality traits of the agent, (2) characteristics of the agent's task, (3) the context of employment (organizational structure, features of the accounting system), and (4) design choices within the incentive system. We focus on two key issues within these determinants of the effort effect of incentives: (1) the influence of performance measure properties and (2) the influence of incentive power (i.e., the extent of variable pay vs. fixed pay). Our sample selection allows us to abstract from the influence of task characteristics. We also mitigate the influence of personality traits on the effort effect of incentives by controlling for the selection effects of incentives (Waller and Chow, 1985; Banker et al., 2000). We discuss these methodological issues further below. First, we derive how performance measure properties and incentive power are expected to affect the effort effects of incentives.

Incentive power

Agency models suggest that incentives are needed to elicit 'effort' from agents to perform tasks that are valuable to the principal, but onerous to the agent (Milgrom and Roberts, 1992). Stronger incentives are provided if the ratio between variable pay and fixed pay is greater. Considerable evidence exists that shows that incentives matter in the sense suggested by the agency literature (Bonner and Sprinkle, 2002; Prendergast, 1999). Larcker (1983), Brickley et al. (1985), Tehranian and Waegelein (1985) and Yermack (1997) report positive abnormal stock returns on the announcement of the adoption of an incentive plan. Firms that have adopted incentive plans seem to perform better compared to those that have not (Leonard, 1990; Wallace, 1997). Employees perform better when subjected to incentive schemes where pay is more closely related to performance (Abowd, 1990; Banker et al., 1996; Banker et al., 2000; Kahn and Sherer, 1990; Lazear, 1986; Simons, 1987;

Govindarajan, 1988). For example, Banker et al. (2000) show that a substantial part of the total increase in productivity of a firm after the adoption of an incentive plan is due to improved effort by existing and new employees (although most of the productivity effect seems related to the selection of better quality employees). The empirical evidence is not limited to private sector firms only. For example, Baber et al. (2002) show that incentive pay plans can be used to motivate managers of charities to increase the efficiency of their fund raising activities. In sum, the effort effect of incentive contracts depends on the incentive power specified in the contract. Stronger incentives will elicit more effort, ceteris paribus. This suggests the following hypothesis in alternative form:

Hypothesis 1: There will be a positive relation between incentive power and the effort effect of incentives.

Performance measure properties

Many authors have pointed out that the design of incentive systems is "intimately linked" (Milkovich and Newman, 2002) with the properties of performance measures (Bloom and Milkovich, 1998; Tsui et al., 1997; Waller and Chow, 1985; Bushman and Smith, 2001). As to what constitutes the ideal nature of these properties, the literature has not achieved consensus yet. Some authors stress that performance measures needs to be fair and equitable (Bretz et al., 1992; Foster and Ward, 1994). Others point at objectivity and accuracy as desirable properties (Waller and Chow, 1985; Prendergast, 2002; Gibbs et al., 2003), while some hold that measures should be stable or reliable (Milkovich and Newman, 2002; Campbell, 1990; Heneman, 1986). Not all these descriptions of ideal properties have been rigorously derived and it is sometimes difficult to assess whether they are based on normative contentions or on findings from empirical or theoretical research. Traditional agency models outline the consequences of imprecise, noisy, performance measures. In particular, such measures may impose undue risk on agents and reduce the efficacy of incentives (Holmstrom, 1979; Banker and Datar, 1989; Feltham and Xie, 1994; Gibbons, 1998; Indjejikian, 1999). What's more, several recent papers have drawn attention to the possibility that performance measures may be subject to distortion, i.e., are not congruent with desirable corporate goals

(Baker, 2000, 2002; Bushman et al., 2000) or do not communicate strategy well enough (Malina and Selto, 2002). We infer that noise and distortion are disadvantageous properties of performance measures and harm the applicability of the measure in incentive contracts. While noise and distortion are separate properties, they have the same effect on measure applicability.

A noisy measure contains observation errors with regard to the true action choice of an agent. Providing incentives under these circumstances is costly (Ittner et al., 1997; Lambert and Larcker, 1987; Sloan, 1993; Keating, 1997; Bushman et al, 1995; Nagar, 2002). Since the agent cannot rely on the principal to be rewarded for delivered effort (since the performance measure may incorrectly reflect his effort choice), he bears additional risk. Assuming agents are risk-averse implies that the principal will have to compensate the agent for this additional risk (Milgrom and Roberts, 1992; Bloom and Milkovich, 1998; Shields and Waller, 1988). Although empirical studies on the relation between noisy performance measures and effort effects have been scarce, and at times yield mixed results (Garen, 1994; Aggerwal and Samwick, 1999), the evidence seems to indicate that wealth gains are associated with reduction of noise in measures (Ittner and Larcker, 2001; Luft and Shields, 2002).

A performance measure is distorted if it incentivizes agents to act in a manner that is not consistent with corporate goals (Baker, 1992, 2000, 2002). Using a distorted measure in an incentive contract aggravates the problem, since agents will be motivated to work harder to achieve some undesirable goal. Empirical studies have shown that non-distorted measures can increase incentives to manage investments in the interest of shareholders (Wallace, 1997), align managerial actions and corporate strategy (McKenzie and Schilling, 1998), and improve communication of strategy (Malina and Selto, 2002). Note that some authors have argued that noise or distortion in performance measures should be mended by including more measures in the evaluation (e.g., Abowd and Kaplan, 1999). When we refer to the properties of performance measures in a multiple measure context, we mean the 'grand' properties of the

complete set of performance measures used in an incentive contract. In other words, we refer to noise and distortion in all performance measures together.

Ittner and Larcker (2002) show that the relative (distortion and noise) score of performance measures will determine their weight in incentive contracts when more than one measure is included, as suggested by the informativeness principle. Although agency theory suggests that the inclusion of every informative measure in an incentive contract is beneficial, it is unclear whether such is possible at low costs. Murphy (1999) argues that the role of 'informativeness' diminishes when the set of potential actions a manager can take to affect corporate value is expanded. The idea is that managers typically can choose between a wide array of actions that will affect shareholder wealth. The agency problem, then, is not as much to make sure that managers exert effort, but to motivate managers to choose optimally among a multitude of actions. Indeed, the use of multiple measures may reduce the employee's understanding of the overall corporate goals and cause confusion (Ittner and Larcker, 1998). What's more when many measures are used to evaluate performance, top management's judgment is needed to aggregate information to one, overall, conclusion. This increases the opportunities for subordinates to engage in lobbying behavior or other unproductive effort, which is likely to be detrimental to performance (Prendergast and Topel, 1994; Milgrom, 1988; Murphy and Oyer, 2003). Although empirical research on the effect of using multiple performance measures is scarce to date, it would seem that little, if any, evidence exists that firms benefit from doing so (Ittner et al., 2003).

In sum, we hypothesize the following relation between properties of performance measures and the effort effect of incentives (in alternative form).

Hypothesis 2: There will be a negative relation between the amount of noise and/or distortion in performance measures and the effort effect of incentives.

Interaction effect between incentive power and performance measure properties

Milgrom and Roberts (1992) and Demski (1994) argue that strong incentives are likely to be optimal when good performance is easy to identify. In other words, the effort effect of incentive power depends on the properties of the performance measure. Prendergast

(1999) notes that most studies that document a relation between effort effect and incentive power are carried out in cases where the nature of the job of the employee is simple, in the sense that an aggregate measure of performance is readily available. Tsui et al. (1997) report evidence that the absence of such aggregate measure may substantially restrict the effort gains from using high-powered incentive contracts. Moreover, the effort effect associated with desirable properties of performance measures depends on the incentive power in the contract. Both performance measure properties specified above are relevant. More noisy measures reduce the precision with which performance is assessed and increase the likelihood that errors in this assessment are made. Thus, agents face higher risk under noisy measures and using these becomes more costly. Distorted performance measures are more undesirable in high-powered incentive contracts since they will elicit behavior from the agent that is not optimal to the firm (i.e., not congruent with corporate goals). It is a well-known result in the theoretical literature that when such distortions are present, incentive power should be reduced (up to the extent that only a flat wage is offered) (Holmstrom and Milgrom, 1991, 1994).

Hypothesis 3A: The relation between effort effect and incentive power is conditional upon the properties of the performance measures used.

Hypothesis 3B: The relation between effort effect and the properties of the performance measures used is conditional upon the power of the incentives provided.

Controlling for personality traits of the agent

Incentive schemes do not just increase the effort supplied by agents, they also attract more productive agents to the firm (Baker et al., 1988) and thus change the compensation of its labor force. Gibbs (1995) and Lazear (1986) show that higher-powered incentives attract higher quality employees, since more able employees will benefit more from incentive schemes than will the weaker. In support of his argument, Gibbs (1995) documents that employees who have received bonuses in the past have a better chance of promotion (suggesting these employees are high-quality). Bloom and Michel (2002) and Banker et al. (2000) show that employee turnover rates are higher in firms with incentive schemes, which

is consistent with a sorting effect of these schemes. The selection effect of incentive contracts is not only increasing in the power of incentives (Prendergast, 1999), but also depends on the properties of performance measures (Waller and Chow, 1985; Shields and Waller, 1988). Waller and Chow (1985) point out that once this selection effect is controlled for, the effort effect of incentive schemes is no longer impacted by differences in self-perceived personality traits of the agents. Indeed, the agent's perception of his own type and of the features of the employment contract determine whether he will decide to accept the employment offer. In equilibrium, agents who self-selected into the contract should be those whose personality traits are consistent with the hiring firm's requirements. We investigate our hypotheses after controlling for the selection effect of incentive schemes to ensure that our results only reflect the influence of incentive power and performance measure properties on the effort effect of incentives.

Controlling for the context of employment and incentive system design

Context of employment. We include industry membership to characterize the organizational structure of firms. We expect the effect of incentive contracts to be different for manufacturing firms and firms that are either in some service industry, or are not-for-profit or government agencies (Ittner and Larcker, 2002). Prior research has shown that the post-adoption success of a new management tool depends on the support its adoption receives from (middle) management and from employees at large (see, e.g. Shields, 1995).   We therefore include (1) management support and (2) employee support as control variables.

Incentive system design. Firms that have more experience in using incentive contracts might be more successful (if only because we expect firms experiencing long term problems with these contacts to dissolve them). On the other hand, there is some reason to believe that the performance effect of incentive contracts may taper off over time (Banker et al., 2000). We control for the time a firm has been using incentive contracts without making specific predictions as to it association with the effort effect. The extent to which employees in a firm are covered under an incentive contract is likely to affect its performance (Ittner and Larcker, 2002). The incentive contract's screening 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. Plan coverage is therefore included in our analysis.

3. Sample, measures and model specification

This section first describes the data collection procedure and details about the final sample. It then defines 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 devote attention to several procedures used to investigate the reliability and validity of our empirical measures. In particular, we use a latent variable model to deal with measurement error and provide evidence on construct validity as recommended by Ittner and Larcker (2001).

3.1 Sample and descriptive statistics

We use a proprietary dataset based on KPMG Consulting/People Solutions 2001 survey of incentive pay plans in Dutch firms. The survey provides information on plan design (incentive power, employee coverage, experience with incentive plans), pre-adoption objectives of the plan and post-adoption achievement of these objectives and organizational context information (size, industry, management and employee support of the plan). KPMG distributed the survey to approximately 2200 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 resource officer.[1] 234 firms returned the survey, of these 151 firms had implemented an incentive pay plan at the time of the survey. The remaining 83 firms (that had not adopted an incentive pay plan) were asked only about their size and industry. Analysis shows that

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[1] Since the respondents all were CEO, we control, at least to some extent, for the influence of characteristics of the agent's task. Bonner and Sprinkle (2002) feel that 'task complexity' is the most common researched variable in this category. It would seem that CEOs share similar, complex tasks.

both groups are of similar size, but that relatively more non-adopters 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 third parties. The most severe of these include (1) the difficulty in assessing sample selection biases and (2) poor construct properties. Our data suffers from these problems as well. We are limited in terms of addressing sample selection biases or combining survey data with data from public resources since the surveys were returned anonymously. Although the questionnaire included questions about organizational practices that likely influence incentive contracts and usually had more than one indicator per construct, the questions asked were sometimes 'double-barreled'. Moreover, the questionnaire used a 4-point Likert scale, instead of the more usual 5 or 7-point scales. Also, only one respondent answered all questions, which probably increases the likelihood of some measurement error in our variables. While we fully acknowledge these limitations of our dataset, we also take care to explicitly address measurement error in our estimation procedure. We discuss this more fully below. Although we agree with Zimmerman's (2001, 420) statement that 'better data is always preferred to poorer data', we also feel that notwithstanding the limitations of our data, they shed some new light on relations that are not yet fully understood. The alternative would be to discard the data completely. We feel that a more fruitful approach is to leave it to the reader to decide how the evidence presented here should be weighted against his prior beliefs.

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[2] Mean and median size of non-adopters was not significantly different from adopting firms. However, 48% of the non-adopters were not-for-profit firms or government agencies, whereas only 17% of the adopters were in this industry. This difference is significant at the 1%-level using both a t-test for means and a non-parametric Wilcoxon test. We used 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 to have adopted an incentive pay plan. Firms will adopt such plan when the net benefits of adoption are positive. We observe only the outcome of the adoption decision (adopt, not adopt) and not this selection variable (net benefits of adoption). Specifically, we used a Heckman (1979) regression to assess whether our sample suffers from this incidental truncation problem (Greene 2000, 926). Unreported results (available upon request) suggest that our inferences are unaffected by neglecting the potential selection bias and that OLS provides consistent estimates of the parameters of interest.

Appendix 1 provides details on survey questions and the distribution of the respondents' answers to these questions. The sample consists of about one-third of firms from manufacturing, and also one-third of firms from wholesale, retail, transportation and other services. Approximately 17% of the respondents are from government agencies (municipal and federal) or not for profit firms. The remaining 19% of respondents is in a 'knowledge intensive' service industry. Firm sizes vary between less than 100 to over 1000 employees. About 45% of the firms have fewer than 500 employees, and approximately 30% have over 1000. Most firms in the sub sample that adopted an incentive plan have considerable experience (over three years) with these plans. In almost half of these firms, more than 50% of the employees are covered under the plan. Although the maximum incentive pay that can be earned appears modest for most firms (65% receive at most 16% of their annual salary as incentive pay), a substantial amount (13.1%) of respondents reports that in their firm incentive pay is over 36% of annual salary.[3]

3.2 Measures

In this section, we discuss the measurement and psychometric properties of each construct. 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 computed 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 larger are desirable. We find that the 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 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 1 provides

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

details and contains the simple correlations between the constructs. The highest simple correlation is 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 'effort effect'). We conclude that discriminant validity is established in all cases. Our estimation procedure requires all constructs to be standardized to zero mean variables with standard deviation of unity.

Effort effects. Respondents were asked to indicate the effect of the incentive pay plan with regard to a number of dimensions (including stimulating entrepreneurial spirit, motivating effort in a desired fashion and contribution to a firm's culture). These dimensions are similar in the sense that all are related to motivating effort and guiding employee action choice towards to firm's goals. We labelled the underlying construct 'effort effects of incentive contracts'. The survey questions used a four point fully anchored Likert scale (completely agree, agree, disagree, completely disagree).

Incentive power. The power of incentives provided through the incentive pay plan was measured in terms of the additional monthly wages that could be earned at most each year under the plan. Answer possibilities were (1) one monthly salary (8%), (2) two monthly salaries (16%), (3) three monthly salaries (24%), and (4) more than three monthly salaries. We transformed these categorical responses to a ratio scale, where answers of more than three monthly salaries were transformed to the incentive power value of 50% (and the other answers into the percentages mentioned in parentheses).[4]

Performance measure properties. Respondents' answers to three questions were used to assess the 'grand' properties of the performance measures used in the incentive contracts. These questions included 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, the probability of exposing employees to arbitrary evaluations, and the extent to

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[4] The results are robust against other reasonable choices with regard to the transformation of the category more than three monthly salaries (including: 75% and 100%).

which measures are limited to assessing short-term performance only, or only partly capture the responsibilities of employees.

Interaction effect. Our theory predicts that the influence of performance measure properties on the effort effect of incentive contracts depends on the level of incentive power. Relations like these are commonly modelled in social sciences with an interaction term (Jaccard et al., 1990). We follow Ping's (1996) approach to estimate interaction effects in latent variable models. The indicators of the interaction construct are created as products of the indicators of the two latent variables that are thought to interact. In our case we compute three product terms by multiplying each indicator of our performance measures properties construct with the corresponding value from the incentive power construct. This approach was validated for partial-least-squares models (our estimation method) by Chin et al. (2003).

Control variables. We include the following variables to control for various incentive plan design characteristics, personality traits, and organizational context differences: (1) selection effect, (2) support from top management, (3) support among non-management employees, (4) incentive plan coverage, (5) firm size, (6) firm experience with incentive plans, and (7) industry.

The selection effect was measured with three questions on the success of using the incentive plan in hiring and attracting good quality employees. Respondents rated success on a four-point fully anchored Likert scale. The questions asked whether the firm is a more attractive employer on the market, whether the recruitment of employees was improved and, finally, whether the wage expense is better linked to the performance of the firm. Two survey questions were related to the support top management provides to the use of incentive pay plans. These questions sought to evaluate if management fully supported the implementation of the plan. Three survey questions captured the support of non-management employees for the incentive plan. The common denominator of these questions was whether the plan was contentious among employees. Incentive plan coverage was measured by a categorical survey question. Respondents were asked to indicate if (1) less than 5%, (2) 5-25%, (3) 25-50% or (4) more than 50% of the employees were covered under the incentive plan. These

answers were transformed to a ratio scale variable with values of 2.5%, 15%, 38%, or 75% respectively.[5] Firm size was measured with a categorical question using six possible answers: (1) less than 100 employees, (2) 100-250, (3) 250-500, (4) 500-750, (5) 750-1000, and (6) more than 1000. We transformed these answers also to a ratio scale variable with values of 50, 175, 375, 625, 875, and 1000 employees respectively. We then took the natural logarithm to reduce scale problems. A firm's experience with incentive plans could be either (1) less than 1 year, (2) 1-2 years, (3) 2-3 years, or (4) longer than 3 years. Instead of using ordinal variables, we transformed the answers to a ratio scale with values of 1, 1.5, 2.5 and 5 years, respectively. Finally, we included an indicator variable which takes the value of unity if the firm is in a traditional manufacturing industry and zero otherwise.[6]

3.3 Model specification and econometric issues

We estimate our latent variable model using partial least squares (PLS). In PLS the measurement model (relating 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, p. 292).[7] 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 when 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 (not reported, but available from authors). Bootstrapping is used to evaluate the statistical significance of the path coefficients. Specifically, we generate 1000 random samples of 151 observations (with replacement) and use the resulting

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[5] Results are, however, robust to reasonable other transformation schemes.
[6] We used this relatively crude industry control to save degrees of freedom in our model estimation.
[7] See Chin and Newsted (1999) or Wold (1982) for a detailed description of the estimation procedure.

empirical distribution of the parameter estimates to compute bootstrap t-statistics and standard errors. Earlier applications in accounting include Ittner et al. (1997) and Anderson et al. (2002).

Our model relates two effect variables (effort effect and selection effect) to our key explanatory variables (performance measure properties, incentive power, and their interaction). We control as described earlier for an array of factors that are likely to impact on the effect of incentive contracts. It should be noted that these factors and our key explanatory variables reflect design choices of the firm (Milgrom and Roberts, 1995). That is, the firm chooses to specify incentive contracts with, for example, maximum available bonus of two months' salary. The firm chooses to include a minority of employees under the contract, or to have the contract cover all. In short, we acknowledge that the firm makes any number of design choices with regard to organizational structures and incentive systems. We examine in this paper the effect of all these choices on effort (and on selection). Since these effects must follow <u>after</u> whatever firm choices are made, we do not expect our model to suffer from simultaneity issues (and we can use a fully recursive system).

Figure 1 depicts our conceptual model.

4. Results

Table 1 provides a Pearson correlation matrix across variables. We find, as expected, strong, positive correlations (p<1%) between the effort effect of incentive contracts and its associated variables, incentive power and performance measure properties. Most control variables are significant and associated in the expected direction with the effort effect of incentive contracts. In particular, the selection effect of incentive contracts is strongly associated with their effort effect, suggesting the importance of controlling for its impact when investigating the effort consequences of incentives. However, we do not find that firm size or experience with the incentive plan are correlated with the effort effect.

Results are shown in Table 2. The first hypothesis relates to the issue how incentive power affects the effort effect of incentive contracts. We find no support for the idea that higher incentive power is associated with better effort (once the selection effect is controlled

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for). The coefficient value on incentive power in the link to the effort effect is –0.081 (t=0.95). Hypothesis two predicted that less noisy or less distorted performance measures would have a positive impact on the effort effect of incentive contracts. Our evidence strongly supports this hypothesis. The coefficient value on performance measure properties in the link to the effort effect is 0.207 (t=2.42). Finally, the third hypothesis related to an interaction effect between incentive power and performance measures properties. Theory stated that the association of each of these variables with the effort effect of incentive contracts depends on the level of the other variable. We find no support for this hypothesis. The coefficient value on the interaction term in the link to effort effect is 0.009 (t=0.10).

We find a strong relation between the effort effect of incentive contracts and their selection effect. Apparently, the better the proposed incentive contract succeeds in selecting good quality employees, the higher is the effort effect of the contract. The coefficient value on the selection effect in the link with the effort effect is 0.404 (t=4.24). In turn, we find that the selection effect of incentive contracts is improved if incentive power is higher (coefficient value = 0.207, t=2.56), and if the performance measures in the contract are less noisy or distorted (coefficient = 0.175, t=1.99).

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 of this variable in the causal link with the effort effect is 0.192 (t=2.06). The other control variables are not significantly associated with the effort effect of incentive contracts. However, we find that employee support and the plan's coverage of employees are positively and significantly associated with the selection effect of incentive contracts.

Our model explains about 39% of the variance in the effort effect of incentive contracts (and about 40% of the variance in the selection effect of those contracts).

5. Discussion

We find only partial support for our hypotheses. Nevertheless, jointly our findings present a plausible picture of how incentive contract design and associated performance

measure choices influence the effects of these incentive contracts. In this section, we tie together our findings so far and discuss their implications for theory.

It would seem that much of the perceived effects of incentive contracts are realized through the recruiting of better employees. Consistent with traditional agency theory, contracts that offer steeper pay-performance relations (i.e., higher incentive power) attract commensurately better employees. These employees choose among incentive contracts based on their perception of their skill (Chow, 1983). If an individual believes he is well-skilled, he is more likely to enter into an employment contract that offers high-powered incentives. Indeed, his expected payoff under such contract will be higher than under a contract that offers a flat wage. In contrast, individuals with low ability will not choose for a contract with high-powered incentives since they will be worse off under such scheme. In equilibrium, the perceptions individuals have about their abilities should not be wrong. Not only will an employee's perception of his abilities be important when choosing among incentive contracts, also the attributes of the contract matter. In particular, as Waller and Chow (1985) claim, workers may base their contract selection on the perception that performance will be measured unidimensionally and accurately. Our results support this contention; we find strong evidence that performance measure properties matter when evaluating the selection effect of incentive contracts.

Once the selection effect of recruiting better employees is accounted for, incentive power does not seem to affect the effort of employees in the firm. However, the way in which the performance of employees is measured has a significant impact on the effort provided under an incentive contract. Noisy or distorted measures reduce the efficacy of having an incentive plan as suggested by our theory. This relation between performance measure properties and the effort effect of incentive contracts does not depend on the power of incentives provided under the contract.

In sum, we find that the properties of performance measures affect the efficacy of incentive contracts (in terms of effort delivered) twofold: directly and indirectly via their

influence on the selection of better employees. Incentive power, on the other hand, only impacts on the selection of employees and does not directly lead to more effort.

6. Conclusions

In this study we examine how incentive power and performance measure properties impact on the efficacy of incentive contracts in motivating employees to provide effort. Our theory predicts that high powered incentives will elicit more effort from employees. Theory also predicts that less noisy or distorted performance measures will increase effort under incentive contracts. Finally, the effect of performance measure properties on effort is conditional on the level of incentive power provided. Our evidence partially supports these predictions. We find that less noisy or distorted performance measures have a positive relation with the effort effect of incentive contracts. This relation does, however, not depend on the level of incentive power provided. Neither do we find that incentive power affects delivered effort directly. Instead, our findings show 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 offered to recruitees has a steep pay-performance relation, and more importantly, if the contracts has defined performance measures that have little noise or distortion. Our study emphasizes the importance of defining accurate performance measures in incentive contracts. Not only will good measures increase the efficacy of incentive contracts in motivating effort, but also will they enhance the selection of employees.

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 used employed four point Likert scales, i.e., scales without natural midpoint. Some of the questions asked in the survey were 'double barreled' and some constructs were measured with just one indicator. To some extent these are the inherent problems of using a secondary dataset. It should be noted that the PLS estimation procedure admits an assessment of the validity and reliability of our constructs. Overall, the statistics suggest that the constructs in this study are reliable, have modest amounts of measurement error and pass the tests for discriminant validity. Moreover,

PLS explicitly models and isolates sources of measurement error and allows relations to be adjusted for these errors (Barclay et al., 1995). Notwithstanding these, we acknowledge that the results should be interpreted with the data limitations in mind. Second, the survey measured 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 'hard' data. We cannot since the dataset we used does not allow us to establish the identity of the firms in the sample. Moreover, concerns about measurement error in perceptual constructs are at least somewhat mitigated by the aforementioned estimation procedures. Our results are consistent with theoretical predictions with regard to both performance measure properties and incentive power, it would seem unlikely that these results are completely driven by measurement error.

We leave for future research to provide theory and empirical evidence on the properties of performance measures examined here and on other dimensions that seem relevant. We could not disentangle the separate influence of distortion or noise in performance measures on incentive contracting, nor did we explicitly address the issue of using multiple measures (with each its own characteristics). It is likely that more detailed examination of these properties leads to additional insights.

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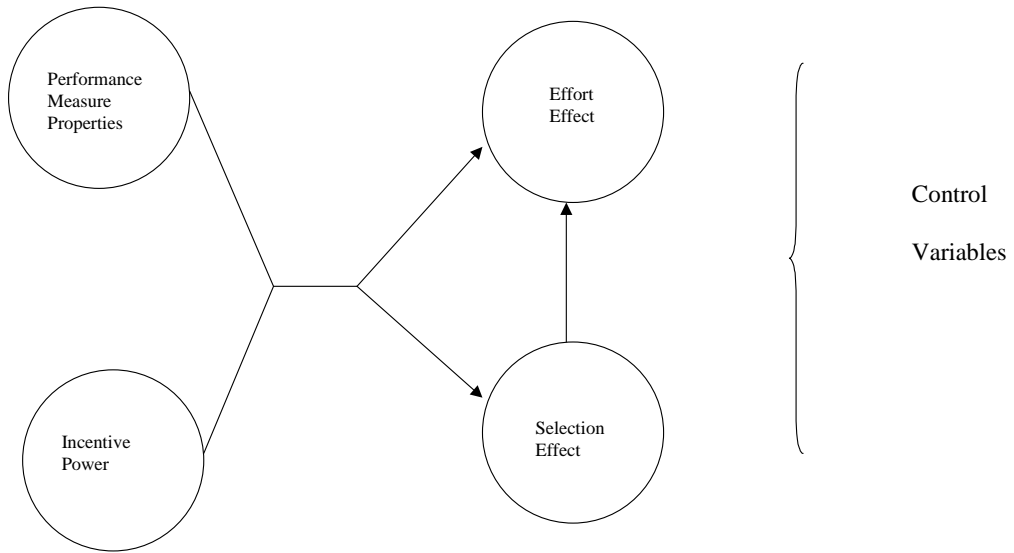
Figure 1: Conceptual model

Table 1 – Panel A

Descriptive statistics on the sample. Based on 151 observations. Respondents are CEOs of Dutch firms. Data from KPMG People Solutions 2001 Compensation practices survey.

	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%		
Plan coverage	Percentage of employees covered by incentive contracts	< 5%	5-25%	25-50%	>50%		
		16.0%	29.2%	6.3%	48.5%		

Table 1 – Panel B

Pearson correlations between latent variables. Based on 151 observations. Diagonal entries 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. Coefficient estimates above 0.16 are significant at the 5%-level.

	Composite Reliability Index	1	2	3	4	5	6	7	8	9	10
1. Effort effect	0.848	**0.727**									
2. Selection effect	0.833	0.553	**0.790**								
3. Incentive power	-	0.175	0.349	-							
4. Performance measure properties	0.814	0.437	0.406	0.228	**0.771**						
5. Size	-	-0.037	-0.016	-0.086	-0.173	-					
6. Plan coverage	-	0.132	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	0.867	0.449	0.466	0.252	0.383	-0.058	0.195	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	0.281	-0.043	-

Table 2

Results of Partial Least Squares analysis. Based on 151 observations. T-statistics in parentheses are based on bootstrapping (1000 samples with replacement). *,**,*** denotes significance at 10%, 5% and 1% level two-tailed, respectively. NP = no prediction.

Path from:	Predicted Sign	Path to:	
		Effort effect of incentive contracts	Selection effect of incentive contracts
		Multiple R2 = 0.3948	Multiple R2 = 0.4014
Endogenous variable:			
1. Selection effect of incentive contracts	+, not included	0.404 (4.24)***	
Test variables:			
2. Incentive power	+, +	-0.081 (0.95)	0.207 (2.56)***
3. Performance measure properties	+, +	0.207 (2.42)***	0.175 (1.99)**
4. Interaction of [2]•[3]	+, +	0.009 (0.10)	0.118 (1.34)
Control variables:			
5. Size	NP, NP	0.000 (0.01)	0.077 (1.14)
6. Plan coverage	+, +	-0.059 (0.68)	0.246 (3.25)***
7. Support of top management	+, +	0.013 (0.13)	0.107 (1.23)
8. Support of employees	+, +	0.192 (2.06)**	0.209 (2.29)**
9. Experience with plan	+, +	0.031 (0.45)	0.075 (1.06)
10. Industry dummy	NP, NP	0.038 (0.52)	0.016 (0.20)

Appendix 1.

Construct	Items	Mean	Std.
Effort effect of incentive contracts			
	The entrepreneurial spirit of employees has clearly improved.	2.57	0.60
	The performance of a substantial group of employees has improved.	2.41	0.59
	Our organization know clearly knows in which direction to steer the effort of employees.	2.61	0.67
	More than in the past, guiding employees towards desired behavior has been successful.	2.57	0.63
	Variable pay positively contributed to our firm's culture. Attaining better results and providing more effort is now perceived as important.	2.77	0.59
Selection effect of incentive contracts			
	We are a more attractive employer on the market.	2.49	0.62
	We recruited personnel whose attitude better fitted the organization.	2.54	0.66
	Our annual wage expense is better linked to the performance of the organization.	2.48	0.76
Performance measure properties			
	It is difficult to measure the performance of employees. [Note: noise]	2.68	0.73
	The probability of arbitrary performance evaluation is high. [Note: noise]	2.55	0.70
	The relation between organizational outcome and employee effort is difficult to establish. [Note: distortion]	2.73	0.76
Support of top management			
	Management is troubled by the implementation of the variable pay plan or does not support it sufficiently.	2.70	0.78
	Management finds it difficult to distinguish between employees when evaluating performance.	2.28	0.77
Support of employees			
	Most of the employees do not support the incentive plan.	2.92	0.68
	The incentive plan is much debated under employees and does not help to improve performance.	2.95	0.62
	The incentive plan does not fit in the organization's culture.	3.05	0.63