

## **DISCRETION AND THE COMPLEXITY OF SIMPLE INCENTIVE CONTRACTS**

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### **ABSTRACT**

In CEO incentive contracts, discretion by the board of directors is often present in one form or another. We argue that discretion can improve incentive contracting by addressing two important considerations: (1) risk reduction and (2) congruity improvement. We distinguish between discretion being applied in incentive contracts solely based on earnings (implicit earnings-based contracts) and discretion being applied in incentive contracts based on multiple measures (implicit multi-measure contracts). We argue that, in an earnings-based contract, the benefit of discretion is its ability to reduce risk by subjectively adjusting for uncontrollable factors and this benefit is more likely to be exploited the greater the noise in accounting earnings. In a multi-measure contract, the benefit of discretion is its ability to reduce noncongruity by subjectively weighting these measures ex-post and this benefit is more likely to be exploited the greater the difficulty of predicting the optimal course of action ex-ante. We therefore expect that, conditional on the use of only accounting information (accounting and nonaccounting information), the choice of implicit contracts is a positive function of accounting noise (environmental uncertainty). Finally, we expect that the ability to exploit the benefits of discretion depends on the knowledge of the board. The empirical results based on incentive contract data for 424 CEOs of U.S. public firms are consistent with our expectations.

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## **1. Introduction**

In this paper, we examine the determinants of different types of discretion in CEO incentive contracts. Firms use CEO incentive contracts to align the executive's interests with those of their owners. In these contracts, discretion by the board of directors is often present in one form or another. In observed business practice, there are multiple examples of important subjective components that add to objectively measured dimensions of managerial effort. For example, CEOs are often evaluated on qualitative aspects of the job such as leadership and innovation or the board can be deliberately vague ex-ante in how performance will be translated into rewards. In this paper, we focus on the latter type of discretion and in particular on: (1) the use of discretionary bonuses/adjustments in contracts solely based on earnings (implicit earnings-based contracts) and (2) the use of subjective weights in contracts based on multiple measures (implicit multi-measure contracts). In the context of these implicit contracts, we address the following two questions. First, what motives do boards have to write implicit contracts, and thereby condition bonus payments on their subjective evaluation of the extent to which ex-ante specified measures reflect an accurate picture of CEO performance? Second, do these motives for writing implicit contracts, as also the type of implicitness used, change with specific contract configurations and associated contracting problems?

There are two important considerations in designing incentive contracts, i.e., the risk premium to be paid to a risk averse agent and the extent to which the contract achieves congruence in objectives between the principal and agent. We argue that discretion can play an important role in incentive contracting by addressing the problems of risk and noncongruity. If a single performance measure is used, because it is a sufficiently perfect representation of the economic consequences of the agent's actions, then the remaining contracting problem is one of risk caused by performance measure noise (Feltham and Xie 1994). In this case, the principal can

apply discretion to subjectively adjust for the impact of uncontrollable factors and make the contract implicit, the benefits of which are increasing in the level of noise. If multiple performance measures are used, then an important contracting problem is how to weight these measures to assure congruity with the principal's gross payoff. One of the choices that need to be made in this respect is whether to fix these weights ex-ante or allow for discretion ex-post. The benefit of keeping the weights ex-ante implicit is that relevant pre-decision information that will only be observed after the contract has been signed can be subjectively incorporated in rewarding the CEO. This informational advantage is more prevalent the more uncertain the environment, because increased uncertainty makes it more difficult to ex-ante establish the optimal course of action.

The above arguments imply that, in a single-measure contract, the benefit of discretion is its ability to reduce risk by subjectively adjusting for uncontrollable factors and this benefit is more likely to be exploited the greater the noise in the single measure. We therefore expect that, conditional on the use of a single performance measure, the choice of implicit contracts is a positive function of performance measure noise. Further, in a multi-measure contract, the benefit of discretion is its ability to reduce noncongruity by subjectively weighting these measures ex-post and this benefit is more likely to be exploited the greater the difficulty of predicting the optimal course of action ex-ante. We thus expect that, conditional on the use of multiple performance measures, the choice of implicit contracts is a positive function of environmental uncertainty.

Despite the above-mentioned benefits, there are also costs associated with the use of implicit contracts, which explains why we do not observe implicit contracts all the time for all firms. Some of the costs relate to the mere use of implicit contracts, such as problems of renegeing, favoritism, and bias (e.g., Baker et al. 1994; Prendergast and Topel 1996; Moers 2005).

Other costs are subtler and relate to the extent to which the benefits of discretion can be exploited. In this paper, we focus on the latter type of costs, i.e., lack of benefits. In order for the implicit contract to be valuable, the discretionary adjustments should either lead to a reduction in risk or a reduction in noncongruity. We argue that the ability to achieve these reductions, and thus exploit the benefits of discretion, depends on the knowledge of the board of directors. The less knowledge the less able the board is in interpreting what they observe and thus the less likely the discretionary adjustments will improve incentive contracting. As a result, we expect that the impact of noise and environmental uncertainty on the use of implicit contracts is moderated by the monitoring knowledge of the board of directors.

To test our predictions, we use an extensive data-set based on compensation contract information retrieved from 1998-2002 SEC proxy statements. The data provide us with information on the performance measures specified for deriving annual bonuses and whether their application in the compensation decision is regulated implicitly or explicitly. In line with expectations, we find that the incidence of observing implicit contracts is positively related to (1) the noise in accounting earnings, once accounting measures are the sole performance measures used and (2) the extent of environmental uncertainty, once the firm combines accounting and nonaccounting measures. We further find strong evidence that monitoring knowledge of the board of directors moderates the impact of noise on implicit contracts, but only moderate evidence that it moderates the impact of environmental uncertainty. Finally, numerous robustness checks corroborate the above findings.

We contribute to the literature in several related ways. Despite the prevalence of discretion, there is only limited empirical evidence of its determinants. Most of the previous studies in this area empirically examine the existence or extent to which discretion is applied without distinguishing between different types of discretion (e.g., Murphy and Oyer 2003; Gibbs

et al. 2004; Ederhof 2007).<sup>1</sup> In a similar vein, even though previous research states that there are different types of benefits to using discretion (see e.g., Murphy and Oyer 2003), no attempt has been made to disentangle these benefits. We contribute to the literature by conceptually and empirically showing that different types of discretion create different types of benefits and that making this link is important. We further contribute to the literature by providing evidence that economic arguments underlie the use of discretion in incentive contracts. Previous research has been unable to show that economics arguments drive the use of discretion (e.g., Murphy and Oyer 2003; Gibbs et al. 2004). We show that, in addition to distinguishing different types of discretion, it is important to separate issues of risk from issues of uncertainty in incentive contract design. Finally, our study contributes by showing that the type of discretion applied is related to the choice of performance measures. That is, different types of discretion address different contracting problems and these contracting problems depend on the choice of performance measures.

The remainder of this paper is structured as follows. In section 2, we discuss the theory and develop the hypotheses. In section 3, we describe the sample selection, method, and variable measurement and in section 4 we discuss the empirical results. Finally, in section 5 we provide a conclusion.

## **2. Theory and Hypotheses**

### *2.1 Background*

Casual observation of actual practice indicates that accounting performance measures play an important, and often exclusive, role in CEO compensation decisions. Prior studies on incentive contracting document this widespread reliance on accounting numbers. For example, Bushman et

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<sup>1</sup> See for an exception, for example, Moers (2005).

al. (1996) and Said et al. (2003), report that more than 50% of their sample firms rely exclusively on accounting numbers in determining CEO bonuses. There are several reasons why accounting information is important in incentive contracting. First, accounting data are readily available for purposes other than incentives and are therefore relatively costless for incentive purposes. Further, accounting earnings are objectively measured, verifiable by third parties, and conservative in nature, all of which improve their usefulness for contracting (see e.g., Watts and Zimmerman 1986). In addition, Sloan (1993) argues that earnings can shield executives against market risk inherent in firms' stock prices. Finally, accounting earnings are highly aggregated, ultimately capturing the effects of all managerial actions, and are therefore valuable in addressing the delegation-incentive problem (Moers 2006).

Given the importance of accounting information, we focus on motives of boards of directors to deviate from explicit incentive contracts that are exclusively written on earnings and to introduce discretion in the performance appraisal process. We argue that discretion can improve incentive contracting by addressing two important considerations: (1) risk reduction and (2) congruity improvement (Feltham and Xie 1994). In doing this, we distinguish between discretion being applied in incentive contracts solely based on earnings, i.e., implicit earnings-based contracts, and discretion being applied in incentive contracts based on both accounting and nonaccounting information, i.e., implicit multi-measure contracts.

## *2.2 Implicit Earnings-Based Contracts*

If there is a contractible performance measure that is sufficiently congruent, i.e., a sufficiently perfect representation of the economic consequences of the agent's actions, then the sole use of this performance measure can direct the attention of the agent in the right direction. In settings where the CEO's actions have predominately contemporaneous performance effects rather than

future performance effects, accounting earnings can be thought of as sufficiently congruent. Explicit incentive contracts solely based on accounting information can then be effective, though not necessarily efficient. For discretion to improve incentive contracting, it needs to address the remaining contracting problem of risk reduction and thereby increase efficiency.

The potential inefficiency of earnings-based contracts centers on the noise in accounting earnings. The analytical literature indicates that supervisor discretion can be a solution to the noise inherent in objective performance measures. For example, Baker et al. (1994) show that contracts written on a noisy objective measure can be improved if the principal has (unverifiable) information about actual noise realizations and subjectively determines compensation based on that signal. Boards gain knowledge about uncontrollable and ex-ante non-contractible events that occur during the measurement period and that impact accounting earnings. If the board conditions rewards on this knowledge, through the use of discretionary bonuses, they can reduce the CEO's compensation risk.

Although discretion can reduce performance measure noise, this risk reduction benefit might be offset by an increase in risk caused by problems that can occur once discretion is allowed, such as renegeing, favoritism, and bias (Baker et al. 1994; Prendergast and Topel 1996; Moers 2005). As a result, discretion is more likely to improve incentive contracting the greater the benefits of reducing performance measure noise, and these benefits are greater the noisier the measure. Based on the above discussion, we state the following hypothesis.

H1: In earnings-based contracts, the use of discretionary bonuses is positively related to the noise in earnings.

### *2.3 Implicit Multi-Measure Contracts*

In case earnings are far from being sufficiently congruent, the addition of a more diverse set of performance measures can be optimal (e.g., Holmstrom 1979; Feltham and Xie 1994). Empirical evidence shows that the use of nonfinancial measures and subjective judgments are valuable when accounting numbers fail to immediately capture the effects of all important managerial actions (e.g., Bushman et al. 1996; Ittner et al. 1997; Banker et al. 2000; Gibbs et al. 2004). If boards decide to supplement earnings with alternative measures, a critical issue in contract design is the weighting of these measures (Banker and Datar 1989; Ittner et al. 2003). *Ceteris paribus*, the principal prefers a weighting scheme that minimizes distortions and makes the overall performance evaluation of the agent congruent with the principal's objective.

To achieve this, the principal has to decide to either use an objective, formulaic approach or leave the incentive weights on performance measures open to ex-post adjustment. While an objective formulaic approach avoids problems that can result from ex-post subjective evaluations, the rigidity of this approach can be problematic in uncertain environments. Fixing the weights ex-ante provides incentives for behavior that is not adaptive to changes in the environment. This is effective if the optimal course of action is known ex-ante, but can cause problems in fast changing environments where responsive actions are required (Demsetz and Lehn 1985). As a result, in an uncertain environment, the agent needs to take actions that are value enhancing but unknown ex-ante, which creates a demand for an incentive system that induces situation specific adaptive behavior.

The use of discretion in weighting different performance measures ex-post allows for this adaptive behavior. The board can, in their weighting decision, incorporate relevant pre-decision information that they observe after the contract has been signed. Given this incorporation, the agent has incentives to similarly incorporate this pre-decision information in his action choice in

a congruent way. In sum, the benefits of flexibility in using diverse measures to derive compensation are high when boards know important performance dimensions, but are uncertain as to what constitutes good performance and which (to what extent) CEO actions will affect firm value during the fiscal year. Accordingly, we state the following hypothesis.

H2: In multi-measure contracts, the use of implicit incentive weights is positively related to environmental uncertainty.

#### *2.4 Director Knowledge*

As noted before, the use of discretion in incentives provides the principal with the opportunity to let her personal preferences play a role in the compensation decision. As such, the mere use of discretion is costly. However, even if the principal is 'honest', discretion can be costly. These costs are subtle and relate to factors that limit or destroy the potential benefits of discretion. The benefits of discretion hinge on the accuracy of the observed unverifiable signal; the lower the accuracy of this signal the lower the benefits of using it to resolve contracting problems (Baker et al. 1994). Discretion can therefore be (too) costly if an honest and unbiased principal misinterprets performance data.

The probability that performance data is incorrectly interpreted is higher the less knowledge the board has. That is, a board that is characterized by a low monitoring knowledge might observe unverifiable signals, but be unable to correctly interpret what they are observing. In an earnings-based contract, this implies that the board can misinterpret the noise realizations and make discretionary adjustments that do not decrease compensation risk and might even increase compensation risk. In a similar vein, the board might misinterpret observed pre-decision information and choose incentive weights in a multi-measure contract that are inconsistent with the optimal action choice. Under rational expectations, these costs are taken into account in the

ex-ante contracting choice, which implies that an increase in noise (environmental uncertainty) is less likely to lead to an implicit earnings-based contract (multi-measure contract) the lower the monitoring knowledge of the board. As a result, we state the following two hypotheses.

H3<sub>a</sub>: In an earnings-based contract, the relationship between the use of discretionary bonuses and noise in earnings is less positive the less knowledgeable the board.

H3<sub>b</sub>: In a multi-measure contract, the relationship between the use of implicit incentive weights and environmental uncertainty is less positive the less knowledgeable the board.

### **3. Sample, Method and Variable Measurement**

#### *3.1 Sample selection*

Our analysis is based on CEO incentive contracts described in the compensation section of SEC Proxy Statements (DEF 14a). Proxy statements do not only provide information about specified performance measures but also whether boards of directors apply them in a formula or with subjective flexibility to derive compensation at the end of a fiscal year. Our sample consists of publicly listed firms included in EXECUCOMP without a change in the CEO position in the period from 1998 to 2002. Thereby, we obtain an initial sample of 2,895 observations for 579 firms across five years as mentioned.

The full sample initially reduces to 2,575 observations due to three sources of missing compensation-related information: lacking proxy information (63 obs.), companies not administering annual incentive programs (127 obs.), and missing indication of performance measures (130 obs.). We merge the remaining observations with stock market and financial statement data obtained from COMPUSTAT and CRSP, by firm and fiscal year, which reduces the sample to 2,073 observations due to missing information. Finally, missing board of directors'

information leads to the loss of additional 320 observations, resulting in a final sample size of 1,753, for 424 firms across five years in 11 different industries, as classified by two-digit SIC code.

Our main research interest lies in board motives for choosing inside two different performance measure constellations: implicit contracts with respect to (1) earnings and (2) multiple diverse measures. Therefore, we divide the initial sample into the two subsamples EARNINGS and DIVERSE. To determine these subsamples and to create the dependent variables of interest, all individual proxy statements were separately read by one of the authors and a research assistant. There were only a small number of differences in the classifications (approximately 5% of the sample), all of which were discussed with a second author and subsequently resolved.

The EARNINGS sample contains observations when the board bases (the explicit part of the) bonus entirely on earnings or an earnings-related measure. This sample (n=812) is derived by focusing on named performance measures such as “Earnings per Share”, “ROA”, “ROE”, or “Residual Income”, as well as the indicators for earnings being the only measure specified (“exclusively”, “only”, no appearance of other measures). The DIVERSE sample encompasses contracts in which boards employ a combination of earnings and alternative non-accounting measures (n=941). In addition to the mentioned earnings indicators, we search for words such as “Quality”, “Efficiency”, “Customer Satisfaction”, “New Product Development”, “Leadership”, and “Strategic Positioning”.

### *3.2 Dependent Variables*

To test the research hypotheses stated, two independent variables capture board discretion in performance measure application. We define a binary variable for discretion in each of the

subsamples EARNINGS and DIVERSE. In the subsample EARNINGS, we measure IMPL\_EARN as an indicator variable that takes on the value 1 if we identify a semantic structure that indicates that boards apply discretion in linking earnings performance to pay, and 0 otherwise. Examples of discretion include “[...], the bonus is not subject to a mathematical formula” and “[...] in awarding bonuses the board may, upon its sole discretion, increase or decrease bonus payments.”<sup>2</sup> In the sub-sample EARNINGS, the mean of the dependent variable IMPL\_EARN is 26.23 per cent (213 obs.).<sup>3</sup> Of those contracts that ex-ante disclose the option to use discretion, at least 33.33% actually exercise this option ex-post.<sup>4</sup>

In the subsample DIVERSE, we measure IMPL\_DIVERSE as an indicator variable that takes on the value 1 if boards leave relative weights on diverse measures implicit, and 0 otherwise. We search for semantic structures indicating boards not formulaically using diverse performance measures for bonus determination. Examples include “these factors were considered subjectively without specific weight to any item” and “in awarding bonuses, the board may choose among performance measures it considers important for assessing CEO performance”. We identify 751 observations (79.8%) where flexibility is applied in the use of diverse performance measures.

In Table 1, we provide a detailed overview of excerpts from proxy statements corresponding to compensation contracts in EARNINGS and DIVERSE and whether we code

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<sup>2</sup> A common practice of boards is the specification of earnings targets and resulting pay out schemes, which are characteristics of a formula bonus. Still, some boards explicitly indicate that they can overrule the formula outcome. In this case, the bonus is not court-enforceable and consequently implicit.

<sup>3</sup> The use of discretionary bonuses is obviously not restricted to earnings-based contracts. However, the incidence of discretionary bonuses in the DIVERSE subsample, i.e., in multi-measure contracts, is only 12.98% and is significantly lower than the incidence in the EARNINGS subsample ( $p < 0.01$  two-tailed). This observation is consistent with the argument that adding performance measures because they are informative can have risk reduction effects (e.g., Feltham and Xie 1994), which reduces the need for discretion for the purpose of risk reduction.

<sup>4</sup> This percentage is likely to be understated, given that firms do explicitly disclose when they exercise discretion to increase bonus payments, but refrain from doing so when they make downward discretionary adjustments. This observation signals that using ex-post measures of discretion can be problematic (see e.g., Ederhof 2007).

these contracts as implicit (IMPL\_EARN=1; IMPL\_DIVERSE=1) or formulaic (IMPL\_EARN=0; IMPL\_DIVERSE=0).

----- Insert Table 1 about here -----

### *3.3 Independent Variables*

*Noise.* We measure NOISE based on the variability in median 3-digit industry accounting returns over five years preceding the proxy data including the items ROA, ROE, and ROS. Principal component analysis reveals one factor with eigenvalue greater than unity. Higher fluctuations in accounting returns of the median firm in a respective industry are assumed to proxy the extent to which company performance is vulnerable to market fluctuations beyond a manager's control.

*Environmental Uncertainty.* Following Demsetz and Lehn (1985) and Core and Guay (1999), we proxy for the degree of environmental uncertainty by using return volatility. We measure the standard deviation of the residuals from a market-model, i.e., a regression of a firm's monthly stock returns on the CRSP value-weighted index estimated over period of 12-60 months prior to the proxy data. We subsequently apply logarithmic transformation of the standard deviation to arrive at our measure (UNCERTAINTY).

*Director Knowledge.* We measure the construct monitoring knowledge of Board of Directors by computing a factor score including board size, the proportion of busy outside directors, and the proportion of busy inside directors. Our arguments to include these items are as follows. Board size is presumed to be associated with less effective monitoring and difficulty in reaching consensus (Lipton and Lorsch 1992; Jensen 1993). The more difficult it is to reach consensus the more likely it is that discretion will be based on inaccurate signals. We include the proportion of busy outside directors (i.e. directors with three or more directorships) and busy inside directors (i.e. directors with two or more directorships) as they often adopt a "one solution

fits all” approach to exerting corporate control (Core et al. 1999). This approach is detrimental to the use of discretion because it lowers the ability of directors to correctly interpret performance data and hence will lead to assessments based on inaccurate signals. Principal component analysis reveals one factor with eigenvalue greater than unity. As director knowledge decreases with these measures, higher values of the factor score imply *less* knowledge (LO\_DIR\_KNOWLEDGE).

### *3.4 Control Variables*

In the analysis of the determinants of the use of discretion in earnings-based contracts, we control for firm size, the relative power of the CEO over the board of directors, industry, and year. In the existing literature, firm size has proxied for growth opportunities and the difficulties of monitoring an agent (Holthausen and Larcker 1991; Gaver and Gaver 1993; Bushman et al. 1996; Core et al. 1999). We measure firm size by the logarithm of firm sales measured in millions of Dollars (FIRM\_SIZE). We make no directional prediction with regard to the effects of firm size on the decision for implicit performance measure application.

We further control for the possibility that CEOs possessing power over the board of directors may prefer contracts that are not administered by a formula and are consequently less transparent to outsiders. In that way, CEOs can exercise their influence and “pick” those performance measures for bonus determination that reflect a favorable picture of his actions during the measurement period. We compute the CEO power measure (CEO\_POWER) as a three item factor score including an indicator variable for CEO duality, the proportion of outside

directors appointed by the CEO, and the proportion of inside directors appointed by the CEO.<sup>5</sup> Principal component analysis reveals one factor with eigenvalue greater than unity.

In the analysis of the determinants of the use of discretion in multi-measure contacts, we control for CEO equity incentives in addition to controlling for firm size and CEO power. Murphy and Oyer (2003) expect that the effects provided by ex-post flexibility in weighting performance measures may be similar to those provided by equity incentives, as the market ‘weights’ the consequences of CEO actions in setting the firm’s stock price. We measure the variable EQUITY\_INC by calculating the sensitivity of the CEO’s equity portfolio to price using the method described in Core and Guay (2002).

Table 2 provides summary statistics of all variables for the total sample and the sub-samples EARNINGS and DIVERSE. To control for potential effects of outliers, all continuous variables are winsorized at their 1<sup>st</sup>, 99<sup>th</sup> percentiles. Table 3 presents the Pearson correlations between the independent variables, none of which cause multicollinearity concerns.

----- Insert Table 2 about here -----

----- Insert Table 3 about here -----

### 3.5 Empirical Specification and Estimation Techniques

Based on the hypotheses and the above description of variables, we estimate the following equations:

$$(1) \quad P(IMPL\_EARN_i = 1 | EARNINGS = 1) = \alpha_0 + \alpha_1 NOISE_i + \alpha_2 LO\_DIR\_KNOWLEDGE_i + \alpha_3 NOISE_i \times LO\_DIR\_KNOWLEDGE_i + \alpha_4 CONTROLS_i + \varepsilon_i$$

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<sup>5</sup> Note that these items are the only three items that significantly load on the latent variable “CEOPOWER” in Ittner et al. (1997).

$$\begin{aligned}
& P(IMPL\_DIVERSE_i = 1 | DIVERSE = 1) = \alpha_0 + \alpha_1 UNCERTAINTY_i \\
(2) & + \alpha_2 LO\_DIR\_KNOWLEDGE_i + \alpha_3 UNCERTAINTY_i \times LO\_DIR\_KNOWLEDGE_i \\
& + \alpha_4 CONTROLS_i + \varepsilon_i
\end{aligned}$$

In estimating equation (1) and (2), we center NOISE and UNCERTAINTY at the mean and rescale LO\_DIR\_KNOWLEDGE in such a way that the main effect of NOISE (UNCERTAINTY) in equation (1) ((2)) reflects the impact of NOISE (UNCERTAINTY) for the highest observed level of director knowledge. Following our hypotheses, we expect the coefficient  $\alpha_1$  to be positive and  $\alpha_3$  to be negative in both equations.

We estimate equations (1) and (2) using three methods. First, we pool all observations and estimate a probit regression using firm-clustered standard errors. Second, we run annual probit regressions and calculate average coefficients and the corresponding Z-statistic. Finally, we use a bootstrapping procedure where we (1) randomly select a single observation for each firm, (2) estimate the probit regression for the randomly selected sample, (3) repeat this analysis for 1,000 random samples, and (4) estimate the average coefficients and corresponding bootstrapped confidence intervals.

## 4. Results

### 4.1 Main Analysis

Table 4 presents the probit regression results for the probability of discretion being applied in incentive contracts solely written on earnings. The results of the pooled sample are shown in Column three. We find that noise in accounting earnings (NOISE) exhibits a positive and significant relationship with the likelihood of using discretion in earnings-based contracts. We further find a negative and significant interaction effect of NOISE×LO\_DIR\_KNOWLEDGE. This indicates that the impact of noise on the probability of using discretion is less positive the

less the monitoring knowledge of the boards. All other independent variables have no significant effect on the probability of using discretion in earnings-based contracts.

Column four and five of Table 4 show the results for the annual probit regressions and the random sample probit regressions. The results are similar to those for the pooled sample with one notable exception. That is, in the annual regressions, `LO_DIR_KNOWLEDGE` has a significant negative effect on the probability of using discretion, which implies that, at the (sample) average level of noise in earnings, less knowledgeable boards are less likely to use discretion. It should, however, be noted that this result hinges on the assumption of independence between years.<sup>6</sup>

Overall, our results are consistent with the expectation that discretion in the application of earnings is more likely the noisier the accounting numbers, but that this likelihood is lower the less the monitoring knowledge of the board. The results thus provide strong support for hypothesis 1 and 3a.

---- Insert Table 4 about here ----

Table 5 reports the probit regression results for the likelihood of implicit incentive weights in incentive contracts based on both accounting and non-accounting information. The results of the pooled sample, shown in Column three of Table 5, show that our environmental uncertainty proxy (`UNCERTAINTY`) is positively associated with the probability of applying implicit incentive weights. Thus, the greater the uncertainty the more likely the use of implicit incentive weights, which is consistent with expectations. The interaction of environmental uncertainty and director knowledge (`UNCERTAINTY×LO_DIR_KNOWLEDGE`) is negative and significant, which is consistent with the expectation that the impact of uncertainty is less positive the less the monitoring knowledge of the board. Further, contrary to expectations,

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<sup>6</sup> Further analysis indicates that it takes approximately 3 independent years (out of 5) for the coefficient of `LO_DIR_KNOWLEDGE` to be significant.

EQUITY\_INC has a significant positive impact on using implicit weights, while the other control variables are not significant at conventional significance levels.

The results of the annual probit regressions and random sample probit regressions are presented in Column four and five, respectively. The results are similar to the pooled sample results with two notable exceptions. First, in the random sample probit regressions, the interaction UNCERTAINTY×LO\_DIR\_KNOWLEDGE is negative, but not significant. Second, in the random sample probit regressions, firm size has a significant positive effect on the probability of using implicit weights, which indicates that the overall monitoring environment is associated with implicit multi-measure contracts.

Overall, we find strong evidence that the value of implicit weights applied in multi-measure contracts increases with environmental uncertainty, but only moderate evidence that this effect is dependent on the monitoring knowledge of the board. The results thus provide strong support for hypothesis 2 and moderate support for hypothesis 3b.

---- Insert Table 5 about here ----

In sum, we provide evidence consistent with the argument that, in earnings-based contracts, discretion is used to reduce the risk imposed on the agent and that the ability to achieve this is conditional on the monitoring knowledge of the board. We further provide evidence consistent with the argument that, in multi-measure contracts, discretion is used to improve congruity in objectives between the principal and agent when it is difficult to ex-ante establish the optimal course of action. As a result, discretion improves incentive contracting through risk reduction and congruity improvement.

## *4.2 Robustness Checks*

In the previous analyses, we examined the choice of implicit contracts within two different subsamples without controlling for potential sample selection effects. Although it is unclear how this biases the results, if at all, we follow Heckman (1979) and include the Inverse-Mills-Ratio (IMR) from a sample selection model. In the following, we discuss several factors proposed in the literature to influence the use of diverse measures in incentive contracts (see e.g., Bushman et al. 1996; Ittner et al. 1997; Said et al. 2003). We include these factors in two selection models estimating why firms are included in the EARNINGS or DIVERSE sub samples. The IMRs resulting from the selection models are then used to correct for the possibility that a firm's choice of a specific implicit contract is also related to the likelihood of the firm choosing a specific performance measure configuration.

A firm's strategic configuration is an important determinant of how complete accounting earnings are in assessing managerial performance (Ittner et al. 1997). Following the defender-prospecter categorization proposed by Miles and Snow (1978), we expect earnings to be more informative for firms operating at the defender end of the continuum. We compute the construct STRATEGY as a three item factor score of a firm's market to book, employees to sales and R&D to sales ratios. We use averages of these ratios five years prior to the proxy data, where lower values imply firms being positioned near the defender end of the continuum.

The lengths of firm product development- and life cycles determine how well accounting earnings assess immediate effects of managerial long-term oriented actions. Using the National Academy of Engineering classification (1992) two indicator variables taking on the value of one if a firm is characterized as having long product development and -life cycles, respectively, are defined (D\_CYCLE; L\_CYCLE).

We also include the firm's financial stability using Altman Z-Scores (Altmann 1968) averaged five years prior to the proxy data (ALTMAN). Financially distressed firms need to emphasize financial measures to direct managerial focus to the improvement of short-term profits to ensure firm survival (Ittner et al. 1997). Finally, we include NOISE, EQUITY\_INC, CEO\_POWER, FIRM\_SIZE, and all variables of the second-stage not listed above.<sup>7</sup>

The results (not tabulated) of the selection model, excluding the unique second-stage variables, show that the incidence of multi-measure contracts is positively associated with STRATEGY and FIRM\_SIZE, and negatively associated with NOISE, which is consistent with previous research. Further, the results of the main analysis, presented in Table 4 and 5 remain unchanged after including the IMRs of the selection models. Overall, these results corroborate our previous inferences.

Further, we test whether our argument that specific factors lead to a preference for a specific type of discretion holds. More specifically, we argue that noise, not uncertainty, leads to discretion in earnings-based contracts to reduce risk, while uncertainty, not noise, leads to discretion in multi-measure contracts to reduce noncongruity. To test this, we examine whether our results for equation (1) in Table 4 (equation (2) in Table 5) are sensitive to the inclusion of UNCERTAINTY and UNCERTAINTY×LO\_DIR\_KNOWLEDGE (NOISE and NOISE×LO\_DIR\_KNOWLEDGE). The results from these regressions (not tabulated) lead to the same inferences as those discussed above. More importantly, UNCERTAINTY and UNCERTAINTY×LO\_DIR\_KNOWLEDGE (NOISE and NOISE×LO\_DIR\_KNOWLEDGE) have no significant effect in equation (1) ((2)).

In addition to the above robustness checks, we perform the following analyses:

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<sup>7</sup> The second stage is equation (1) for the analysis of implicit earnings-based contracts and equation (2) for the analysis of implicit multi-measure contracts.

- To test whether informativeness issues (also) explain the use of discretion in earnings-based contracts, we include STRATEGY, D\_CYCLE, L\_CYCLE, and ALTMAN as additional controls. The results (not tabulated) show that none of these informativeness proxies have a significant impact on the use of discretion in earnings-based contracts, while the results for all other variables are similar to those presented in Table 4.
- To further analyze the contradictory result that the use of equity incentives increases the use of implicit weights in multi-measure contracts, we examine whether this result is driven by less knowledgeable boards and/or powerful CEOs. We include the interaction terms EQUITY\_INC×LO\_DIR\_KNOWLEDGE and EQUITY\_INC×CEO\_POWER in the probit estimation of the use of implicit weights. The results (not tabulated) show that the interaction EQUITY\_INC×LO\_DIR\_KNOWLEDGE is positive and marginally significant ( $p < 0.10$  one-tailed), while the interaction EQUITY\_INC×CEO\_POWER is not significant. All other inferences are similar to those presented in Table 5. These findings indicate that the positive association between equity incentives and implicit weights is driven by less knowledgeable boards.
- To examine whether the million-dollar-tax-rule, which follows from Internal Revenue Code Section 162(m), affects the use of discretion and its disclosure within the proxy statement, we include a dummy variable that equals 1 if lagged salary plus bonus exceeds \$1 million and zero otherwise. The inclusion of this dummy variable in examining both the use of discretion in earnings-based contracts and the use of implicit weights in multi-measure contracts shows no significant effects. All other inferences are identical to those shown in Table 4 and 5.

## **5. Conclusion**

In CEO incentive contracts, discretion by the board of directors is often present in one form or another. In this paper, we examine what role discretion plays in these contracts and the factors that determine its use. Two important considerations in incentive contracting are the risk premium paid to a risk averse agent and the level of congruence achieved and we argue that discretion can play a role in addressing these considerations. First, discretion can be used to reduce the risk imposed on an agent by subjectively adjusting for uncontrollable factors. This role is especially important in a single-measure contract and increases in importance the higher the noise. Second, discretion can lead to a congruity improvement, a role which is especially important in multi-measure contracts. Discretion can lead to a congruity improvement by subjectively weighting the multiple performance measure ex-post, the benefits of which are higher the more uncertain the environment.

In the empirical analysis, we focus on contracts solely based on accounting earnings and contracts based on both accounting and non-accounting information. Our empirical results are in line with expectations and show that the use of discretion is positively related to (1) the noise in accounting earnings, once accounting measures are the sole performance measures used and (2) the extent of environmental uncertainty, once the firm combines accounting and nonaccounting measures. We further find that knowledge of the board of directors moderates the impact of noise and environmental uncertainty on implicit contracts.

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**TABLE 1**

Excerpts from compensation committees' reports included in proxy statements

**Panel A: Observations included in EARNINGS**

1. Explicit use of earnings (IMPL_EARN=0)	<b>Topps Co Inc</b> (proxy dated 05/26/2000) For fiscal 2000, bonuses were intended to reward achievements by the executive officers and were contingent upon the Company's financial performance during the year. The Company's Bonus Plan for fiscal 2000 was structured to reward executive officers for increases in the Company's operating profits.[...] Mr. Shorin's bonus for fiscal 2000 was determined entirely by reference to uniform, pre-established earnings targets that were developed for all senior executives at the beginning of the fiscal year.
2. Implicit use of earnings (IMPL_EARN=1)	<b>Sonic Corp.</b> (proxy dated 12/17/2001) The Company has adopted an incentive bonus plan, which covers all of the Company's executive officers, as well as other mid-level management personnel. Under the plan, the Compensation Committee measures the performance of the Company against an annual business plan prepared by management and reviewed and approved by the Board of Directors. Achievement of the earnings per share target set forth in the annual business plan may result in the payment of incentive payments equal to a percentage of the base salary of the covered officer. Under the plan, the committee may award up to 50% of the incentive payments if the Company achieves 85% of the annual business plan and may award up to 100% of the incentive payments as the percentage of earnings per share achieved increases from 85% to 100%. The plan also allows the committee to increase the incentive payments ratably to the extent the Company exceeds the earnings per share target. The committee has the discretion whether and in what amounts to award any incentive bonuses.

**Panel B: Observations included in DIVERSE**

1. Explicit weights on diverse measures (IMPL_DIVERSE=0)	<b>Actel Corp.</b> (proxy dated 04/08/2002) Under Actel's Executive Bonus Plan for 2001, incentive cash payments were based on Actel's revenues and profits, the achievement of corporate goals, and the growth of Actel relative to its principal competitors. The revenue and profitability objectives were established [...] so that the percentage achievement of each was determinable objectively at the end of the year. The corporate goals for 2001 included engineering, selling, and marketing objectives, which were weighted in the order indicated. The engineering objectives included silicon, software, and process goals. The selling objectives included sales and design-win goals. The marketing objectives included product launch and product planning goals. The revenue, profitability, and corporate goals were weighted differently under the Executive Bonus Plan for some executive officers, based on relevance to their positions, but had an aggregate weighting of 80% for all executive officers. The "competitive performance" objective accounted for the other 20%, and it was also determinable objectively at the end of the year.
2. Implicit weights on diverse measures (IMPL_DIVERSE=1)	<b>J &amp; J Snack Foods Corp.</b> (proxy dated 02/08/2001) Annual performance standards for each executive officer's area of responsibility are established by the Chief Executive Officer for other executive officers. In some cases, bonuses are linked primarily to achieving increases from the prior year's sales and/or earnings. In other cases, bonuses reflect a more subjective view of an individual's performance. The bonus for Mr. Shreiber was not linked to any specific formula. The Compensation Committee considers both the long term aspect of the Company's performance and year to year results. Among the items considered by the Committee were J & J's Sales, Operating Income, Operating Income as a percent of sales, Net Earnings, Earnings Per Share, Return on Equity and Stock Price. These items were reviewed for the previous year and for a five year period. The Committee also considers matters which are likely to have a long term impact on the Company but may not be reflected on the annual financial statements. The above factors were considered subjectively without specific weight to any item.

**TABLE 2**  
**Descriptive Statistics of Variables in the Total Samples and the Subsamples EARNINGS and DIVERSE.**

Variable	TOTAL SAMPLE (n=1,753)		EARNINGS (n=812)		DIVERSE (n=941)	
	MEAN	St. Dev.	MEAN	St.Dev.	MEAN	St.Dev.
IMPL_EARN	-	-	0.26	0.44		
IMPL_DIVERSE	-	-			0.80	0.40
NOISE	0.00	0.98	-0.11	0.89	0.10	1.04
UNCERTAINTY	-2.25	0.39	-2.24	0.36	-2.25	0.41
LO_DIR_KNOWLEDGE	0.00	0.99	-0.11	0.95	0.09	1.02
CEO_POWER	0.00	1.00	0.04	1.01	-0.04	0.99
EQUITY_INC	5.60	1.63	5.60	1.60	5.61	1.65
FIRM_SIZE	7.32	1.40	7.27	1.26	7.36	1.51

See Appendix A for variable measurement and definitions.

**TABLE 3**  
**Pearson Correlation Coefficients Between the Independent Variables (n=1,753)**

Variable	NOISE	UNCERTAINTY	LO_DIR KNOWLEDGE	CEO_POWER	EQUITY INC	FIRM SIZE
NOISE	<b>1.00</b>					
UNCERTAINTY	0.33*	<b>1.00</b>				
LO_DIR_KNOWLEDGE	-0.11*	-0.41*	<b>1.00</b>			
CEO_POWER	0.04	0.10*	-0.04	<b>1.00</b>		
EQUITY_INC	0.09*	0.08*	0.10*	0.36*	<b>1.00</b>	
FIRM_SIZE	-0.19*	-0.38*	0.56*	0.12*	0.37*	<b>1.00</b>

\* Denotes statistical significance at the 5% level or higher (two-tailed).  
See Appendix A for variable measurement and definitions.

**TABLE 4**  
**Probit Estimations of the Choice of Discretion in Earnings-Based Contracts**

Independent Variables	Predicted Sign	Pooled Sample (P-value)	Annual Samples (P-value)	Random Samples (P-value)
NOISE	+	0.311** (0.039)	0.572*** (0.000)	0.331*** (0.001)
LO_DIR_KNOWLEDGE	?	-0.090 (0.407)	-0.183** (0.047)	-0.064 (0.458)
NOISE×LO_DIR_KNOWLEDGE	-	-0.325*** (0.003)	-0.537*** (0.000)	-0.309*** (0.000)
CEO_POWER	?	0.050 (0.591)	0.047 (0.378)	0.027 (0.642)
FIRM_SIZE	?	-0.063 (0.552)	-0.062 (0.262)	-0.054 (0.380)
Industry dummies		Yes	Yes	Yes
Year dummies		Yes	-	Yes
Firm-clustering		Yes	-	-
Pseudo R <sup>2</sup>		4.2%	7.8%	6.6%
Sample size		812	152 – 186	185 – 207

\*\*\*, \*\* is statistically significant at the 1% and 5% level, respectively (one-tailed for predictions, two-tailed otherwise).

See Appendix A for variable measurement and definitions.

**TABLE 5**  
**Probit Estimations of the Choice of Implicit Weights in Multi-Measure Contracts**

Independent Variables	Predicted Sign	Pooled Sample (P-value)	Annual Samples (P-value)	Random Samples (P-value)
UNCERTAINTY	+	0.997** (0.024)	1.197*** (0.000)	1.203*** (0.001)
LO_DIR_KNOWLEDGE	?	-0.058 (0.525)	-0.047 (0.568)	-0.056 (0.608)
UNCERTAINTY× LO_DIR_KNOWLEDGE	-	-0.321* (0.097)	-0.476*** (0.001)	-0.323 (0.116)
EQUITY_INC	-	0.153** (0.011)	0.162*** (0.000)	0.172*** (0.001)
CEO_POWER	?	-0.026 (0.777)	-0.023 (0.661)	-0.058 (0.480)
FIRM_SIZE	?	0.033 (0.705)	0.012 (0.830)	0.098* (0.092)
Industry dummies		Yes	Yes	Yes
Year dummies		Yes	-	Yes
Firm-clustering		Yes	-	-
Pseudo R <sup>2</sup>		12.4%	15.3%	15.2%
Sample size		941	172 – 204	217 – 239

\*\*\*, \*\*, \* is statistically significant at the 1%, 5%, and 10% level, respectively (one-tailed for predictions, two-tailed otherwise).  
See Appendix A for variable measurement and definitions.

**APPENDIX A**  
**Variable Measurement and Definitions**

NOISE	The time series variability in median industry accounting returns measured five years prior to the proxy data. The ranked factor score is calculated using variability of (1) return on assets, (2) return on sales, and (3) return on equity. Noise in accounting numbers is assumed to increase with greater time series variability in industry returns.
UNCERTAINTY	The extent of environmental uncertainty the firm operates in. Measured as the time series variability of monthly stock returns 60 months prior to the proxy data.
LO_DIR_KNOWLEDGE	The board of directors knowledge, calculated as a ranked factor score including (1) board size, (2) the proportion of busy outside directors, and (3) the proportion of busy inside directors, higher values implying less knowledge.
CEO_POWER	CEO influence over the board of directors measured as a factor score of (1) the proportion of outside directors appointed by the CEO, (2) the proportion of inside directors appointed by the CEO, and (3) CEO duality.
FIRM_SIZE	Natural logarithm of total firm sales (mio. \$).
EQUITY_INC	The sensitivity of the CEO's equity portfolio to a 1% change in stock price.
STRATEGY	The firm's prospective strategy measured as a factor score of (1) the ratio of research and development to sales (2) the market-to-book ratio, and (3) the ratio of employees to sales.
L_CYCLE	A dummy variable that takes on the value of 1 if the firm is classified as having long term product life cycles, and 0 otherwise.
D_CYCLE	A dummy variable that takes on the value of 1 if the firm is classified as having long term product development cycles, and 0 otherwise.
ALTMANN	A variable accounting for the firm's degree of financial stability. Calculated using Altman's (1968) financial stability model, values below 1.8 implying a high likelihood of firm bankruptcy.