Managerial investment horizon and the role of performance measures*

Jan Bouwens
Tilburg University
CentER and Department of Accountancy
PO Box 90153, 5000 LE Tilburg, The Netherlands
+31 13 466 3252
j.bouwens@uvt.nl

Laurence van Lent
Tilburg University
CentER and Department of Accountancy
PO Box 90153, 5000 LE Tilburg, The Netherlands
+31 13 466 8288
vanlent@uvt.nl

preliminary and incomplete

First draft: February 2007

* We appreciate helpful comments from Peter Easton and Valeri Nikolaev.

Managerial investment horizon and the role of performance measures

Abstract

Using a sample of 66 business unit managers, we show that the horizon of these managers in the firm is associated with their investment spending. We then document how performance measures are employed to reduce the dependence of investment spending on the manager's horizon. We find that non-financial measures and disaggregated cost and revenue measures can be helpful to attenuate the relation between managerial horizon and investment spending. In contrast, we find that accounting return measures and stock-price related measures exacerbate horizon problems. We conjecture that performance measures which are forward looking help managers to internalize the firm's horizon. At the same time, if forward-looking measures reward "undelivered performance" too much, they will amplify instead of reduce the horizon problem. Our results suggest that stock price related measures, while very forward looking, over-reward undelivered performance and as such become less useful in mitigating horizon problems. Together with accounting return measures, we find that stock price measures are used more in response to longer firm planning horizons as the manager's horizon becomes longer (and the misalignment between the manager's and firm's horizons smaller).

JEL-code: D92; L22; M41
Keywords: performance measures, investments, horizon problem, division managers

Managerial investment horizon and the role of performance measures

1. Introduction

Despite many management and accounting studies that have looked at the effect on investments of horizon problems—i.e., opportunistic actions by managers who are about to leave the firm—the role of performance measures in mitigating these problems remains unclear (Dechow and Sloan 1991; Murphy and Zimmerman 1993; Cheng 2004). At least two reasons may account for this lack of understanding. First, previous studies have generally used CEO age to proxy for horizon (arguing that due to statutory retirement, CEOs over 61 are more likely to have a limited horizon within the firm). More importantly, most extant work focuses on the role of incentive compensation in mitigating horizon problems and ignores the question of how performance measures are used to promote desired behavior. In contrast, we use a survey-based measure of a manager's horizon and we therefore can identify short-term horizons in addition to those caused by pending retirement. Since we increase the precision of the horizon measure over that used in most earlier studies, we can conduct more powerful tests of our hypotheses. In addition, while we control for incentive compensation, we focus directly on a range of performance measures that are widely used in practice and investigate how their use is associated with investment behavior in a firm. As accountants are more often concerned with developing performance measures than with designing incentive compensation systems, our study may provide some balance to the preponderance of evidence on the latter and the scarcity of evidence on the former.

In a sample of 66 business unit managers, we address the following questions:

(i) How is a manager's horizon associated with the level of investment spending and is this association affected by the use of different types of performance measures?

(ii) How does the use of a specific type of performance measure depend on the planning horizon of the firm vis-à-vis the manager's horizon?

Our results show a strong positive association between a manager's horizon in the firm and future investment spending. As expected, managers who believe that they will continue to work in the same firm (but not necessarily in the same business unit) spend more on investments than managers with a short-term horizon. Perhaps more importantly, we document, consistent with other studies (e.g., Bouwens and van Lent 2007), a distinct use of the different performance measures we consider in our analysis. Our conjecture is that investment decisions should be made independent from the manager's horizon; performance measures, then, can be used to attenuate the association between horizon and spending. We show, in contrast, that stock price-related measures and accounting return measures (e.g., return on investments, economic value added) exacerbate the effect of a manager's horizon on investment spending. On the other hand, disaggregated (cost and revenue) measures and some non-financial measures appear to attenuate the effect of horizon on investments.

Consistent with these findings, we show that non-financial measures are used more as the planning horizon of the firm's investments increases. When a manager has a long horizon in the firm, however, the *horizon problem* becomes smaller, all other things equal, and firms use non-financial measures less. Stock price-related measures and accounting return measures are used more as the horizon problem becomes smaller, which suggests that these measures do not reduce the problem but are used in response to longer planning horizons only when there is no misalignment between the firm's and the manager's horizons.

Overall, these findings are consistent with the idea proposed in earlier theoretical work that forward-looking measures can be helpful in mitigating horizon concerns (Dikolli 2001). Stock-price related measures are generally believed to be forward-looking but our results for these performance measures cast doubt on their ability to relieve horizon problems. We suggest that one explanation for their relative poor performance in addressing horizon problems is that stock prices, in particular, capture "promised" performance, which has not yet been delivered. Rewarding managers for announcing investment projects while they may have left the firm by the time the project needs to be implemented may in fact amplify, not reduce investment distortions. In contrast, non-financial measures and disaggregated

measures are both forward-looking and rely less on "promised" performance. We surmise from the evidence that these measures can be used to reduce the misalignment between firm and manager horizon. Accounting return measures, finally, while much touted in literature as an ideal metric to resolve alignment problems appear to amplify investment distortions.

The importance of investment spending for the survival of a firm can scarcely be overestimated. Crucial is that firms are able to ensure that their investment spending is well-directed and not subject to opportunistic behavior by managers with a limited horizon in the firm. Performance measures are a key instrument to espouse appropriate behavior. And yet, extant research has all but ignored their role. We attempt to shed some first empirical light on the issues surrounding performance measurement and investment behavior when a manager's horizon is an issue.

2. Hypothesis development

A. The relation between management horizon and investment decisions

It is well-accepted in the economics literature that career concerns can distort investment decisions (e.g., Holmstrom and Ricart I Costa 1986; Stein 1988; Thakor 1990; Song and Thakor 2006). One particular concern is that managers sacrifice long-term interests in order to boost current profits. Reducing the investments required to innovate the product range or the manufacturing technology of the firm saves outlay costs in the short term, but can substantially damage the firm's growth and competitive position. The problem is that many of these investment projects, while positive NPV, need significant cash outlays at first (immediately harming the performance of a manager) while the benefits only accrue after some considerable time (Smith and Watts 1982). Should a manager expect to leave the firm before the benefits materialize then his incentives to commit to the investment project are low. Indeed, as Reichheld (1996) points out:

> "Managers who see little chance that they will still be with a company three or four years hence are less likely to invest in the future than to concentrate on highly measurable short-term accomplishments that will embellish their resumes." (p. 156-57)

Narayanan (1985b; 1985a) shows more formally that investment distortions are increasingly probable when the time between the initial investment outlay and the occurrence of the first positive cash flows becomes longer. This happens because when managers choose from projects which are of equal value to shareholders, they prefer those that pay back faster; this is because managers hope to enhance their reputation earlier, and boost their subsequent wages. Hirshleifer and Thakor (1992) argue that the incentives for managers to build their reputation distorts investment decisions in favor of relatively safe, low valued projects (which generate positive cash flows sooner).

Extant empirical evidence, usually focusing on CEOs, is generally consistent with the conjecture that managers with a short horizon reduce R&D spending (Dechow and Sloan 1991), although the evidence is not completely uncontested (Murphy and Zimmerman 1993). Some would argue that those with long-term horizons in the firm have, in fact, limited outside opportunities (Fama 1980) and prefer to enjoy "the quiet life" (Bertrand and Mullainathan 2003) by not investing in new projects. Long expected horizons in the firm then are an expression of managerial entrenchment and are unlikely to solve the investment distortion problem. Investment distortions may also arise when long-tenured managers become unwilling to change their behavior as new information arrives because responding might imply that their previous behavior was wrong (Prendergast and Stole 1996). Given these mixed predictions, we treat the relation between managerial horizon and investment spending as an empirical matter.

B. The role of performance measures in mitigating the horizon problem

Textbook authors often feel they have license to make sweeping statements: "Most accounting measures are short-term measures of performance. They all suffer from the 'horizon problem', whereby managers emphasize short-term performance at the expense of long-term returns" (Brickley, Smith and Zimmerman 1997, pg. 303). Similarly, Merchant and Bruns (1986) aver "Accounting earnings are poor measures of performance. The lack of understanding of this basic fact causes obvious and serious problems" (pg. 60). Notwithstanding the accounting profession's self-loathing, "(strategic) investment decisions,

which are likely to involve sizeable human capital risks and opportunities for the manager, need incentive alignment and control" (Holmstrom and Ricart I Costa 1986, pg. 857). Control implies the use of performance measures. In particular, from the firm's point of view investment decisions should not depend on the horizon of a business unit manager. We conjecture therefore that performance measures are employed to reduce the dependence of future investment spending on the manager's horizon.

The prevalence of accounting-based performance measures in practice is not surprising in view of recent theoretical work demonstrating that accrual-based performance measures can generate investment incentives that are less susceptible to horizon problems than are cash flow-based measures (Reichelstein 2000; Dutta and Reichelstein 2002). Some authors argue in particular in favor of using residual income measures to reduce investment distortions (Reichelstein 1997; Rogerson 1997; Dutta 2003; Dutta and Reichelstein 2003). This yields the following prediction:

H1: Increasing the use of accounting return measures attenuates the relation between managerial horizon and future investment spending.

Theory also supports the use of forward-looking performance measures to reduce horizon problems (Dikolli 2001; Sedatole, Cohen Kulp and Dikolli 2003; Dikolli and Vaysman 2006). The intuition is that forward-looking measures can be used to induce managers to better internalize the investment horizon of their principals. Market returns or other stock-price related measures are often considered (extremely) forward-looking because stock prices represent the present value of all future cash flows based on all information available to investors at the time (Lambert 2001). As such, these measures would appear to be ideally suited to overcome (at least partially) the horizon problem. However, stock prices reflect actions of managers that are expected, but not yet delivered. If managers can leave the firm before performance has materialized, using stock-based performance measures may exacerbate instead of reduce incentive problems (Barclay, Gode and Kothari 2000). Indeed, since managers have been compensated *in advance* for their investments based on stock price

performance there is little reason for them to stick around and actually implement the projects.

Non-financial measures are often argued to be more forward-looking than accounting performance measures (Ittner, Larcker and Rajan 1997; Ittner and Larcker 1998a; Banker, Potter and Srinivasan 2000; Ittner, Larcker and Randall 2003; Bryant, Jones and Widener 2004). The evidence is mixed, however. While some non-financial measures (e.g., customer satisfaction) appear to be associated with future profitability in some cases, others have no predictive value (Ittner and Larcker 1998b, 1998a, 2003; Sedatole 2003; Ittner and Larcker 2005). Clearly then, the category of non-financial measures needs to be further delineated to derive clear predictions.[1] We choose, somewhat arbitrarily, to use the well-known balanced scorecard classification of non-financial measures into: (1) customer, (2) internal processes, (3) markets, and (4) learning. This classification is useful because most managers are familiar with the balanced scorecard and its categories, which is helpful when collecting the data. In addition, textbook treatments of the balanced scorecard often assert that "learning" and "customer" measures in particular are forward-looking (with a long horizon). If forward-looking measures are indeed helpful to mitigate the horizon problem, then focusing on those measures that are generally believed to be the most forward-looking provides the more powerful test.

While less so than in the case of stock-price measures, non-financial metrics are also susceptible to the problem of capturing promised but not yet delivered performance. For example, managers may increase customer satisfaction (with the ultimate intention of raising profits) but whether this effort actually pays off remains to be seen. Again, there is a distinct possibility that managers leave their current position before the performance has been realized (if it ever is). In view of these conflicting arguments we do not make specific predictions about the role of stock price or non-financial measures. Our results should be informative about whether these forward-looking metrics attenuate the relation between managerial

[1] Bouwens and van Lent (2007) also comment on the need to provide more details on the crude category of "non-financial measures".

horizon and investment spending (if their forward-looking quality dominates) or if they are only effective when used to evaluate managers with longer horizons (when the "undelivered performance problem" dominates). We thus propose the following relations in null form:

$H2_0$: Increasing the use of stock price related measures does not affect the relation between managerial horizon and future investment spending.

$H3_0$: Increasing the use of non-financial measures does not affect the relation between managerial horizon and future investment spending.

In contrast, disaggregated accounting measures such as costs and revenues are more a measure of delivered performance (due to the accountant's application of the matching principle). At the same time, these measures have been averred to possess forward-looking properties (Bouwens and van Lent 2007). Consistent with this, Fairfield, Sweeney and Yohn (1996) document that disaggregating financial measures improves their association with future profitability. Since for these measures the tradeoff between "forward-looking qualities" and "undelivered performance" is likely resolved in favor of the former, we can provide a signed prediction:

H4: Increasing the use of costs and revenue measures attenuates the relation between managerial horizon and future investment spending.

We do not make predictions about the use of profit measures because our business unit managers are all routinely evaluated on profit measures (making it much less likely that the use of this measure is determined by horizon considerations).

C. Firm planning horizon, managerial horizon, and the use of performance measures

We now turn to the question whether the firm's planning horizon matters with respect to the type of performance measure used to evaluate managers. Our inquiry is motivated by our desire to further penetrate the firm's use of performance measures as a way to cope with a mismatch between firm and managerial horizons. Recall that horizon problems occur because the financial benefits of an investment project are not the same as the personal benefits of the manager who has to decide on the project. This misalignment becomes more pronounced as the expected positive cash flows are realized further in the future. Indeed, investment

spending will generally reduce the financial performance of a manager until such time as the new product can be successfully marketed or the new manufacturing process can be implemented.

Our analysis follows up on the conjecture in the previous section that some measures, while in principle useful for reducing horizon problems, may only be effective if the manager stays with the firm long enough. Note that we expect performance measures to affect the actions managers take (given their horizon); we do not believe that the managerial horizon itself changes owing to the use of different performance measures.

Thus, while investment projects with long planning horizons may call for the use of forward-looking measures that bring the future forward, this is only a viable practice when the manager's horizon is sufficiently long or when the measure in question does not rely too much on undelivered performance. At the same time, as the manager's horizon grows, its misalignment with the firm's horizon becomes smaller—and thus too the need for forward-looking measures. We treat this again as empirical issues because it is not a priori clear how much stock price and non-financial metrics are subject to the condition that they are only effective when used for managers with long horizons. We summarize this reasoning as follows:

$H5_0$: The relation between the firm's planning horizon for investment projects and the use of stock price-related measures is unaffected by the manager's horizon.

$H6_0$ The relation between the firm's planning horizon for investment projects and the use of non-financial measures is unaffected by the manager's horizon.

Since accrual based accounting measures do not suffer (as much) from the problem that performance has not yet been delivered, we expect the relation between disaggregate measures and firm planning horizon to become less positive as the manager's horizon increases. Longer managerial horizons imply less misalignment and therefore less need of forward looking measures. Similarly, we expect accounting return measures to be less

positively associated with investment uncertainty as the manager's horizon increases. We thus predict:

H7: A manager's horizon attenuates the relation between the firm's planning horizon for investment projects and the use of costs and revenue measures.

H8: A manager's horizon attenuates the relation between the firm's planning horizon for investment projects and the use of accounting return measures.

For completeness, we note that we do not make predictions about the use of profit measures for the same reason as before.

3. Sample, variable measurement, and model estimation

A. Sample selection

We use the client list of a major audit firm to obtain our sample of business unit managers from publicly listed firms. The client list contains names and addresses of *business unit* managers, a selection of whom we contacted directly to request their participation in the survey. Our procedure has two advantages. First, we are able to identify, without involvement of the parent firm, the managers we want to target in our survey. Since we approach the prospective respondents using the audit firm as an intermediary, we are much more likely to receive a willing audience. To be eligible for our sample, we require that business units have their own balance sheet. This ensures that the business unit manager is involved in investment decisions (a fact we later verify in our initial contact with the respondent). We also only include firms with more than one business unit. Applying these criteria yields an initial sample of 50 firms with together 301 business unit managers. Of these, 66 managers from 26 firms agreed to participate in the study. We only include multiple observations from one firm when the business units involved had little or no mutual relations (i.e., they did not report to the same manager nor was one unit the supplier of the other unit).

Surveys were administered by phone. Respondent received a package that contained the questionnaire and a cover letter that explained in broad terms the purpose of the research before the phone call was made. Phone interviews are less costly than site visits but have much of the same advantages. The researcher can verify that the respondent understands the

questions and can make sure that all questions are answered (minimizing missing data problems). Phone interviews also provide safeguards about having the intended respondent indeed answering the questions (as opposed to a junior staff member or an assistant).

Table 1, Panel A reports on the industry affiliations of our sample business units. The sample includes firms from both traditional and hi-tech manufacturing and from (financial) service industries. Compared to the population of firms with more than 100 employees (to proxy for our sample requirement that sample firms have more than one business unit), the sample contains relatively more manufacturing firms (population = 34%), fewer from the service industry (population = 57%) and about the same from financial services (population = 9%).

Panel B of Table 1 summarizes the characteristics of the respondents to the survey. Respondents are about 45 years of age on average (median = 46.5). The longevity of managers in the current business unit is 7.3 years on average (median = 5.0) and managers have about 4 years of experience in their current job (median = 2). Compared to their immediate superior, the respondents are less experienced in the firm (mean = -5.5 years) and in the industry (mean = -3.7 years).

B. Variable measurement

The Appendix contains an overview of all survey items and scales used in this study. The Appendix also has descriptive statistics of the items used to construct the composite variables based on the original scales and the associated Cronbach's alpha, a measure of internal consistency. Following the recommendations of Hair et al. (1998), we factor analyze all Likert-scale based survey items together to establish whether our sample exhibits a "clean factor structure". Items are standardized to have a mean of zero and standard deviation of unity before conducting the factor analysis. We also use factor analysis to establish the measurement properties of our composite variables. Untabulated findings support that our variables have good reliability and construct validity.[2] Where possible we use alternative measures to assess the convergent validity of our variables. We report on this and provide

[2] Details are available from the authors upon request.

more details on the measurement of the main and control variables next. Descriptive statistics on all variables included in this study are reported in Table 2, Panels A and B. Panel C of the table has the Pearson correlations between the variables.

Main variables

Managerial horizon in the *firm* and Managerial horizon in the *job*: We ask managers three related questions: to assign a probability to the possibility that they will be working for their current firm (1) five years from today, (2) ten years from today, and (3) more than 10 years from today. We then ask the managers to do the same for the possibility that they will be in their current job in each of these time spans. Finally, we ask managers about their age. When administrating the survey, we made sure no logically inconsistent answers were given. Factor analysis supports the construction of two variables: horizon in the *firm* and horizon in the *job*. Since we use Varimax rotation to create these two variables, we force them to be orthogonal. The "managerial horizon in the firm" variable, then, captures whether the respondent believes that his long-term future is in the firm (as opposed to on the outside market). Alternatively, one can think of this variable as capturing the likelihood that *upon leaving the current job* a manager continues to work in the firm. High values on these two composite variables indicate that the manager has a long horizon.

Expected investment spending on new products: We are interested in the amount the manager expects to spend on investments in new products or services in the next budget year (t+1). To reduce potential measurement error, we ask respondents to take investment spending two years ago (t-2) as their reference point and index this amount to 100. We then urge respondents to consult any internal reports or other company documentation they need to recollect the specifics and provide us with investment spending in t-1, t, and finally, t+1. By asking for a time series of actual investments, we anchor their prediction for next year's spending and reduce the chance of wholly unrealistic estimates. The expected investment spending (t+1) amount (divided by 100) is the value for our variable of interest.

Expected investment spending on new processes: Similarly, we ask managers to indicate (using index numbers) their past, present, and expected investment spending on new

processes. Again, the value of the index divided by 100 for next year's investment spending is the variable of interest. We measure spending on new processes for two reasons. First, we use two distinct, but related, measures of investment spending on innovative projects as mutual checks on construct reliability and validity. Second, prior work on investment spending in innovations usually recognizes product-related innovations and betterments of the manufacturing process (or the service provision process). By investigating both, we are able to provide a more complete picture of the horizon issues surrounding investment spending.

(Standardized) Average time to market for new products or services: We ask managers to report how many months pass on average between the decision to invest in the development of a new product or service and its introduction on the market. We standardize answers to have a mean of zero and standard deviation of unity. Not until a product or service is marketed can positive cash flows be expected. Therefore, this variable approximates the planning horizon of the firm. When it takes longer, on average, to put a new product on the market, we believe it is reasonable to assume that the firm's planning horizon is longer as well.

(Standardized) Average time to implementation for new processes: Likewise, we ask managers to report how many months go by, on average, between the decision to invest in the development of a new (manufacturing) process and its implementation in the business unit. Answers are again standardized to have a mean of zero and standard deviation of unity. This variable is an alternative proxy for firm planning horizon.

Weight on type of performance measure: We rely on an instrument described in Abernethy et al. (2004) to obtain estimates of the use of different types of performance measures for the periodic evaluation of the manager. We consider the following categories: (1) stock-price related measures, (2) non-financial measures, (3) profit measures, (4) revenue and cost measures, and (5) accounting return measures. We ask managers to assign a weight between 0% and 100% to each category. The assigned weight should correspond to the importance their *superior* attaches to the measure when evaluating their periodic performance. When managers indicate that their superior uses non-financial measures, we ask for further detail

about the weight placed on non-financial measures related to (1) processes, (2) market, (3) customer, and (4) learning.

Since some prior studies have suggested that the use of performance measures can depend on the decision-context in which they are applied (Ittner and Larcker 2001), we verify, as a validity check, whether the weight on performance measures differs for incentive payments (say, annual bonus) or longer-term career decisions. Untabulated findings suggest that the weight placed on a measure is qualitatively the same across decision context (t-tests of the mean weight on each measure show no significant differences). The findings of a correlation analysis support the convergent validity of our measure: the answers to the three decision contexts are highly correlated. Note that we carefully specify—in the question heading—the decision context we want the respondent to think of when answering (Ittner and Larcker 2001).

Control variables

Percentage incentive pay: We ask respondents to indicate what part of their total compensation depends on their performance. Specifically, this variable is computed as total performance-dependent pay (bonus, equity grants, stock options) divided by their fixed salary.

Information asymmetry: We rely on an 8-item instrument proposed by Dunk (1993), which asks respondents to compare their information about the work carried out in the business unit to that of their superior. Higher values on this variable indicate more information asymmetry between business unit managers and their boss. The composite variable is strongly correlated with respondent characteristics that are often believed to be related to information asymmetry (e.g., tenure in the current job, longevity in the firm or industry compared to the superior).[3] These (unreported) correlations support the convergent validity of our measure.

Competition: We use Khandwalla's (1972) 4-item instrument to capture the competitive environment of the business unit. Factor analysis suggests that we drop one item to ensure that the construct is unidimensional.

[3] Where possible, we use (convergent validity) questions that rely on "harder", more objective data in response to Ittner and Larcker's (2001) recommendation.

Growth opportunities: Following Abernethy et al. (2004), we ask managers to rate the growth opportunities of their business unit specifically and (more broadly) the industry in which they operate.

(Relative) Size: We take the logarithm of the number of full-time employees of a business unit as our measure of *Size*. We are also interested in the relative size of the business unit in the firm. We measure relative size as the average of (1) the percentage of business unit sales in total firm revenues and (2) the percentage of business unit assets in total firm assets.

Interdependencies: We follow Bouwens and Van Lent (2007) and measure the extent to which the work in a business unit is affected by other business units (and vice-versa) with a 3-item instrument. We demonstrate convergent validity of our composite measure of interdependencies by correlating the measure with two other variables taken from the survey. First, we ask respondents to provide the percentage of incoming goods or services that are sourced from other business units within the firm. Next, we also ask about the percentage of total outgoing goods or services provided to other business units within the firm. Each of these alternative measures captures one ("harder") dimension of dependencies existing within the firm: those following from the production function. Untabulated tests show that our composite measure is strongly associated with these alternative measures.

C. Model estimation

We have a sample of 66 business unit managers from 26 firms. Clearly, since we obtain more than one observation from the same firm, these observations cannot be considered independent draws from the population. Observations are clustered at the firm-level and simple ordinary least squares regressions produce inefficient estimates of the model's coefficients as well as biased standard errors (Petersen 2007). We use the generalized estimating equations (GEE) method to adjust for these adverse effects of clustering (Liang and Zeger 1986). GEE is an extension of the generalized linear model and is a special case of the generalized method of moments estimator in which no overidentifying restrictions are present; its advantage is that it can deal easily with heteroskedasticity and clustered observations (Zorn 2001).

4. Results

We present three sets of results. First, we establish a relation between investment spending and the managerial horizon. Next, we show how the relation between investment spending and managerial horizon is influenced by the use of different types of performance measures. Finally, we show how the use of different types of performance measures varies with the extent of the misalignment between the managerial horizon and the firm's planning horizon.

A. The relation between management horizon and investment decisions

We did not make a directional prediction about the relation between managerial horizon and investment spending. Indeed, theory avers that a longer managerial horizon can both increase and decrease investment spending. We distinguish in what follows between the manager's expected horizon in the *firm* (but not necessarily in his current business unit) and his horizon in the current *job*. Managers who expect to leave their current job soon are less likely to distort their investment decisions if they continue to work for the same firm. For example, it may hurt their reputation (and subsequent career) if the performance of a business unit sharply declines upon the departure of the manager. Alternatively, managers who expect to stay in their current job for a long time should have horizons which are well aligned with the planning horizon of the firm. On the other hand, such managers may also not be performing very well. Heading up a business unit is typically an intermediate stage in the career of managers and we would expect many of them to either leave the company for a position of more responsibility elsewhere or be promoted to the next level up in the hierarchy.

We use the following model for expected investment spending (in both products and processes),

$$Y_{it+1} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \sum_j \beta_j \times Controls_{jit} + \varepsilon_{it} \qquad (1)$$

where Y_{t+1} is the expected investment spending in new products (new processes) in year t+1, X_{1it} is *Managerial horizon in the current job*, and X_{2it} is *Managerial horizon in the firm*. *Controls* is a vector of control variables that includes *Information Asymmetry, Growth*

Opportunities, Competition, Relative Size of the Unit, and *Size*. Earlier work (Smith and Watts 1992) suggests these variables are likely associated with the investment opportunity set (and therefore with investment spending).

Table 4 presents the results of the GEE estimation of Equation (1). We first estimate two baseline models that include either the business unit control variables or the two managerial horizon variables. The Wald tests of these baseline models indicate that they are misspecified (model p-values>0.10) and we consequently discuss only the full model including both the business unit control variables and the managerial horizon variables of our ultimate interest. We find that *Growth Opportunities* are consistently positively and *Competition* is significantly negatively associated with investment spending. We also find that *Information Asymmetry* increases investment spending on new products, but not on new processes. Turning to the managerial horizon variables, we find that a manager's horizon in the firm is strongly positively associated with investment spending in both new products ($\hat{\beta}_2$ = 0.53; p<0.05) and new processes ($\hat{\beta}_2$ = 0.57; p<0.01). On the other hand, we find no evidence that a manager's horizon in the current job affects her investment spending. This suggests that what matters most in aligning interests between the manager and the firm (and in reducing investment distortion) is the expectation a managers has about his career in the firm. Managers who expect that they will leave their current job to obtain another position in the same firm invest more than managers who believe they will leave their job for a position elsewhere. The absence of a relation between a manager's horizon in the current job and investment spending, is consistent with the idea that managers with a long expected tenure in their current job are either of low ability or are entrenched and avoid investments to "enjoy the quite life."

B. The role of performance measures in mitigating the horizon problem

In our second set of results, we focus, for parsimony, only on the relation between *Managerial horizon in the firm* and investment spending. Our objective is to establish whether performance measures can overcome potential investment distortions caused by a difference

between the manager's and the firm's horizons. We use the following model to address this question,

$$Y_{it+1} = \beta_0 + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{2it} \times X_{3it} + \sum_j \beta_j \times Controls_{jit} + \varepsilon_{it} \quad (2)$$

where X_{3it} is the weight on a specific type of performance measure (i.e., on stock price-related, non-financial, profit, revenue and cost, or accounting return measures) and all other variables are as defined before. To facilitate the interpretation of the coefficients, we mean-center X_{3it} (recall that *Managerial horizon in the firm* (X_{2it}) already is a zero-mean variable). After mean centering, the coefficient β_2 represents the effect of managerial horizon on expected investment spending *for a firm with an <u>average</u> weight on a specific type of performance measure.* Likewise, β_3 is the effect of the weight on a specific type of performance measure on investment spending *for a manager with an <u>average</u> horizon in the firm* (Wooldridge 2000; Jaccard and Turrisi 2003). The interaction term $X_{2it} \times X_{3it}$ captures how the association between managerial horizon and investment spending changes by putting more weight on a performance measure. We evaluate the joint effect of using a performance measure (managerial horizon) on investment spending by conducting a Wald test on the restriction $\beta_3 = 0, \beta_4 = 0$ ($\beta_2 = 0, \beta_4 = 0$) (Wooldridge 2000). The Wald test takes into consideration that the effect of a performance measure (managerial horizon) on investment spending comes from two sources: via the simple effect β_2 (β_3) and via the interaction effect β_4. The latter captures how a performance measure affects the relation between managerial horizon and investment spending, while the former shows (for the average firm) the direct effect of a performance measure (manager horizon) on spending.

Estimation results of Equation (2) are in Table 5, Panel A. As before we report separate estimates for investment spending in new products and in new processes. Consistent with our earlier results, the Wald restriction tests of the joint effect of *Managerial horizon in the firm* suggest a strong association with expected investment spending in all specifications.

Evaluated for the average firm, a longer horizon in the firm increases investment spending; we interpret this as further evidence that investment distortions are smaller when a manager expects to stay in the firm longer. We also use the Wald restriction tests to assess which performance measures are associated with investment spending (directly or indirectly). The results of these tests suggest that stock price-related measures, non-financial measures and accounting return measures influence investments.

In hypothesis **H1**, we argue that accounting return measures attenuate the relation between manager's horizon and investment spending. In our model, this translates to the prediction that the coefficient on the interaction term ($\hat{\beta}_4$) is negative. In fact, we find the opposite (Column (5): $\hat{\beta}_4$ = 3.60, p<0.01; Column (10): $\hat{\beta}_4$=3.40, p<0.01). Hypothesis **H2** and **H3** are stated in the null form, because it is a priori unclear whether using forward-looking measures that may reward performance not yet delivered reduces or exacerbates the horizon problem. Hypothesis **H2** is about the use of stock price related measures. We find that increasing the weight on stock price-related measures makes the association between a manager's horizon and investment spending more positive (Column (1): $\hat{\beta}_4$=14.41, p<0.01; Column (6): $\hat{\beta}_4$=14.02, p<0.01). Non-financial measures, on the other hand, attenuate the relation described in **H3** between managerial horizon and investments in new processes, but not in new products (Column (2): $\hat{\beta}_4$=-1.26, p>0.10; Column (7): $\hat{\beta}_4$=-1.51, p<0.10). Since the category non-financial performance measures contains a diverse set of metrics, we further explore their relation with investment spending in the *Supplemental analyses* below.

Consistent with **H4** we find that increasing the weight on costs and revenue measures attenuates the relation between managerial horizon and future investment spending, although the evidence is limited to the context of innovations in new products (Column (4): $\hat{\beta}_4$=-2.03, p<0.10; Column (9): $\hat{\beta}_4$=-1.84, p>0.10).

For completeness, Table 5, Panel A also reports the results for the estimation of Equation (2) when X_{3it} is the weight on profit measures. Profit measures do not seem to influence future investment spending.

To summarize, we find considerable evidence that stock price-related measures and accounting return measures affect the relation between investment spending and a manager's horizon. Contrary to what theory suggests, however, it would seem that accounting return measures do not reduce but amplify the effect of the manager's horizon on investments. Not unexpectedly, stock price measures, while very forward looking, also increase the effect of the manager's horizon on investments. We ascribe this to stock prices being very much subject to the "undelivered performance problem." Non-financial measures are also forward looking but appear to suffer less in some contexts from the same problem and are then helpful in overcoming horizon problems. We undertake a closer analysis of this tentative conclusion next.

Supplemental Analyses. Instead of using the weight on non-financial measures as an independent variable, we use four more detailed categories as described in Section 3: (1) processes, (2) markets, (3) customer, and (4) learning. We then estimate Equation (2) for each of these more detailed non-financial categories and for both investment spending in new products and in new processes, as before. Under hypothesis **H3**, those measure categories that are likely to be more forward looking should reduce the association between managerial horizon and investment spending provided they do not reward undelivered performance too much. We find that process-related or market-related non-financial measures do not alter the relation between horizon and investments. More importantly, learning and customer measures appear to attenuate the association between horizon and investment spending. This effect is particularly pronounced for learning measures, which are arguably the most forward looking (Column (4): $\hat{\beta}_4$=-2.62, p<0.10; Column (8): $\hat{\beta}_4$=-3.27, p<0.05). Some authors have warned that introducing non-financial measures may distract managers from value-creating activities

as these measures give ambiguous signals. Our results suggest that such admonitions might underestimate the role of non-financial measures in reducing horizon problems.

C. Firm planning horizon, managerial horizon, and the use of performance measures

In our final set of tests, we investigate how changing the managerial horizon affects the relation between the firm planning horizon and the use of specific types of performance measures. We consider two proxies for firm planning horizon: (1) the average time to market for new products and (2) the average time to implementation for process innovations. We model the relation of interest as follows,

$$W_{it} = \gamma_0 + \gamma_2 X_{2it} + \gamma_3 TIME_{it} + \gamma_4 X_{2it} \times TIME_{it} + \sum_k \gamma_k \times PMControls_{kit} + \varepsilon_{it} \qquad (3)$$

where W_{it} is the weight on a specific type of performance measure (i.e., stock-price related, non-financial, profit, costs and revenues, or accounting return measures), $TIME_{it}$ represents the time to market for new products or the time to implementation for new processes, respectively, $PMControls$ is a vector of control variables that includes *Information Asymmetry, Growth Opportunities, Competition, Interdependencies, Size,* and *Relative Size of the Unit*. These control variables are motivated by earlier work on the determinants of the use of performance measures (Bushman, Indjejikian and Smith 1995; Ittner et al. 1997; Keating 1997; Abernethy et al. 2004; Bouwens and van Lent 2007). X_{2it} once again represents *Managerial horizon in the firm.* Similar to the earlier analysis, we mean-center $TIME_{it}$ and X_{2it}, which implies that γ_2 is the effect of managerial horizon on the weight on a specific type of performance measure for firms with an <u>average</u> time to market/implementation, while γ_3 is the effect of time to market/implementation on the weight on a specific type of performance measure for firms whose manager has an <u>average</u> horizon.

Table 6, Panel A summarizes the estimation results for Equation (3). We first test whether our proxies for firm planning horizon are associated with the weight on specific types of performance measures, either directly or indirectly. The Wald restriction tests show that average time to market does not significantly affect the weight on non-financial measures or

on accounting return measures (and we do not discuss these further). When using the alternate proxy "average time to implementation," all measures are affected by investment uncertainty.

For hypothesis **H5**, we find that increasing the manager's horizon renders the association between average time to market/implementation and the weight on stock price measures more positive (Column (1): $\hat{\gamma}_4$=0.008, p<0.01; Column (6): $\hat{\gamma}_4$=0.014, p<0.01). This suggests that stock price measures are more effective when used to evaluate managers with long enough horizons. We find, in contrast, for hypothesis **H6** that a manager's horizon attenuates the relation between average time to implementation and non-financial measures (Column (2): $\hat{\gamma}_4$=0.008, p>0.10; Column (7): $\hat{\gamma}_4$=-0.067, p<0.01). This implies that a change in firm planning horizon has a smaller (positive) effect on the use of non-financial measures when a manager's horizon is long than in case she expects to be in the firm for a short time. When managers have longer horizons, the misalignment between the manager's and the firm's horizon is smaller and consequently, firms have to rely less on forward-looking measures. Another way of looking at this is that the relation between non-financial measures and investment uncertainty is less sensitive to a manager's horizon (than stock price measures), presumably because non-financial measures do not capture as much undelivered performance.

We predict that the manager's horizon attenuates the relation between disaggregated measures (**H8**) and accounting return measures (**H9**) and firm planning horizon. We find, in contrast, that the relation between average time to implementation and accounting return measures becomes more positive as the managerial horizon grows (Column (5): $\hat{\gamma}_4$=0.001, p>0.10; Column (10): $\hat{\gamma}_4$=0.038, p<0.05). The relation between investment uncertainty and disaggregated measures, on the other hand, does not depend on the manager's horizon. However, the average firm uses disaggregated measures more in response to a longer firm planning horizon (Column (4): $\hat{\gamma}_2$=0.084, p<0.01; Column (9): $\hat{\gamma}_2$=0.051, p<0.05).

For completeness, Table 6 also reports on the question of how the relation between firm planning horizon and profit measures is affected by managerial horizon. We find no evidence of a horizon effect in this relation.

Supplemental analyses. We further investigate the role of the broad category of non-financial measures to tease out potential differences in the wide variety of available metrics. We estimate Equation (3) but replace the dependent variable by the weight on process-related, market, customer, and learning non-financial measures, respectively. As before we estimate Equation (3) using the two proxies for firm planning horizon described earlier. Table 6, Panel B summarizes the findings. Wald restriction tests suggest that there is no effect of firm planning horizon on the weight on each of the four non-financial measures when using average time to market as a proxy (and we do not discuss this proxy further). We find considerable evidence that the relation between average time to implementation and process-related non-financial measures is affected by a manager's horizon in the firm. It is not very surprising that process-related measures play a more important role when firm planning horizon is measured with a proxy that captures how long it takes for *process*-related innovations to be implemented. Similar results obtain, but somewhat weaker, for learning and customer measures. Our results suggest that the use of process, customer, and learning non-financial measures is lower in response to longer firm planning horizons when the manager's horizon in the firm is longer as well. These measures allow firms to cope with long firm planning horizons, but the use of forward looking measures becomes not as pressing when managers stay on longer in the firm, because their horizon will be much more aligned with that of the firm.

5. Discussion and conclusion

Many authors have voiced their concern about the potential distortions in investment decisions caused by managers who have a shorter horizon in the firm than their principals. Ideally, investments should be independent of the horizon of the manager who is making the decisions. We show first that in contrast to this ideal, future investment spending on innovations in new products on new processes is strongly influenced by the time a manager

expects to remain in the firm (but not necessarily in his current job). We then conjecture that firms use performance measures to mitigate the effect of managerial horizon on investment spending. We consider accounting return measures, which have been put forward as a metric that can overcome investment distortions. We also consider stock price related, non-financial, and disaggregated accounting measures. We argue that the latter three types of measures are forward looking which can help managers to better internalize the firm's investment horizon. At the same time, these measures suffer from the problem that they capture (in part) unrealized future performance and may therefore reward a manager for as yet undelivered performance. To the extent that forward-looking measures are not too much affected by the undelivered performance problem, they should contribute to reducing the association between managerial horizon and investment spending. Our findings show that non-financial and disaggregated measures, such as costs and revenues achieve this purpose. On the other hand, accounting return measures and stock-price related measures exacerbate the "horizon problem" and should therefore only be considered effective when used to evaluate managers who have a long horizon.

Subsequent tests in which we show directly how the use of different performance measures varies with the planning horizon of the firm's investments and a manager's horizon confirm these conclusions. While the use of non-financial measures in response to investment decisions appears to be relatively insensitive to the manager's horizon, the opposite holds true for accounting return measures and stock price-related measures. Only when the manager's horizon is long enough will firms increase the use of these measures in an effort to cope with investment uncertainty.

Our findings discombobulate some strong claims in the theoretical literature averring that accounting return measures reduce investment distortions and that forward-looking measures should be used in response to the horizon problem. We leave for future work to outline the reason why accounting return measures seem to fail to fulfill the role they are assigned in theory.

References

Abernethy, M. A., J. Bouwens and L. van Lent (2004). "Determinants of control system design in divisionalized firms." The Accounting Review **79**(3): 545-570.

Banker, R., G. Potter and D. Srinivasan (2000). "An empirical investigation of an incentive plan that includes nonfinancial performance measures." The Accounting Review **75**: 65-92.

Barclay, M. J., D. Gode and S. P. Kothari (2000). Earnings versus price changes: Delivered versus expected performance.

Bertrand, M. and S. Mullainathan (2003). "Enjoying the quiet life? Corporate governance and managerial preferences." Journal of Political Economy **111**(5): 1043-1075.

Bouwens, J. and L. van Lent (2007). "Assessing the performance of business unit managers." Working Paper, Tilburg University.

Brickley, J., C. W. Smith and J. Zimmerman (1997). "Management fads and organizational architecture." Journal of Applied Corporate Finance **10**(2): 24-39.

Bryant, L., D. A. Jones and S. K. Widener (2004). "Managing value creation within the firm: An examination of multiple performance measures." Journal of Management Accounting Research **16**: 107-131.

Bushman, R. M., R. J. Indjejikian and A. Smith (1995). "Aggregate performance measures in business unit manager compensation: The role of intrafirm interdependencies." Journal of Accounting Research **33**(Supplement): 101-127.

Cheng, S. J. (2004). "R&d expenditures and ceo compensation." Accounting Review **79**(2): 305-328.

Dechow, P. M. and R. Sloan (1991). "Executive incentives and horizon problem." Journal of Accounting & Economics **14**: 51-89.

Dikolli, S. S. (2001). "Agent employment horizons and contracting demand for forward-looking performance measures." Journal of Accounting Research **39**(3): 481-494.

Dikolli, S. S. and I. Vaysman (2006). "Contracting on the stock price and forward-looking performance measures." European Accounting Review **15**(4): 445-464.

Dunk, A. (1993). "The effects of budget emphasis and information asymmetry on the relation between budgetary participation and slack." The Accounting Review **68**(2): 400-410.

Dutta, S. (2003). "Capital budgeting and managerial compensation: Incentive and retention effects." Accounting Review **78**(1): 71-93.

Dutta, S. and S. Reichelstein (2002). "Controlling investment decisions: Depreciation and capital charges." Review of Accounting Studies **7**(2-3): 253-281.

Dutta, S. and S. Reichelstein (2003). "Leading indicator variables, performance measurement, and long-term versus short-term contracts." Journal of Accounting Research **41**(5): 837-866.

Fairfield, P. M., R. J. Sweeney and T. L. Yohn (1996). "Accounting classification and the predictive content of earnings." The Accounting Review **71**(3): 337-355.

Fama, E. F. (1980). "Agency problems and the theory of the firm." Journal of Political Economy **88**: 288-307.

Hair, J. F., R. E. Anderson, R. L. Tatham and W. C. Black (1998). Multivariate data analysis. Upper Saddle River, NJ, Prentice Hall.

Hirshleifer, D. and A. V. Thakor (1992). "Managerial conservatism, project choice, and debt." Review of Financial Studies **5**(3): 437-470.

Holmstrom, B. and J. Ricart I Costa (1986). "Managerial incentives and capital management." Quarterly Journal of Economics **101**(4): 835-860.

Ittner, C. D. and D. F. Larcker (1998a). "Are nonfinancial measures leading indicator of financial performance? An analysis of customer satisfaction." Journal of Accounting Research **36**(Supplement): 1-35.

Ittner, C. D. and D. F. Larcker (1998b). "Innovations in performance measurement: Trends and research implications." Journal of Management Accounting Research **10**: 205-238.

Ittner, C. D. and D. F. Larcker (2001). "Assessing empirical research in managerial accounting: A value based management perspective." Journal of Accounting and Economics **32**(1): 349-410.

Ittner, C. D. and D. F. Larcker (2003). "Coming up short on nonfinancial performance measurement." Harvard Business Review(November): 88-95.

Ittner, C. D. and D. F. Larcker (2005). Moving from strategic measurement to strategic data analysis. Controlling strategy: Management, accounting, and performance measurement. C. S. Chapman. Oxford, Oxford University Press.

Ittner, C. D., D. F. Larcker and M. V. Rajan (1997). The choice of performance measures in annual bonus contracts. The Accounting Review. **72:** 231-256.

Ittner, C. D., D. F. Larcker and T. Randall (2003). "Performance implications of strategic performance measurement in financial services firms." Accounting, Organizations and Society **28**(7): 715-742.

Jaccard, J. and R. Turrisi (2003). Interaction effects in multiple regression. Thousand Oaks, Sage Publications.

Keating, A. S. (1997). "Determinants of divisional performance evaluation practices." Journal of Accounting and Economics **24**: 243-274.

Khandwalla, P. (1972). "The effect of different types of competition on the use of management controls." Journal of Accounting Research **10**(2): 275-285.

Lambert, R. A. (2001). "Contracting theory and accounting." Journal of Accounting and Economics **32**: 3-87.

Liang, K.-Y. and S. L. Zeger (1986). "Longitudinal data analysis using generalized linear models." Biometrika **37**(1): 13-22.

Merchant, K. A. and W. J. Bruns (1986). "Measurements to cure management myopia." Business Horizons **29**(3): 56-64.

Murphy, K. J. and J. L. Zimmerman (1993). "Financial performance surrounding ceo turnover." Journal of Accounting & Economics **16**(1-3): 273-315.

Narayanan, M. P. (1985a). "Managerial incentives for short term results." Journal of Finance **40**(5): 1469-1484.

Narayanan, M. P. (1985b). "Observability and the payback criterion." Journal of Business **58**(3): 309-323.

Petersen, M. A. (2007). Estimating standard errors in finance panel data sets: Comparing approaches. Working-paper, Northwestern University.

Prendergast, C. and L. Stole (1996). "Impetuous youngsters and jaded old-timers: Acquiring a reputation for learning." Journal of Political Economy **104**(6): 1105-1134.

Reichelstein, S. (1997). "Investment decisions and managerial performance evaluation." Review of Accounting Studies **2**: 157-180.

Reichelstein, S. (2000). "Providing managerial incentives: Cash flows versus accrual accounting." Journal of Accounting Research **38**(2): 243-269.

Reichheld, F. F. (1996). The loyalty effect. Boston, MA, Harvard Business School Press.

Rogerson, W. (1997). "Intertemporal cost allocation and managerial investment incentives: A theory explaining the use of economic value added as a performance measure." Journal of Political Economy **105**: 770-795.

Sedatole, K. L. (2003). "The effect of measurement alternatives on a nonfinancial quality measure's forward-looking properties." Accounting Review **78**(2): 555-580.

Sedatole, K. L., S. Cohen Kulp and S. S. Dikolli (2003). The role of ceo and investor horizons in the contracting use of forward-looking performance measures. Harvard NOW Working-paper 03-35.

Smith, C. W. and R. L. Watts (1982). "Incentive and tax effects of executive compensation plans." Australian Journal of Management **7**(2): 139-157.

Smith, C. W. and R. L. Watts (1992). "The investment opportunity set and corporate financing, dividend and compensation policies." Journal of Financial Economics **32**: 263-292.

Song, F. H. and A. V. Thakor (2006). "Information control, career concerns, and corporate governance." Journal of Finance **61**(4): 1845-1896.

Stein, J. C. (1988). "Takeover threats and managerial myopia." Journal of Political Economy **96**(1): 61-80.

Thakor, A. V. (1990). "Investment "myopia" and the internal organization of capital allocation decisions." Journal of Law, Economics and Organization **6**(1): 129-154.

Wooldridge, J. M. (2000). Introductory econometrics: A modern approach, South-Western College Publishing.

Zorn, C. J. W. (2001). "Generalized estimating equation models for correlated data: A review with applications." American Journal of Political Science **45**(2): 470-490.

T A B L E 1

Summary Statistics on Sample Firms and Respondents

Panel A: Industry classification of sample firms		
Industry:	Frequency	Cumulative frequency (in %)
Food and Beverages	10	16%
Chemicals, plastics and non-metallic minerals	10	32%
Metal and machine shops	3	35%
Computers, electronic components and electric products	17	61%
Miscellaneous manufacturing	7	71%
Wholesale and retail	5	79%
Financial services	7	89%
Other services	7	100%

Panel B: Respondent characteristics					
Variable:	**Mean**	**Std. dev.**	**Q1**	**Median**	**Q3**
Longevity in unit	7.3	6.9	2.0	5.0	12.0
Tenure in current job	3.8	4.3	2.0	2.0	5.0
Longevity in firm compared to superior [*]	-5.5	12.1	-10.0	-7.0	0.0
Longevity in industry compared to superior [*]	-3.7	13.3	-10.0	-5.0	5.0
Age	45.3	8.0	38.0	46.5	51.0

[*] A minus sign denotes that the respondent's longevity is shorter than that of his/her superior.

Based on a sample of 66 observations. Data source: survey among managers of business units.

T A B L E 2
Summary Statistics on All Variables

Panel A: Descriptive statistics on all variables				
Variable:	**Mean (Std. Dev.)**	**Q1**	**Median**	**Q3**
Expected investment expense in new products	1.47 (1.19)	1.00	1.10	1.50
Expected investment expense in new processes	1.49 (1.25)	1.00	1.10	1.25
Interdependencies	0.00 (0.80)	-0.70	0.11	0.68
Information asymmetry	0.00 (0.91)	0.58	0.17	0.74
Competition	0.00 (0.76)	-0.43	-0.07	0.54
Growth opportunities	0.00 (0.88)	-0.40	0.09	0.53
Manager's horizon in firm	0.00 (0.94)	-0.66	-0.22	0.75
Manager's horizon in job	0.00 (0.96)	-0.43	-0.35	0.05
Standardized average time to market for new products	0.00 (1.00)	-0.56	-0.28	-0.01
Standardized average time to implementation for new processes	0.00 (1.00)	-0.75	-0.22	0.32
Percentage incentive pay	0.37 (0.24)	0.25	0.30	0.40
Absolute size of the unit (log)	5.98 (1.66)	4.71	5.99	7.31
Relative size of the unit	0.11 (0.12)	0.04	0.10	0.15

Based on a sample of 66 observations. Data source: survey among business unit managers. Details on the items included in composite variables are in the Appendix.

T A B L E 2 – *Continued*

Panel B: Descriptive statistics on the weight on specific types of performance measures		
Decision context:	**PERIODIC PERFORMANCE EVALUATION**	
Performance metric:	Mean (Std. dev.)	Range (Median)
Stock-price related measures	1.4 (4.5)	[0-30] (0.0)
Non-financial metrics – Processes	5.2 (7.9)	[0-45] (1.5)
Non-financial metrics – Market	4.6 (6.6)	[0-30] (0.0)
Non-financial metrics – Customer	5.8 (8.1)	[0-40] (2.8)
Non-financial metrics – Learning	3.7 (6.0)	[0-26] (0.0)
Profit measures	42.8 (27.9)	[0-100] (40.0)
Revenue and cost measures	20.0 (21.1)	[0-100] (20.0)
Accounting return measures	13.5 (17.1)	[0-90] (5.00)

T A B L E 3 – *Continued*

Panel C: Pearson correlations between all variables																	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1. Stock price related measures																	
2. Non-financial measures	-0.10																
3. Profit measures	-0.15	**-0.50**															
4. Revenue and cost measures	0.00	-0.06	**-0.54**														
5. Accounting return measures	0.14	-0.17	**-0.31**	-0.20													
6. Expected investments in new products	**0.52**	-0.21	-0.08	-0.09	**0.40**												
7. Expected investments in new processes	**0.48**	-0.21	-0.12	-0.09	**0.43**	**0.95**											
8. Interdependencies	-0.09	*0.25*	0.03	0.17	**-0.46**	**-0.34**	*-0.31*										
9. Information asymmetry	0.02	-0.19	0.17	-0.04	0.03	**0.32**	*0.26*	-0.04									
10. Competition	-0.12	-0.07	**0.42**	-0.09	-0.21	*-0.30*	**-0.33**	*0.30*	-0.05								
11. Growth opportunities	0.15	*-0.25*	0.21	-0.15	0.12	**0.43**	**0.37**	-0.15	*0.28*	0.11							
12. Manager's horizon in *firm*	**0.33**	-0.21	0.03	-0.03	0.17	**0.57**	**0.57**	*-0.26*	0.17	-0.13	0.17						
13. Manager's horizon in *job*	0.06	0.03	-0.11	0.14	0.01	-0.06	-0.11	-0.16	0.10	0.15	-0.07	0.02					
14. Time to market for new products	0.18	0.05	**-0.31**	0.24	0.16	0.12	0.14	-0.16	-0.17	-0.14	0.04	0.10	-0.20				
15. Time to implementation new processes	0.19	0.17	**-0.40**	0.19	0.18	**0.37**	**0.46**	-0.07	-0.01	*-0.25*	0.13	0.12	-0.17	**0.62**			
16. % incentive pay	-0.07	0.10	0.04	-0.20	-0.09	-0.16	-0.17	-0.01	-0.12	-0.09	0.17	-0.23	-0.09	-0.03	-0.08		
17. Absolute size of the unit	-0.11	0.07	0.18	*-0.24*	-0.01	**-0.33**	*-0.30*	0.15	-0.16	0.23	-0.01	**-0.33**	*-0.27*	0.20	-0.03	**0.62**	
18. Relative size of the unit	0.01	0.13	*-0.30*	0.14	0.15	-0.02	-0.06	0.06	-0.15	0.00	-0.09	0.02	**0.33**	-0.07	-0.05	0.16	0.11

Bold (*italics*) indicates p-value<0.01 (<0.05).

T A B L E 4

Generalized Estimating Equations (GEE) Regressions of the Determinants of the Expected Investment Expense of the Business Unit

	INVESTMENTS IN NEW PRODUCTS			**INVESTMENTS IN NEW PROCESSES**		
Variables:	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	2.16*** (0.49)	1.47*** (0.22)	1.76*** (0.37)	2.08*** (0.52)	1.49*** (0.25)	1.67*** (0.43)
Business unit characteristics:						
Information asymmetry	0.19** (0.10)		0.16** (0.07)	0.13 (0.11)		0.10 (0.12)
Growth opportunities	0.64* (0.37)		0.53** (0.22)	0.61 (0.39)		0.48** (0.23)
Competition	-0.55* (0.32)		-0.47** (0.22)	-0.63* (0.37)		-0.52** (0.27)
Relative size of the unit	0.91 (0.81)		0.74 (0.61)	0.33 (0.97)		0.20 (0.67)
Absolute size of the unit	-0.07 (0.05)		-0.02 (0.06)	-0.02 (0.06)		0.02 (0.07)
Percentage incentive pay	-1.03 (0.67)		-0.73 (0.48)	-1.28 (0.80)		-0.92 (0.61)
Manager's prospects:						
Manager's horizon in *job*		-0.09 (0.10)	-0.07 (0.11)		-0.17* (0.09)	-0.10 (0.09)
Manager's horizon in *firm*		0.73* (0.44)	0.53** (0.23)		0.76* (0.41)	0.57*** (0.23)
Wald test model (p-value)	7.26 (0.30)	3.45 (0.17)	16.90 (0.03)	8.14 (0.23)	3.53 (0.17)	50.24 (<0.01)

Based on 66 observations. Variable definitions are in Appendix 1. Robust standard errors are in parentheses (adjusted for clustering caused by including multiple business unit observations per firm). Data are from a survey among business unit managers. ***, **, * denotes significance at the 1%, 5%, and 10% (two-tailed) levels respectively.

T A B L E 5

Generalized Estimating Equations (GEE) Regressions of the Weight on Performance Measure Type and a Manager's Horizon in Firm onto the Expected Investment Expense of the Business Unit

Panel A: Main analysis using the weight on stock price-related, non-financial, profit, costs and revenues, and accounting return measures										
	INVESTMENTS IN NEW PRODUCTS					**INVESTMENTS IN NEW PROCESSES**				
Variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
[A] Manager's horizon in *firm*	0.23*** (0.06)	0.53*** (0.19)	0.52*** (0.22)	0.47*** (0.18)	0.29*** (0.08)	0.29*** (0.09)	0.56*** (0.18)	0.56*** (0.21)	0.51*** (0.17)	0.33*** (0.09)
[B] Weight on:										
Stock price-related metrics	6.33*** (1.29)					5.54*** (1.63)				
Non-financial metrics		-0.55 (0.72)					-0.77 (0.82)			
Profit metrics			-0.32 (0.34)					-0.43 (0.38)		
Cost and revenue metrics				-0.36 (0.41)					-0.48 (0.44)	
Accounting return metrics					1.11 (0.87)					1.52 (1.08)
Interaction **[A]•[B]**	14.41*** (3.11)	-1.26 (0.90)	-0.41 (0.62)	-2.03* (1.14)	3.60*** (0.83)	14.02*** (3.89)	-1.51* (0.81)	-0.41 (0.60)	-1.84 (1.22)	3.40*** (0.69)
BU characteristics controls	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Wald test model (p-value)	775.45 (<0.01)	28.14 (<0.01)	13.45 (0.06)	20.22 (<0.01)	102.45 (<0.01)	1215.95 (<0.01)	114.09 (<0.01)	55.18 (<0.01)	55.22 (<0.01)	393.93 (<0.01)
Wald test on Joint effect "Manager's horizon in *firm*" (p-value)	23.47 (<0.01)	12.56 (<0.01)	6.00 (0.05)	8.44 (0.01)	23.34 (<0.01)	21.91 (<0.01)	12.55 (<0.01)	7.10 (0.03)	10.34 (<0.01)	28.49 (<0.01)
Wald test on Joint effect "Weight on performance measure type" (p-value)	26.86 (<0.01)	4.44 (0.11)	0.93 (0.62)	3.35 (0.19)	19.36 (<0.01)	16.56 (<0.01)	10.24 (<0.01)	1.32 (0.52)	2.28 (0.32)	26.18 (<0.01)

T A B L E 5 – *Continued*

Panel B: Supplemental analyses on different types of non-financial measures								
	INVESTMENTS IN NEW PRODUCTS				INVESTMENTS IN NEW PROCESSES			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
[A] Manager's horizon in *firm*	0.67** (0.30)	0.62** (0.30)	0.75** (0.32)	0.66** (0.30)	0.74*** (0.27)	0.69** (0.29)	0.78*** (0.29)	0.74** (0.29)
[B] Weight on:								
Processes	-2.02 (1.71)				-2.62 (1.69)			
Markets		-1.15 (1.75)				-2.06 (1.95)		
Customer			-2.67 (2.33)				-2.77 (2.52)	
Learning				-0.09 (1.64)				-0.65 (2.30)
Interaction **[A]•[B]**	-3.41 (2.36)	-2.30 (2.42)	-4.03* (2.46)	-2.62* (1.63)	-4.40 (2.00)	-3.41 (2.58)	-4.02* (2.22)	-3.27** (1.43)
BU characteristics controls	Included	Included	Included	Included	Included	Included	Included	Included
Wald test model (p-value)	25.63 (<0.01)	44.91 (<0.01)	44.11 (<0.01)	18.92 (<0.01)	144.36 (<0.01)	48.65 (<0.01)	91.77 (<0.01)	73.19 (<0.01)
Restriction tests:								
Wald test on Joint effect "Manager's horizon in *firm*" (p-value)	10.55 (<0.01)	18.78 (<0.01)	12.54 (<0.01)	6.20 (0.05)	8.52 (0.01)	8.38 (0.02)	12.37 (<0.01)	6.38 (0.04)
Wald test on Joint effect "Weight on performance measure type" (p-value)	2.43 (0.30)	1.13 (0.57)	5.28 (0.07)	5.75 (0.06)	6.32 (0.04)	1.88 (0.39)	8.85 (0.01)	8.54 (0.01)

Based on 66 observations. Variable definitions are in Appendix 1. Robust standard errors are in parentheses (adjusted for clustering caused by including multiple business unit observations per firm). Intercepts are included but suppressed for brevity. Business unit characteristics controls are: growth opportunities, competition, percentage incentive pay, and information asymmetry. Data are from a survey among business unit managers. ***, **, * denotes significance at the 1%, 5%, and 10% levels respectively.. We estimate the following equation: $Y_{it+1} = \beta_0 + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{2it} \times X_{3it} + \sum_j \beta_j \times Controls_{jit} + \varepsilon_{it}$ in which Y denotes "investments in new products" or "investments in new processes," X_{2it} is "manager's horizon in firm", and X_{3it} is "weight on performance measure type"; controls is a vector of the included controls for business unit characteristics. The reported Wald statistic (model) is a test of $\beta_1 = \beta_2 = \beta_3 = \ldots = \beta_i = 0$. The restriction tests report Wald statistics of the following tests for the joint effect of "manager's horizon in firm" on Y and "weight on performance measure type" on Y, respectively: $\beta_2 = 0, \beta_4 = 0$ and $\beta_3 = 0, \beta_4 = 0$.

T A B L E 6

Generalized Estimating Equations (GEE) Regressions of the Weight on Type of Performance Measure onto Average "Time-to-Market" of a New Product or "Time-to-Implementation" of a Process Innovation, Manager's Horizon in Firm, and Their Interaction.

Panel A: Main analyses with weight on stock price related, non-financial, profit, costs and revenue, and accounting return measures as dependent variables										
	Weight on:					*Weight on:*				
Variable	**Stock-price related measures**	**Non-financial measures**	**Profit measures**	**Costs and revenue measures**	**Accounting return measures**	**Stock-price related measures**	**Non-financial measures**	**Profit measures**	**Costs and revenue measures**	**Accounting return measures**
Test variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Manager's horizon in *firm* **[A]**	0.012** (0.006)	-0.028 (0.022)	0.050** (0.025)	-0.033 (0.028)	0.009 0.021)	0.010*** (0.003)	-0.008 (0.025)	0.044* (0.026)	-0.026 (0.029)	-0.004 (0.018)
"Average time to market" for new products **[B]**	0.007* (0.003)	0.017 (0.031)	-0.104*** (0.022)	0.084*** (0.030)	0.014 (0.018)					
"Average time to implementation" for process innovations **[B]**						0.009** (0.005)	0.027 (0.021)	-0.108*** (0.030)	0.051** (0.025)	0.033* (0.020)
Interaction **[A] • [B]**	0.008*** (0.002)	-0.008 (0.017)	-0.005 (0.015)	-0.003 (0.014)	0.001 (0.012)	0.014*** (0.004)	-0.067*** (0.021)	-0.009 (0.030)	0.011 (0.022)	0.038** (0.015)
Controls for weight on type of performance measure	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Wald statistic model (p-value)	51.36 (<0.01)	21.09 (0.01)	149.00 (<0.01)	37.19 (<0.01)	40.33 (<0.01)	96.59 (<0.01)	90.83 (<0.01)	63.78 (<0.01)	26.11 (<0.01)	78.81 (<0.01)
Restriction tests:										
Wald test on Joint effect of "Manager's horizon in *firm*" (p-value)	24.15 (<0.01)	2.32 (0.31)	4.98 (0.08)	1.93 (0.38)	0.18 (0.91)	23.11 (<0.01)	16.04 (<0.01)	3.16 (0.21)	1.02 (0.60)	6.27 (0.04)
Wald test on Joint effect of "Average time to market" or "Average time to implementation" (p-value)	20.11 (<0.01)	0.46 (0.80)	21.72 (0.01)	8.95 (0.01)	0.58 (0.75)	15.40 (<0.01)	12.87 (0.01)	13.65 (<0.01)	4.31 (0.12)	6.85 (0.03)

T A B L E 6 – *Continued*

Panel B: Supplemental analyses of non-financial measures								
	Weight on non-financial measure:				*Weight on non-financial measure:*			
Variable	**Processes**	**Markets**	**Customer**	**Learning**	**Processes**	**Markets**	**Customer**	**Learning**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Test variables:								
Manager's horizon in firm **[A]**	-0.016* (0.010)	-0.008 (0.009)	-0.012 (0.012)	-0.008** (0.004)	-0.009 (0.009)	-0.008 (0.009)	-0.009 (0.013)	0.017*** (0.006)
"Average time to market" for new products **[B]**	0.003 (0.009)	-0.007 (0.009)	-0.001 (0.010)	0.021** (0.011)				
"Average time to implementation" for process innovations **[B]**					0.015** (0.007)	-0.008 (0.008)	0.003 (0.013)	0.016** (0.006)
Interaction **[A] • [B]**	-0.006 (0.007)	-0.001 (0.005)	-0.006 (0.007)	0.005 (0.007)	-0.031*** (0.005)	-0.005 (0.009)	-0.017* (0.010)	-0.014* (0.008)
Controls for weight on type of performance measure	Included	Included	Included	Included	Included	Included	Included	Included
Wald statistic model (p-value)	33.50 (<0.01)	14.87 (<0.09)	30.16 (<0.01)	47.67 (<0.01)	138.00 (<0.01)	17.35 (0.04)	35.75 (<0.01)	63.80 (<0.01)
Restriction tests:								
Wald test on Joint effect of "Manager's horizon in firm" (p-value)	4.63 (0.10)	1.89 (0.39)	5.03 (0.08)	4.37 (0.11)	40.11 (<0.01)	2.20 (0.33)	8.23 (0.02)	13.56 (<0.01)
Wald test on Joint effect of "Average time to market" or "Average time to implementation" (p-value)	0.70 (0.70)	1.10 (0.58)	1.03 (0.60)	5.21 (<0.07)	66.90 (<0.01)	2.32 (0.33)	2.88 (0.24)	16.60 (<0.01)

Based on 66 observations. Variable definitions are in Appendix 1. Robust standard errors are in parentheses (adjusted for clustering caused by including multiple business unit observations per firm). Intercepts are included but suppressed for brevity. Controls for the weight on type of performance measures are information asymmetry, competition, growth opportunities, within-firm dependencies, size of the business unit, and relative size of the business unit in the firm. Data are from a survey among business unit managers. ***, **, * denotes significance at the 1%, 5%, and 10% levels respectively.

We estimate the following equation: $W_{it} = \gamma_0 + \gamma_2 X_{2it} + \gamma_3 TIME_{it} + \gamma_4 X_{2it} \times TIME_{it} + \sum_k \gamma_k \times PMControls_{kit} + \varepsilon_{it}$, in which W denotes "weight on performance measure type" X_{2it} is "manager's horizon in *firm*", and $TIME_{it}$ is "average time to market" or "average time to implementation"; $PMControls$ is a vector of the included controls for factors that are known to influence the weight on performance measure type. The reported Wald statistic (model) is a test of $\gamma_1 = \gamma_2 = \gamma_3 = \ldots = \gamma_i = 0$. The restriction tests report Wald statistics of the following tests for the joint effect of "manager's horizon in firm" on Y and "average time to market/implementation" on Y, respectively: $\gamma_2 = 0, \gamma_4 = 0$ and $\gamma_3 = 0, \gamma_4 = 0$.

A P P E N D I X

Variable Definitions and Descriptive Statistics on Items of Composite Measures

VARIABLE	DESCRIPTION	SCALE CRONBACH'S ALPHA	MEAN (STD. DEV.)	INTERQUARTILE RANGE (MEDIAN)
Expected investment expense in new products	Forecasted investment expense of the business unit (at t+1) in new products or services	Index: base=100		
Expected investment expense in new processes	Forecasted investment expense of the business unit (at t+1) in new processes	Index: base=100		
Weight on type of performance measure	The weight a supervisor attaches to a performance measure when evaluating the manager's performance over the past year	Percentage: 0-100%		
Interdependencies	Composite measure of overall impact of the activities of the focal BU on other units in the firm and vice versa.	Likert scale: 1-7 Alpha = 0.66		
▪ Item 1	To what extent do your unit actions impact on work carried out in other units of your firm?	(1=no impact at all, 7 = A very significant impact)	3.92 (1.3)	3-4 (4.0)
▪ Item 2	To what extent do actions of managers of other units in your firm impact on the work carried out in your unit?	(1=no impact at all, 7 = A very significant impact)	4.00 (1.6)	3-5 (4.0)
▪ Item 3	To what extent could your unit operate as a independent (stand-alone) firm?	(1=not at all, 7=for all our activities)	5.36 (1.7)	5-7 (2.0)
Information asymmetry	Composite measure of information differences between respondents and their superiors	Likert scale: 1-7 (1=My supervisor has much better information, 7 = I have much better information) Alpha = 0.78		
▪ Item 1	Compared to your superior, who is in possession of better information regarding the activities undertaken in your organizational unit?		6.0 (1.0)	6-7 (6.0)
▪ Item 2	Compared to your superior, who is more familiar with the input-output relationships inherent in the internal		6.0 (0.9)	6-7 (6.0)

	operations of your organizational unit?			
▪ Item 3	Compared to your superior, who is more certain of the performance potential of your organizational unit		5.3 (1.1)	4-6 (5.0)
▪ Item 4	Compared to your superior, who is more familiar technically with the work of your organizational unit?		5.8 (1.2)	5-7 (6.0)
▪ Item 5	Compared to your superior, who is better able to assess the potential impact on your activities of factors external to your organizational unit?		5.0 (1.2)	4-6 (5.0)
▪ Item 6	Compared to your superior, who has better understanding of what can be achieved in your organizational unit?		5.4 (1.0)	5-6 (5.0)
Competition	Composite measure of the degree of competition facing the business unit	Likert scale: 1-7 (1= no competition, 7 = very significant competition) Alpha=0.65		
▪ Item 1	What is the intensity of price competition your unit faces?		5.5 (1.2)	4-7 (6.0)
▪ Item 2	What is the intensity of competition in promotion, distribution, and marketing your unit faces?		4.8 (1.4)	4-6 (6.0)
▪ Item 3	What is the intensity of the competition with respect to product range (variety) your unit faces?		4.7 (1.19)	4-6 (5.0)
Growth opportunities	Composite measure of the growth opportunities of the business unit?	Likert scale: 1-7 (1 = strong decline, 7 = strong increase) Alpha=0.87		
▪ Item 1	What is your expectation with respect to the growth opportunities that exist within the *industry* in which you compete?		5.2 (1.07)	5-6 (5.0)
▪ Item 2	What is your expectation with respect to the growth opportunities your *specific unit* faces?		5.7 (0.95)	5-6 (6.0)
Manager's horizon in job	Composite measure of a manager's expected tenure in his or her current position.	Probability: 0-100% Alpha = 0.74		
	Assign a probability to each of the following			
▪ Item 1	The likelihood that you		27.0	10.0-50.0

	will be in your current job 5 years from today		(27.1)	(10.0)
▪ Item 2	The likelihood that you will be in your current job 10 years from today		5.9 (15.1)	0.0-1.0 (0.0)
▪ Item 3	The likelihood that you will be in your current job more than 10 years from today		3.5 (12.1)	0.0-0.0 (0.0)
Manager's horizon in firm	Composite measure of the expected tenure of a manager in his current firm	Probability: 0-100% and years Alpha = 0.61		
	Assign a probability to each of the following			
▪ Item 1	The likelihood that you will be working for your current firm five years from today		57.7 (30.1)	50.0-80.0 (55.5)
▪ Item 2	The likelihood that you will be working for your current firm ten years from today		26.8 (24.8)	5.0-50.0 (20.0)
▪ Item 3	The likelihood that you will be working for your current firm more than ten years from today		14.8 (19.0)	0.0-25.0 (5.00)
▪ Item 4	What is your age? (Reverse coded)		45.3 (8.0)	38.0-51.0 (46.5)
"Average time to market" for new products	Answer to the question "How much time passes on average between deciding about investing in the development of a new product and its introduction on the market?	Number of months	18.4 (22.4)	6.0-18.0 (12.0)
"Average time to implementation" for new processes	Answer to the question "How much time passes on average between deciding to invest in the development of a new process and its implementation in your unit?"	Number of months	14.4 (11.2)	6.0-18.0 (12.0)
Percentage incentive pay	Percentage of pay contingent on delivered performance relative to fixed pay.	Percentage: 0-100%		
Absolute size of the unit	Natural logarithm of 1+the number of employees of the BU		1208 (1649)	110-1500 (400)
Relative size of the unit	Average of (1) the percentage BU sales in total firm revenues and (2) the percentage of BU assets in total firm assets	Percentage: 0-100%		