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An Empirical Investigation of the Performance Consequences of Nonfinancial Measures

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ABSTRACT: Firms are increasingly implementing new performance measurement systems to track nonfinancial metrics such as customer and employee satisfaction, quality, market share, productivity, and innovation. This study examines the implications of nonfinancial performance measures included in compensation contracts on current and future performance. Contextual factors, environmental factors, and strategic plans vary across firms and, in turn, adopting appropriate nonfinancial measures determines the performance consequences of such measures. Our findings support the contention that firms that employ a combination of financial and nonfinancial performance measures have significantly higher mean levels of returns on assets and higher levels of market returns. Although we find evidence that the adoption of nonfinancial measures improves firms' current and future stock market performance, we find only partial support for accounting performance improvements. Overall, the results indicate that the association between the use of nonfinancial measures and firm performance is contingent on the firm's operational and competitive characteristics.

Data Availability: *All data used in this study are available from public sources.*

INTRODUCTION

The increasing emphasis on the use of a combination of financial and nonfinancial performance measures has been widely discussed in the accounting literature (e.g., Ittner and Larcker 1998, 2001; Ittner et al. 1997; Keating 1997; Strives et al. 1998). Competition has compelled firms to implement management strategies and systems to overcome dissatisfaction with traditional short-term perspective financial measurement systems. One of the principal motivations behind the use of nonfinancial measures is the notion that only a collection of conceptually sound financial and nonfinancial performance measures

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can properly align the efforts of an enterprise with its strategic objectives (Kaplan and Norton 1996). Although nonfinancial measures have been widely advocated and adopted, empirical research has provided little evidence on whether these initiatives yield significant economic benefits. The purpose of this paper is to fill that gap.

The objectives of this study are twofold. First, consistent with recent claims in the performance measurement literature, we investigate whether the inclusion of nonfinancial measures in compensation contracts is positively associated with contemporaneous and future accounting and stock market performance. Second, we investigate the related hypothesis that the relation between the use of nonfinancial measures and economic performance is a function of the "fit" or "match" between a firm's operational and competitive circumstances and its choice of performance measures.

Using panel data covering the period 1993–1998, we compare the performance of a sample of firms that used both financial and nonfinancial measures (1,441 firm-year observations) to a matched sample of firms that based their performance measurement solely on financial measures (1,441 firm-year observations). Our use of more objective archival data differs from most prior studies that rely on perceptual measures of the efficacy of performance measurement (Abernethy and Lillis 1995; Foster and Gupta 1997; Ittner and Larcker 1995, 1998a; Symons and Jacob 1995).[1] The triangulation of this archival study with prior research offers additional insight into the effects of performance measurement systems that incorporate a wide variety of performance measures (Birnberg et al. 1990; Flick 1992; Hunton et al. 2002; Ittner and Larcker 2001).

Our results indicate that nonfinancial measures are significantly associated with future accounting-based and market-based returns; with contemporaneous data, the same holds for market-based returns but not accounting-based returns. The results also indicate that the use of nonfinancial measures is significantly associated with innovation-oriented strategy, adoption of strategic quality initiatives, length of product development, industry regulation, and level of financial distress. Moreover, we find evidence that the relation between the use of nonfinancial measures and future and current firm performance depends on the match between use of nonfinancial measures and the firm's characteristics.

The remainder of the paper is organized as follows. In the second section, we discuss the relevant literature and develop the testable hypotheses. In the third section, we describe the sample and empirical tests. The fourth section contains the results of the empirical tests and the sensitivity analysis, and the fifth section includes the summary and conclusion of the study.

HYPOTHESES DEVELOPMENT

Performance Consequences of Nonfinancial Measures

Economic theory suggests that performance metrics should include not only financial performance measures, but also nonfinancial measures that reflect different dimensions of managerial actions (Banker and Datar 1989; Ittner and Larcker 1998b). According to agency theory (Banker and Datar 1989; Feltham and Xie 1994; Holmstrom 1979), nonfinancial measures should be included in management compensation contracts (subject to their costs

[1] Most of the previous studies are either field or survey studies. The firm-specific nature and the sample selection biases associated with field studies (e.g., Banker, Potter, and Srinivisan 2000) and the overall response rate and the possibility of biased perceptions in survey studies (e.g., Ittner and Larcker 1995) limit the generalizability and construct validity of those results.

and the risk imposed on the manager) if nonfinancial measures provide incremental information about manager's actions beyond that conveyed by financial measures.

The informativeness principle (Banker and Datar 1989; Feltham and Xie 1994; Holmstrom 1979) underlies a large body of empirical research examining the implications of agency theory on the trade-off between risk and incentives. Intuitively, the compensation contract should not exclude a performance measure that provides incremental information about the dimensions of managerial action that the shareholders wish to encourage (Ittner et al. 1997). When nonfinancial measures are included in the compensation contract, managers more closely align their efforts along the dimensions emphasized by those measures, resulting in improvements in performance (Banker, Potter, and Srinivisan 2000).

Firms seek to enhance their competitiveness by employing innovative quality-oriented management strategies and utilizing performance measurement systems that include a broad range of financial and forward-looking nonfinancial measures (Strives et al. 1998). The potential benefits of nonfinancial performance measures in management accounting have been widely cited (Eccles 1991; Johnson and Kaplan 1987; Kaplan and Atkinson 1989; Lambert 2001; Schiff and Hoffman 1996). This emphasis reflects the shift from treating financial figures as the foundation for performance measurement to treating them as one element among a broader set of measures. This perspective contends that nonfinancial performance measures focus attention on the long-term perspective, thus leading to better performance.

The performance measurement literature also assumes that the integration of nonfinancial measures in measurement systems allows managers to better understand the relations among various strategic objectives, to communicate the association between employees' actions and strategic goals, and to allocate resources and set priorities based on those objectives (Kaplan and Norton 1996). Moreover, focusing on the definition and implementation of strategies and information systems that emphasize value creation and the underlying drivers of value can ideally align management processes and internal goals with external goals (Ittner and Larcker 2001). The fit between strategies and processes promotes congruence between the actions taken by the agent and the actions desired by the principal, thereby maximizing shareholders' value (Banker and Datar 1989; Feltham and Xie 1994; Holmstrom 1979).

Incorporating nonfinancial measures in a firm's performance measurement system may also provide more direct and timely feedback on managerial effort in some environments than financial measures do (Barua et al. 1995). Further, nonfinancial measures are contemporaneously available for purposes of evaluating the impact of current efforts. This affords the manager an opportunity to take immediate corrective action (Rees and Sutcliffe 1994). Finally, nonfinancial measures are less subject to manipulation since they are typically less dependent on managerial judgment than are cost allocations or balance sheet valuations (Rees and Sutcliffe 1994).

Prior studies investigating the relation between nonfinancial measures and current performance generally rely on customer satisfaction and total quality management (TQM) as nonfinancial measures. Using cross-sectional data from 77 Swedish firms representing different industries, Anderson et al. (1994, 1997) find that, after controlling for past returns and time trend, contemporaneous accounting performance is positively associated with customer satisfaction. Perera et al. (1997) find that the use of nonfinancial measures is associated with enhanced performance for firms pursuing customer satisfaction through their manufacturing strategy. Ittner and Larcker (1998a) examine the relation between customer satisfaction and firm performance using customer-level, business unit, and firm-level data.

They find some evidence that firm-level customer satisfaction measures are associated with the firms' current market value, but not with contemporaneous accounting measures. Behin and Riley (1999) find that customer satisfaction is contemporaneously associated with financial performance in the U.S. airline industry. In contrast, Ittner and Larcker's (1998b) survey suggests that many firms do not experience a significant association between customer satisfaction and contemporaneous accounting and market returns.

Prior studies that examine the relation between TQM and firm performance generally provide evidence consistent with enhanced contemporaneous accounting-based and market-based performance for those firms implementing TQM. Ittner and Larcker's (1995) results suggest that information and reward systems that place greater emphasis on nonfinancial information are associated with higher accounting returns in organizations making relatively little use of TQM practices, but not in organizations with extensive TQM programs. Symons and Jacobs (1995) indicate that TQM-based reward systems are associated with higher performance. Chenhall (1997) concludes that firms using both TQM and nonfinancial manufacturing performance measures achieve higher performance than those using TQM without the nonfinancial measures. Simons (1987) finds that return on investment is higher when accounting control systems and business strategy are more closely linked. Abernethy and Lillis (1995) indicate that greater reliance on nonfinancial manufacturing measures has a more positive effect on performance in flexible firms than in nonflexible firms. The results in Hirschey et al. (1998) suggest that nonfinancial information on the quality of patents has consistently positive effects on stock prices. Taken together, the results of theses studies are consistent with the implications of the impact of nonfinancial measure adoption on current performance. Accordingly, we posit the following hypothesis:

H1: Firms that use a combination of nonfinancial and financial measures perform better contemporaneously than firms that use financial measures alone.

Although we predict that the inclusion of nonfinancial measures in the firms' performance metrics will improve firm performance, it is crucial to consider the time frame related to performance evaluation. Since the efficacy of nonfinancial measures may take substantial time to be revealed in performance, we also investigate the relationship between nonfinancial measures and future firm performance. Several studies suggest that nonfinancial measures are primarily important because their focus on long-term actions leads to better performance (Banker et al. 2000; Hemmer 1996; Johnson and Kaplan 1987; Kaplan and Norton 1992). Managerial efforts incorporating nonfinancial measures should result in positive outcomes such as innovation and quality, leading to better performance in the future. Management's actions influence realized values of nonfinancial measures, which, in turn, are indicators of long-term performance (Banker et al. 2000). Although financial measures generally reflect past performance, nonfinancial measures may reflect actions that lead to future performance (Kaplan and Norton 1992).

Consistent with these claims, a number of studies find that nonfinancial measures are leading indicators of financial performance, even after controlling for current accounting performance (Banker et al. 2000; Behin and Riley 1999; Foster and Gupta 1997). In a study of the use of nonfinancial measures, Foster and Gupta (1997) used two years of data from a wholesale beverage distributor to provide evidence on the link between customer satisfaction and future profitability. The results in Ittner and Larcker (1998a), using customer-level, business unit, and firm-level data, suggest that customer satisfaction is positively related to future financial performance. Similarly, Banker et al. (2000) used time-series data covering 72 months for 18 hotels managed by a hospitality firm to provide evidence on the

impact of nonfinancial measures on future accounting-based performance. The results of their field-based study indicate that current customer satisfaction is significantly and positively related to future financial performance. Their results also suggest that nonfinancial measures contain additional information not reflected in financial measures. Behin and Riley (1999) find some evidence that customer satisfaction is associated with future financial performance in the U.S. airline industry. Finally, Ittner and Larcker (1996) provide evidence that hedge portfolios based on customer satisfaction measures outperformed market returns in subsequent periods. In summary, the results of theses studies find a positive relation between future firm performance and current use of nonfinancial performance measures. Accordingly, we expect superior future performance from firms that use nonfinancial measures. Therefore we hypothesize that:

H2: Firms that use a combination of nonfinancial and financial measures perform better prospectively than firms that use financial measures alone.

The Performance Consequences and the Match of Nonfinancial Measures

The previous hypotheses assume that nonfinancial measures are efficacious for all firms. The match or fit between nonfinancial measures as a management practice and the firm's organizational environment is ignored when examining their performance consequences. Contextual factors, environmental factors, and strategic plans vary across firms. Contingency theories suggest that the choice of appropriate techniques of managerial accounting depends on circumstances surrounding the firm (Gordon and Miller 1976; Hayes 1977; Otley 1980). Therefore, the adoption and use of nonfinancial measures is an endogenous choice, with the potential net benefit depending on contextual factors. Since the performance consequences of nonfinancial measures may be contingent on exogenous variables, the ability to draw inferences about the performance consequences of using those measures might be affected by specification errors.

The optimal choice of performance measures is a function of a variety of factors such as strategic plans, the investment opportunity set available to the firm, and executive compensation (Ittner and Larcker 1998b). Many managers believe that exclusive emphasis on financial measures does not adequately fulfill these functions. One research stream examines the relationship between the use of nonfinancial performance measures and related strategic plans, contextual factors, and the organizational environment. Researchers suggest that variables such as strategy, regulation, product life and development cycles, financial distress, as well as noise in financial measures affect performance consequences (Bushman et al. 1996; Ittner et al. 1997).

A firm's business strategy is likely to influence the relative informativeness of alternative performance measures (Ittner et al. 1997). Defender firms follow a cost-leader orientation in which they attempt to focus on established products and markets to extract strategic advantage by minimizing costs through improvements in operating efficiencies. This focus leads defender firms to employ short-term financial performance measures to align their performance to the near-term financial strategy of the firm (Govindarajan and Fisher 1990; Simons 1987).

Conversely, prospector firms seek new products and markets via initiatives that are unlikely to be immediately evident in the financial results of operations. As a result, for prospector firms, short-term financial measures of performance will be less informative with regard to management efforts to attain long-term strategic goals. Govindarajan and Gupta (1985) find that firms following a prospector strategy are more likely to rely on nonfinancial measures of performance. Based on these arguments, we expect firms that pursue strategic

"forward-looking" goals to be more likely to place emphasis on nonfinancial performance measures in contracting with their managers.

The quality management literature (Daniel and Reitsperger 1991; Ittner and Larcker 1995; Ittner et al. 1997) advocates the benefits of using nonfinancial measures to track the firm's quality improvement efforts. Based on these arguments, we expect firms focusing on a quality strategy to include nonfinancial quality metrics to align manager's efforts with the strategic quality objectives of the firm.

Ittner et al. (1997) argue that distressed firms are expected to rely more on short-term financial measures. Management's desire to avoid bankruptcy and its costly consequences motivates their reliance on short-term financial measures. Thus, a distressed firm's choice of short-term financial measures suggests they will rely less on nonfinancial measures compared to a healthy firm.

Bushman et al. (1996) argue that greater reliance on individual performance measures depends on the relative importance of the firm's product development and product life cycles.[2] Bushman et al. (1996, 162) predict that "a performance measure will only be used if it provides incremental information over other measures." Supplemental measures of performance add value to traditional financial measures with regard to individual performance evaluation, particularly in those instances where information asymmetry exists between managers and investors, and when the firm faces longer planning and product development time horizons. The longer the product development and product life cycles, the less informative financial measures may be (Bushman et al. 1996), and the potentially more informative nonfinancial measures will be.

Specific industry and competitive pressures may impact the choice of the performance measurement metrics. For instance, Ely (1991) finds that managers' accounting choices vary by industry suggesting that those choices may reflect a realization of the potential impact of industry specifics on accounting choices. As discussed in Ittner et al. (1997), nonfinancial measures are extensively used in regulated industries. They argue that in the utility industry, regulators link rate increases to the achievement of nonfinancial goals. Moreover, government intervention in regulated industries may lead firms in these industries to place greater emphasis on nonfinancial measures. Ittner et al. (1997) and Bushman et al. (1996) provide evidence that regulatory and competitive pressures lead many utility and telecommunications firms to utilize nonfinancial measures in their executive compensation packages. Therefore, we anticipate that regulated firms will rely more on nonfinancial measures than nonregulated firms.

Consistent with agency models, a specific performance measure is included in a firm's set of performance measures if it conveys relative and/or incremental information over other performance measures (Banker and Datar 1989; Feltham and Xie 1994; Holmstrom 1979). Because financial measures imperfectly mitigate the information asymmetry problem between managers and shareholders (Bushman et al. 1996; Ittner et al. 1997), nonfinancial measures are more likely to be used as the random noise in financial measures increases. Consistent with this expectation, Ittner et al. (1997) find a positive relation between the noise in financial measures and the relative importance of the nonfinancial measures in bonus contracts. Thus, we predict that the use of nonfinancial measures will increase with the extent of noise in financial measures.

[2] Product development cycle refers to the time required to develop and introduce a new product to the market, while product life cycle represents the market life of a product.

Ittner et al. (1997) analyze the determinants of the use of nonfinancial performance measures in compensation contracts, finding that the weight placed on nonfinancial measures is positively associated with innovation-oriented strategy, the adoption of strategic quality initiatives, and negatively related to a number of variables that proxy for poor financial performance. Bushman et al. (1996) investigate the use of individual performance evaluation (including nonfinancial measures) in compensation contracts. They find that individual performance evaluation, including the use of nonfinancial measures, is contingent upon several factors such as strategic growth opportunity relative to assets in place, the length of both the product development cycle and the product life cycle, and the noise in financial measures. The overall evidence provided by these studies indicates that the use of and weight placed on nonfinancial performance measures are contingent upon several contextual and environmental factors, as well as on firms' strategic plans.

In addition, prior research suggests that organizations that align their performance measures appropriately with contingency factors achieve higher performance (Govindarajan 1988; Simons 1987). Govindarajan and Gupta (1985) find that the benefits derived from nonfinancial performance criteria are contingent on the business unit's strategy. Specifically, firms with a build strategy rely more on long-term nonfinancial criteria than those firms with harvest strategies. This suggests that perceived organization performance is higher when reward systems are matched to business strategy.

Although these studies contend that the optimal weight placed on nonfinancial measures in compensation contracts is contingent on a variety of factors, little evidence exists on the relation between the match between bonus plan measures and firm characteristics and the performance of firms using the nonfinancial measures. The endogenous nature of the adoption of nonfinancial measures raises a potential problem in assessing the performance consequences of nonfinancial measures. Ignoring the possible endogeneity between the use of nonfinancial measures and firm performance may result in inappropriate inferences regarding the usefulness of nonfinancial performance measures. Firms that adopt nonfinancial measures and fail to improve performance may incorrectly estimate the importance of nonfinancial measures. These firms may not enhance their performance because they fail to match their characteristics and the use of nonfinancial performance measures. Conversely, firms that adopt nonfinancial measures and achieve higher performance are believed to have achieved the proper fit between their characteristics and the use of nonfinancial measures. Therefore, we examine the performance differences associated with the degree of mismatch between the use of nonfinancial measures and the contextual factors that reflect the firm's characteristics.[3] We expect positive performance consequences to be more pronounced in firms that better match their use of nonfinancial measures to their firm characteristics. Hence, we hypothesize that:

H3: Firms' contemporaneous performance is decreasing in the degree of mismatch between their characteristics and their use of nonfinancial measures.

H4: Firms' prospective performance is decreasing in the degree of mismatch between their characteristics and their use of nonfinancial measures.

[3] We gratefully acknowledge an anonymous reviewer for this suggestion.

RESEARCH METHODOLOGY

The Use of Nonfinancial Measures

We create a dummy variable (*NFM*) to capture the firm's reliance on nonfinancial measures in its bonus plans. *NFM* takes on the value of 1 if the firm uses both financial and nonfinancial measures, and 0 if it uses financial measures alone.[4] Following Ittner et al. (1997), we use the proxy text files contained in Lexis/Nexis to develop a sample of firms that we judge to be using nonfinancial measures. We identify the sample by searching these files using keywords such as "non-financial or nonfinancial," "customer satisfaction," "employee satisfaction or employee morale or employee motivation," "quality," "process improvement," "re-engineering or reengineering," "new product development," "diversity," "market share," "productivity or efficiency," "safety," "innovation," "operational measure or operational performance," and "strategic objectives."[5] We next read the compensation committee report to confirm that the keyword(s) are used in the appropriate context.

The empirical tests compare performance consequences of firms incorporating both financial and nonfinancial measures versus firms using only financial measures. Our sample of firms using nonfinancial performance measures includes all firms for which panel data regarding performance and the use of nonfinancial measures is available for the eight-year period 1992–1999.[6] We delete 422 firm-year observations due to missing data, mergers and acquisitions, name changes, and bankruptcies. This process results in a usable sample of 1,441 firm-year observations that use both financial and nonfinancial measures in their compensation plans.

We then create a matching sample of firms that do not use nonfinancial performance measures based on the same two-digit SIC code (1,209 firm-years), total assets within a 70–130 percent range (1,365 firm-years), and ROA within a 90–110 percent range (1,441 firm-years). When a firm has no match based on size with the same two-digit SIC code, we use an alternative matching rule based on size with the same one-digit SIC code (156 firms). Failing that, we use the firm of closest size and similar performance to the firm in question with the same one-digit SIC code (76 firm-years).

Using firm size assumes that operating performance varies by size (Fama and French 1996). Several studies of operating performance match sample firms to similar-size firms in the same industry (Denis and Denis 1995; Kaplan 1989). Although Barber and Lyon (1996) confirm the results of Fama and French (1995), their evidence suggests that in samples of unusually small or large firms, size-matching is not critical in detecting abnormal operating performance. Matching on past performance adjusts for underlying economic factors as well as the mean reversion in accounting data that could be attributed to earnings manipulation (Barber and Lyon 1996). Therefore, we match our sample based on industry,

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[4] These firms are further classified into three subgroups. The first subgroup consists of firms with specific weights and a description of how they are used. The second subgroup consists of firms with specific weights but no description of how the measures are used. The third subgroup consists of firms using nonfinancial performance measures without specific weights. (See Panels A, B, and C of the Appendix for examples.)

[5] The SEC requires firms to disclose the principles underlying their executive compensation plans and performance criteria used in determining compensation. Therefore, we used the keywords mentioned above to search for firms that used the nonfinancial measure(s) in determining compensation. We classify firms that use only financial measures in their bonus plans, as well as firms that use none of the keywords in their proxy statements, as not using nonfinancial measures (*NFM* = 0; see the Appendix for examples). The remaining firms' proxies include one or more of the keywords, and we therefore classify them as using nonfinancial measures (*NFM* = 1).

[6] We use 1992 data to calculate the lagged variables of accounting-based performance. We use 1999 data to calculate the future accounting-based and market-based performance. The data sources include text files contained in Lexis/Nexis, Compustat files, and the CRSP database.

size, and past performance to capture variations in operating performance for normal size firms as well as extremely large and small firms.[7]

Table 1 compares the distribution of the sample of firms that use both financial and nonfinancial performance measures versus the matched sample of firms that rely only on financial measures. Table 1 shows that approximately 50 percent of the firm-years using nonfinancial measures come from the durable-goods (422 firm-years) and nondurable-goods (302 firm-years) manufacturing industries. In contrast, only 19 percent of the nonfinancial measures observations come from services firms. Overall, manufacturing firms represent the highest proportion of our sample (49 percent).

Measures of Performance

We use accounting-based and market-based measures to capture economic performance. Our measure of accounting performance is the return on assets (*ROA*) reported in Compustat. *ROA* is defined as earnings before extraordinary items plus interest expense divided by average total assets. We use ROA_{it} and ROA_{it+1} to examine current and future accounting performance, respectively.

Return on assets has been extensively criticized as being a misleading or inadequate indicator of the economic rate of return (Fisher and McGowan 1983; Harcourt 1965; Livingstone and Salamon 1970; Solomon 1966). In particular, return on assets may be

TABLE 1
Distribution of Sample Firm-Years by Industry, 1993 to 1998

Industry	Two-Digit SIC Code	NFM Sample[a]	Matched Sample[b]	Total
Agriculture, Forestry, and Fishing	01–09	23	21	45
Mining and Construction	10–19	31	25	55
Manufacturing (nondurables)	20–29	302	243	545
Manufacturing (durables)	30–39	422	338	760
Transportation and Utilities	40–49	133	125	258
Wholesalers and Retailers	50–59	259	233	492
Financial Services	60–69	120	98	218
Consumer and Business Services	70–89	151	126	277
Alternative procedure matching[c]		NA	232	232
Total		1,441	1,441	2,882

[a] Firms using nonfinancial measures (*NFM*) are obtained by searching the proxy text files contained in Lexis/Nexis.

[b] A firm is matched using the two-digit SIC code, total net assets within a range of 70 percent–130 percent, and ROA within a range of 90 percent–110 percent of a matched firm.

[c] We matched 156 firms with the firm of the same size and performance using one-digit SIC code and 76 firms with the firm of closest size and similar performance without regard to the SIC code. All matches for performance fell within our 90–110 percent ROA criterion.

[7] When we cannot match firms based on similar performance within the same two-digit code, we use the procedures described in Barber and Lyon (1996). *Ceteris paribus*, we match performance within a range of 90 percent–110 percent, using all firms in the same one-digit SIC code. Then, if we still find no performance match, we match based on an ROA range of 90 percent–110 percent using all firms without regard to SIC code. If we could not match on performance, we use the firm with performance closest to the firm in question, without regard to SIC code. In our sample, all matches for performance fall within our 90–110 percent ROA criterion.

distorted by the failure to consider differences in systematic risk, temporary disequilibrium effects, tax laws, and accounting procedures (Smirlack et al. 1984; Wernerfelt and Montgomery 1988). Therefore, we also use market-based measures of performance to test the effect of nonfinancial measures on economic performance. We measure market-based measures of performance using the annualized market-adjusted stock returns (*RET*) from the CRSP database.[8] We use RET_{it} and RET_{it+1} to measure the current and future market performance, respectively.

Panel A of Table 2 presents descriptive statistics for the performance measures of the sample firms. The average ROA_{it}, RET_{it}, ROA_{it+1}, and RET_{it+1} for our sample are: 0.034, 0.198, 0.031, and 0.215, respectively. In Table 2, Panel B, we compare accounting-based and market-based performance between firms using both financial and nonfinancial measures versus those firms using only financial measures. For current accounting-based performance, mean ROA_{it} is significantly higher for firms using nonfinancial measures (0.046 versus 0.031). Similarly, mean current market-based performance (RET_{it}) is significantly higher for users of nonfinancial measures (0.235 versus 0.139). Regarding future performance, mean ROA_{it+1} is significantly higher in firms using nonfinancial measures (0.035 versus 0.030). Finally, mean RET_{it+1} is higher for firms using nonfinancial measures (0.284 versus 0.146). We find similar results using nonparametric tests.

Performance Controls

In testing the performance consequences of using nonfinancial measures we later introduce controls for a number of factors. We include lagged performance (ROA_{it-1}) in the analysis of accounting performance measures to control for past performance. We also control for the effects of exogenous economic factors by including a variable reflecting industry performance ($IROA_{it}$ and $IRET_{it}$) for both performance measures. In addition, we include variables to control for leverage, firm size, growth opportunities, industry regulation, and volatility. Prior studies have indicated that these variables are potentially important determinants of firm performance (Fama and French 1992, 1993; Jeter and Chaney 1992; Lulseged and Christie 2003; Warfield et al. 1995).

Leverage (*LEV*) is measured using the debt-equity ratio. Firm size (*SIZE*) is measured as the log of total assets. Growth opportunities (*GROWTH*) are measured as the market value of equity plus book value of debt divided by book value of assets at the beginning of the year. We use a dummy variable to capture the effect of regulation on firms' performance. The regulation variable (*REG*) takes on the value of 1 if the firm operates in a regulated industry (SIC codes 40–49), and 0 otherwise. We include accounting return volatility (*ACTVOL*) in the accounting-based model and stock volatility (*SCTVOL*) in the market-based model. *ACTVOL* is measured as the standard deviation of annual return on assets over the previous five years, while *SCTVOL* is measured as the standard deviation of the annualized daily stock returns over the previous five years. We predict positive coefficients for *SIZE* and *GROWTH* and a negative coefficient for *LEV*. We offer no predictions for *REG*, *ACTVOL*, or *SCTVOL*.

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[8] Sloan (1996) suggests that markets might fixate on one performance measure and ignore valuable information in other measures, making the use of *RET* as a proxy for market-based performance problematic. Therefore, we also test market performance using Tobin's Q ratio. Tobin's Q is calculated as the ratio of the value of the firm to the current cost of total assets. The value of the firm is equal to [(Closing share price at December 31 × Common Shares Outstanding) + (Total Assets − Common Equity)]. The data on the current cost of total assets is computed using the Producer Price Indices. Using the Tobin's Q ratio (not reported), our results are substantially the same as the stock return models.

TABLE 2
Descriptive Statistics and Univariate Analysis of Accounting and Market Measures of Performance

Panel A: Descriptive Statistics of Sample Firms[a]

Variables[b]	Mean	Std. Dev.	Q1	Median	Q3
ROA_{it}	0.034	1.087	0.019	0.046	0.081
RET_{it}	0.198	0.504	−0.012	0.141	0.386
ROA_{it+1}	0.031	0.608	0.011	0.036	0.091
RET_{it+1}	0.215	0.693	−0.006	0.209	0.565

Panel B: T-tests and Wilcoxon Rank Tests

	Performance			
	Current		Future	
	ROA_{it}	RET_{it}	ROA_{it+1}	RET_{it+1}
Firms using financial measures only (n = 1,441)				
Mean	0.031	0.139	0.030	0.146
Median	0.036	0.136	0.032	0.140
Std. Dev.	1.176	1.623	0.656	2.012
Firms using both financial and nonfinancial measures (n = 1,441)				
Mean	0.046	0.235	0.035	0.284
Median	0.051	0.148	0.040	0.309
Std. Dev.	1.025	2.212	0.987	2.399
Tests of differences between samples				
t-statistics	−2.308*	−20.616**	−3.762**	−17.531**
Wilcoxon Z-test	−5.853**	−23.228**	−4.924**	−19.167**

*, ** Significant at $\alpha = 0.05$ and .01 (two-tailed test), respectively.
[a] Based on a matched sample of 2,882 firm-year observations covering the period 1993–1998.
[b] Variables definitions: ROA_{it} is the current return on assets for firm i in year t and ROA_{it+1} is return on assets for firm i in year $t+1$ using Compustat data items: $ROA = [(\#15+\#18)/\#6]$; RET_{it} is the CRSP-adjusted stock return for firm i in year t; RET_{it+1} is the CRSP-adjusted stock return for firm i in year $t+1$.

Firm Characteristics and the Match with Nonfinancial Measures

We subsequently examine several of the contingency factors that the literature (Bushman et al. 1996; Ittner et al. 1997) suggests determine the efficacy of relying on individual and nonfinancial measures. These factors include the extent to which the firm follows a prospector strategy (*PROS*), the adoption of strategic quality initiatives (*QLTY*), the length of product development (*DCYCLE*), the length of product life cycles (*LCYCLE*), industry regulation (*REG*), financial distress (*DIST*), and noise in financial measures (*FN_CORR*).

We use factor analysis to develop a composite measure of business strategy (*PROS*) using principal component analysis. We use three indicators for competitive strategy: (1) the ratio of research and development to sales, (2) the market-to-book ratio, and (3) the ratio of employees to sales.[9] Higher *PROS* scores reflect the prospector end of the strategy

[9] Ittner et al. (1997) also use the number of new products or new services obtained from F&S Index Plus database, a measure not available for our sample.

continuum (Ittner et al. 1997). Because prospector firms are involved in more innovative actions, they should have a higher ratio of research and development to sales than defender firms (Hambrick 1983). Likewise, since prospectors are expected to have higher growth opportunities compared to defenders, prospectors are expected to have higher market-to-book ratios. The ratio of employees to sales reflects the firms' ability to produce and distribute goods and services efficiently (Thomas et al. 1991). As argued by Ittner et al. (1997), defenders should have fewer employees per dollar sales because of their strategic focus on efficiency. Following Ittner et al. (1997), we measure the previous three variables as the average of the respective yearly ratios over the five years preceding the proxy date.

Quality (*QLTY*) is a dummy variable that takes on the value of 1 if the firm has won or been a finalist in a major quality award competition, and 0 otherwise. The intuition behind this measure is that the quality award criteria require the firm to demonstrate how quality programs fit into the firm's overall business strategy (Ittner et al. 1997). To identify those quality-oriented firms, we use an extensive keyword search of publications in Dow Jones, Lexis/Nexis, and ABI/INFORM.

Following Bushman et al. (1996), we adopt the classification scheme from the National Academy of Engineering (1992) to categorize firms into those with shorter versus longer time horizons. We use the two-digit SIC code and the business description in the firm's 10-K reports and Compustat files to classify our sample according to the adapted National Academy of Engineering's industry group classifications. Table 3 shows the results of the classification process by industry. Using product development cycles, we classify 744 firm-years as having longer horizons and 1,412 firm-years as having shorter horizons. Using product life cycle, we classify 1,362 firm-years as having longer horizons and 794 firm-years as having shorter horizons. We could not classify 726 firm-years based on the National Academy of Engineering classification scheme, leaving a sample of 2,156 firm-year observations for firm characteristic analysis.

We use a dummy variable for regulated industries (*REG*). *REG* is a dummy variable for regulation that takes on the value of 1 if the firm operates in a regulated industry (SIC codes 40–49), and 0 otherwise. To measure financial distress (*FDIST*), we use a composite factor of three indicators (computed using principal component analysis). These three variables are: (1) the probability of bankruptcy measured based on Ohlson's (1980) Model 3; (2) the leverage ratio; and (3) the leverage ratio scaled by R&D. Research and development expenditures proxy for the degree of product specialization (Titman and Wessels 1998).[10]

Prior research often uses the variance of accounting returns and stock returns, or their ratio, as a proxy measure for the unobservable measurement noise in financial-based measures (Holthausen and Larcker 1991; Lambert and Larcker 1987). Bushman et al. (1996) use the time-series correlation between accounting returns and stock returns as a surrogate for the unobservable measurement noise in financial-based measures.[11] This correlation provides an explicit measure of the managerial misrepresentation in accounting numbers (Salamon and Smith 1979). We proxy for the noise in financial measure (*FN_CORR*) as

[10] Consistent with the theory that firms with specialized products are especially vulnerable to financial distress, Opler and Titman (1994) find that highly leveraged firms that engage in very specialized products lose substantial market share to their less leveraged competitors. Customers are reluctant to purchase products from a distressed firm with very specialized products that require future servicing (Maksimovic and Titman 1991). In such situations, managers focus on short-term financial performance to lower the leverage level, increase cash flow, recapture market share, and improve other short-term financial indicators.

[11] Ittner et al. (1997) use two composite variables to proxy for the level of noise in financial measures. The first composite variable includes the standard deviations in annual return on assets, return on equity, and return on sales. The second composite variable consists of Fisher z-scores for the correlation between return on assets, return on equity, and stock market return.

TABLE 3
Time Horizon Classification of Firm-Years by Industry

Industry[a]	Number of Firm-Years	Product Development Cycle (DCYCLE)[b]	Product Life Cycle (LCYCLE)[c]
Aircraft	12	Long	Long
Biotechnology	12	Long	Short
Chemicals	32	Long	Long
Communications	190	Long	Long
Computers	72	Short	Short
Dental	5	Short	Short
Durable—Heavy	63	Long	Long
Durable—Goods	239	Short	Long
Entertainment	17	Short	Short
Financial Services	59	Short	Short
Food	245	Short	Long
Heavy—Construction	17	Long	Long
Hotel	17	Short	Long
Machine—Equipment Heavy	18	Short	Long
Metal products	81	Short	Short
Mining	59	Short	Short
Oil and gas	71	Long	Long
Paper	128	Long	Long
Pharmaceuticals	34	Long	Long
Publishing	65	Short	Long
Software	227	Short	Short
Transportation	141	Long	Long
Wholesale/Retail	352	Short	Short
Total Classified	2,156	Long = 744 Short = 1,412	Long = 1,362 Short = 794
Nonclassified	726		

[a] Adapted from the Classification Scheme of the National Academy of Engineering (1992). The National Academy of Engineering scheme reports cycle times by industry groups that are not directly linked to SIC codes. We use the two-digit SIC code and business descriptions in the firms' 10-K reports and Compustat files to classify our sample into the National Academy of Engineering's industry groups.

[b] *DCYCLE* is a dummy variable that takes on a value of 1 if a firm is classified as having long product development cycle, and 0 otherwise.

[c] *LCYCLE* is a dummy variable that takes on a value of 1 if a firm is classified as having long product life cycle, and 0 otherwise.

the time-series correlation between annual return on assets and annualized daily stock returns over the five years prior to the proxy date. A low correlation is assumed to reflect a higher level of financial noise, which indicates a lower quality of accounting earnings. Thus, we expect firms with a low correlation (high level of financial noise) to rely more on nonfinancial measures. This implies a negative coefficient for *FN_CORR*.

Empirical Models

We examine both within-firm and between-firm effects of nonfinancial measures on firms' economic performance. We use panel data in our tests in order to study variations within a single firm over time, as well as variations among firms at a given point in time (Pindyck and Rubinfeld 1998).[12] To test the first set of hypotheses (H1 and H2), we use the following general model. The model examines the relationship between firms' use of nonfinancial measures and their economic performance:

$$PERFORMANCE = f(USE\_NFM, PERFORMANCE\_CONTROLS) \quad (1)$$

where *PERFORMANCE* is the firm's current (ROA_{it} and RET_{it}) and future (ROA_{it+1} and RET_{it+1}) economic performance; *USE_NFM* reflects whether a firm uses nonfinancial measures in its compensation contracts as proxied by *NFM*; and *PERFORMANCE_CONTROLS* are our control variables for performance discussed earlier.

To test the second set of hypotheses (H3 and H4), we use the following general models. The combined model investigates the relation between nonfinancial measures and economic performance contingent on the match between the use of nonfinancial measures and firm characteristics:

$$USE\_NFM = f(FIRM\_CHARACTERISTICS) \quad (2)$$

$$PERFORMANCE = f(MISMATCH\_NFM, PERFORMANCE\_CONTROLS) \quad (3)$$

where *USE_NFM* reflects whether a firm uses nonfinancial measures in its measurement systems as proxied by *NFM*; *FIRM_CHARACTERISTICS* are variables that determine the use of nonfinancial measures (*PROS*, *QLTY*, *DIST*, *FN_CORR*, *DCYCLE*, *LCYCLE*, *REG*); *PERFORMANCE* is the firm's current (ROA_{it} and RET_{it}) and future (ROA_{it+1} and RET_{it+1}) economic performance; *MISMATCH_NFM* are the residuals from equation (2) reflecting the extent of misfit between the use of nonfinancial measures and firm characteristics; and *PERFORMANCE_CONTROLS* are the covariates for performance discussed earlier.

Following Ittner et al. (2002), we first predict the choice to use nonfinancial measures using logit regression (model 2). We estimate model 2 using variables that proxy for firm characteristics and identified in the performance measurement literature as determinants of the use of nonfinancial measures. Next, in model 3, we examine the current and future performance consequences of the extent of mismatch between the use of nonfinancial measures and firm characteristics. Firm performance should be better (worse) when the firm's use of nonfinancial measures does (does not) fit the firm's particular economic characteristics. The residuals from model 2 (*MISMATCH_NFM*), the match model, estimate the extent to which the firm has "over-invested" or "under-invested" in nonfinancial measures. To allow for potential differences between firms that have over-invested versus under-invested in nonfinancial measures, we estimate two separate variables for positive and negative residuals (*POSNFM* and *NEGNFM*). *POSNFM* is defined as the positive residual from the match model (i.e., the firm uses nonfinancial measures but the predicted probability of use is less than 1), and 0 otherwise. *NEGNFM* is defined as the negative residual from the match model (i.e., the firm does not use nonfinancial measures and the predicted probability of use is greater than 0), and 0 otherwise.

[12] The use of panel data also increases the number of data points thereby enhancing degrees of freedom and the power of our tests.

Since positive and negative residuals both reflect a mismatch of the use of nonfinancial measures, *POSNFM* is expected to be negatively associated with performance and *NEGNFM* is expected to be positively associated with performance. The expected sign is negative for *POSNFM* given that firms over-investing in nonfinancial measures despite having low-predicted probability of use are expected to generate lower performance. Conversely, the expected sign is positive for *NEGNFM* since firms under-investing in nonfinancial measures despite having a high-predicted probability of use is expected to yield lower performance.

RESULTS

Performance Consequences of Nonfinancial Measures

Tables 4 and 5 provide evidence on the current and future performance of firms as a function of their use of nonfinancial measures. Using model 1, we regress firms' current and future accounting-based and market-based performance on a dummy variable for each firm's use of nonfinancial measure (*NFM*) and control variables. Due to complexities in pooled data regressions, we estimate several regressions to assess the robustness of our performance results.[13] The first estimation is based on weighted pooled least-squares (OLS) that combines all the cross-section and time-series data without controlling for any firm-specific effects and autocorrelation. Next, we test for fixed effects and random effects to deal with the cross-section and time-series intercepts and disturbances difficulties. Finally, we performed the Hausman specification test to determine whether these effects, if any, are fixed or random.[14]

Table 4 reports the estimations of the *current* accounting-based and market-based performance fixed effects models. A test for the null hypothesis of no fixed effects is rejected for the current accounting-based model ($F = 2.25$; p-value ≤ 0.001) as well as for the market-based model ($F = 2.98$, p-value ≤ 0.001). In addition, the Durbin-h and the Durbin-Watson statistics indicate no significant serial correlation (1.643 and 2.043, respectively). Based on the Hausman specification Chi-square (not reported), the null hypothesis of random effects is rejected in favor of the fixed effects estimation for the current accounting-based and market-based models. We used the same model validation procedures with subsequent models. In all cases, the fixed effects models provide the best fit compared to OLS with the exception of the market-based model reported in Table 8 and the accounting-based models reported in Table 11.

Table 4 indicates that for the current accounting-based performance using ROA_{it}, the *NFM* variable is positive but not significantly different from 0.[15] The insignificant relationship between the use of the nonfinancial and current accounting-based measures indicates that the use of nonfinancial measures does not improve the contemporaneous financial performance, contrary to our expectations. One alternative explanation is that the return on

[13] One difficulty associated with the least squares pooling procedures is that the assumption of constant intercept and slope may be unreasonable (Pindyck and Rubinfeld 1998). Another difficulty is the cross-section and time-series disturbances resulting from the first squares estimation process (Maddala 1983).

[14] We report results only for the applicable estimation. The results of our regression analyses show no evidence of multicollinearity as condition indices are less than 30 and variance inflation factors are less than 10 (not reported). Moreover, the corrected Durbin-h and Durbin-Watson tests show no evidence of autocorrelation. The Durbin-Watson statistic is inappropriate if the regression equation contains a lagged dependent variable. Instead, the Durbin-h statistic is more appropriate (Durbin 1970).

[15] In testing the current accounting-based model, the nonsignificance of ROA_{it} is not driven by the matching sample procedure for firm performance (i.e., the *ROA* 90–110 percent range requirement). We test the accounting-based model on a sample matched on two-digit SIC codes and firm size without regard to *ROA* range and the results are similar to those reported here.

TABLE 4
Regression Results for Current Performance as a Function of the Use of Nonfinancial Measures[a]
(t-statistics in parentheses)

Variables[b]	Expected Sign	Accounting-Based Model[c]	Market-Based Model[d]
NFM_{it}	+	0.095	0.317
		(1.12)	(6.46)***
$IROA_{it}/IRET_{it}$	+	0.245	0.003
		(1.67)*	(0.687)
ROA_{it-1}	+	0.027	
		(1.85)*	
LEV_{it}	−	−0.085	0.003
		(−3.95)***	(1.18)
$SIZE_{it}$	+	0.002	0.005
		(2.89)***	(2.46)***
$GROWTH_{it}$	+	0.003	0.010
		(0.88)	(2.61)***
REG_{it}	No prediction	0.0132	0.025
		(1.77)*	(2.22)**
$ACTVOL_{it}/SCTVOL_{it}$	No prediction	−0.343	−0.144
		(−0.782)	(−1.32)
Adjusted R^2		0.732	0.694
F-Statistic		240.10***	255.47***
Durbin-h		1.643	
Durbin-Watson statistic			2.043
F-Statistic for no fixed effects		2.25***	2.98***

*, **, *** Significant at the 0.10, 0.05, and 0.01 levels, respectively. Based on one-tailed tests for signed coefficients and two-tailed tests otherwise.

[a] Fixed effects models are based on a sample of 2,882 firm-year observations covering the period 1993–1998. Standardized coefficients are calculated by multiplying the estimated coefficient by the ratio of the standard deviation of the associated right-hand side variable to the standard deviation of the left-hand side variable.

[b] Variables definitions: *IROA* is the industry average of *ROA*; *IRET* is the industry average of *RET*; ROA_{it-1} is the lagged ROA_{it}; *LEV* is leverage measured using debt-equity ratio; *SIZE* is firm size measured as the log of total assets; *GROWTH* is growth opportunities measured as the market value of equity plus book value of debt divided by book value of assets at the beginning of the year; *REG* is a dummy variable for regulation that takes on the value of 1 if the firm operates in a regulated industry (SIC codes 40–49), and 0 otherwise; *ACTVOL* is the standard deviation of annual return on assets over the previous 5 years; *SCTVOL* is the standard deviation of the annualized daily stock returns over the previous 5 years; other variables are as defined in Tables 1 and 2.

[c] Using model 1:

$$ROA_{it} = \alpha_{10} + \beta_{11}NFM_{it} + \beta_{12}IROA_{it} + \beta_{13}ROA_{it-1} + \beta_{14}LEV_{it} + \beta_{15}SIZE_{it} + \beta_{16}GROWTH_{it} + \beta_{17}REG_{it} + \beta_{18}ACTVOL_{it} + \varepsilon_{19it}.$$

[d] Using model 1:

$$RET_{it} = \alpha_{20} + \beta_{21}NFM_{it} + \beta_{22}IRET_{it} + \beta_{23}LEV_{it} + \beta_{24}SIZE_{it} + \beta_{25}GROWTH_{it} + \beta_{26}REG_{it} + \beta_{27}SCTVOL_{it} + \varepsilon_{28it}.$$

assets is based on accounting numbers that are subject to managers' manipulation and may not necessarily reflect real improvement in the performance as measured by nonfinancial measures. Alternatively, the return on assets may largely reflect short-term performance for which nonfinancial performance measures are less important.

Consistent with our expectations, Table 4 shows that NFM_{it} is statistically significant with the expected positive sign in the current market-based model. The significant positive relation between the use of nonfinancial measures and the market-adjusted stock returns is an indication of the value relevance of nonfinancial measures to investors. Therefore, H1 is supported using market-based performance measures but not using accounting-based measures.

Table 5 reports the results of the estimation of the *future* accounting-based and market-based performance models. The null hypothesis of no fixed effects is rejected ($F = 5.34$ and 4.09; p-value ≤ 0.001) for both models. Accordingly, the following discussion of the future accounting and market models is based upon the fixed effects models. As indicated in Table 5, *NFM* is significantly and positively associated with firms' future return on assets, in contrast to the results on the current return on assets in Table 4. This result suggests that although nonfinancial measures appear to be leading indicators of future accounting-based performance, they do not positively impact the current accounting performance as measured by return on assets.

Also in Table 5, we report the estimation of the future market-based regression model. Consistent with our expectations, the use of nonfinancial performance measures (NFM_{it}) is statistically significant with the expected positive sign. The significant positive relation between the use of nonfinancial measures and the market-adjusted stock returns provides evidence that nonfinancial measures are leading indicators of market-based performance. Therefore, H2 is supported using both accounting-based and market-based performance measures.

Regarding the control variables in the current performance (Table 4) and future performance (Table 5) models, the coefficients for *IROA* and lagged *ROA* are positive and significant in the accounting-based models. The negative significant coefficients of *LEV* in both current and future accounting models indicate that firms with higher leverage are less able to achieve higher accounting-based performance. As expected, the coefficients for *SIZE* are positive and significant, indicating that larger firms achieve higher levels of performance as measured by both accounting and market performance. As expected, the coefficients on *GROWTH* in the future accounting-based model and both current and future market-based model are positive and significant. Generally, this result suggests that high-growth firms attain higher levels of performance both in current and future periods, whether these firms have high or low levels of debt. The positive and statistically significant coefficients of *REG* in both tables indicate that regulated firms perform better than nonregulated firms as measured by accounting-based and market-based measures. Finally, except for the future market performance model results, neither *ACTVOL* nor *SCTVOL* are statistically significant in any of the models.

Endogeneity of Nonfinancial Measures

The results of the logit regression prediction for firms' use of nonfinancial performance measures (model 2) are presented in Table 6. The model appears well specified as indicated by the pseudo R^2 and Chi-square statistics. Consistent with prior research (Govindarajan and Gupta 1985; Ittner et al. 1997; Simons 1987), we find that prospector firms (*PROS*) rely more heavily on nonfinancial measures than defender firms. Likewise, the use of nonfinancial measures is greater in quality-oriented firms (*QLTY*), consistent with previous

TABLE 5
Regression Results for Future Performance as a Function of the Use of Nonfinancial Measures[a] (t-statistics in parentheses)

Variables[b]	Expected Sign	Accounting-Based Model[c]	Market-Based Model[d]
NFM_{it}	+	0.053 (3.19)***	0.639 (9.61)***
$IROA_{it+1}/IRET_{it+1}$	+	0.211 (2.22)**	0.002 (0.75)
ROA_{it}	+	0.003 (1.968)**	
LEV_{it+1}	−	−0.153 (−4.35)***	0.002 (−0.89)
$SIZE_{it+1}$	+	0.004 (5.52)***	0.019 (6.89)***
$GROWTH_{it+1}$	+	0.009 (5.74)***	0.026 (5.63)***
REG_{it+1}	No prediction	0.003 (1.65)*	0.019 (3.03)***
$ACTVOL_{it+1}/SCTVOL_{it+1}$	No prediction	−0.075 (−0.821)	−0.243 (−1.67)*
Adjusted R^2		0.795	0.752
F-Statistic		348.70***	348.70***
Durbin-h		1.351	
Durbin-Watson			2.351
F-Statistic for no fixed effects		5.34***	4.09***

*, **, *** Significant at the 0.10, 0.05, and 0.01 levels, respectively. Based on one-tailed tests for signed coefficients and two-tailed tests otherwise.

[a] Fixed effects models are based on a sample of 2,882 firm-year observations covering the period 1993–1998. Standardized coefficients are calculated by multiplying the estimated coefficient by the ratio of the standard deviation of the associated right-hand side variable to the standard deviation of the left-hand side variable.

[b] Variables definition: ROA_{it} is the lagged ROA_{it+1}; other variables are as previously defined in Tables 1, 2, and 4.

[c] Using model 1:

$$ROA_{it+1} = \alpha_{30} + \beta_{31}NFM_{it} + \beta_{32}IROA_{it+1} + \beta_{33}ROA_{it} + \beta_{34}LEV_{it+1} + \beta_{35}SIZE_{it+1} + \beta_{36}GROWTH_{it+1} + \beta_{37}REG_{it+1} + \beta_{38}ACTVOL_{it+1} + \varepsilon_{39it+1}.$$

[d] Using model 1:

$$RET_{it+1} = \alpha_{40} + \beta_{41}NFM_{it} + \beta_{42}IRET_{it+1} + \beta_{43}LEV_{it+1} + \beta_{44}SIZE_{it+1} + \beta_{45}GROWTH_{it+1} + \beta_{46}REG_{it+1} + \beta_{47}SCTVOL_{it+1} + \varepsilon_{48it+1}.$$

research (Ittner et al. 1997; Ittner and Larcker 1997, 1995; Pfau and Gross 1993). The negative significant coefficient of *DIST* indicates that distressed firms are less likely to use nonfinancial measures compared to healthy firms. Consistent with Bushman et al. (1996), the positive significant coefficient of *DCYCLE* indicates that firms with longer product development cycles are more likely to use nonfinancial measures than firms with shorter product development cycles. Conversely, the results provide no support for firms with longer product life cycles (*LCYCLE*) making greater use of nonfinancial measures, a result

TABLE 6
Logit Regression Predicting the Choice of Using Nonfinancial Measures (Model 2)
(t-statistics in parentheses)

Variables[a]	Expected Sign	Match Model (*NFM*)[b]
PROS	+	0.744 (4.07)***
QLTY	+	0.010 (3.93)***
DIST	−	−0.391 (−1.65)*
FN_CORR	−	0.204 (1.08)
DCYCLE	+	0.470 (1.99)**
LCYCLE	+	0.148 (0.10)
REG	+	0.154 (1.90)*
Pseudo R^2		0.239
Chi-square/F-value		147.59***
Number of observations[c]		2,156

*, **, *** Significant at 0.10, 0.05, and 0.01 levels, respectively (one-tailed tests).

[a] Variables definitions: *PROS* is the firms' prospective strategy measured as a composite of (1) the ratio of research and development to sales, (2) the market-to-book ratio, and (3) the ratio of employees to sales; *QLTY* is a dummy variable for quality that takes on the value of 1 if the firm has won or been a finalist in a major quality award competition, and 0 otherwise; *DIST* is financial distress measured as a composite of (1) the probability of bankruptcy measured based on Ohlson's (1980) Model 3; (2) the leverage ratio; and (3) the leverage ratio scaled by R&D; *FN_CORR* is measured as the time-series correlation between annual return on assets and annualized daily stock returns over the five years prior to the proxy date; *DCYCLE* is a dummy variable that takes on the value of 1 if the firm is classified as having long-term product development cycle, and 0 otherwise; *LCYCLE* is a dummy variable that takes on the value of 1 if the firm is classified as having long term product life cycle, and 0 otherwise; other variables are as previously defined in Table 4.

[b] Using model 2:

$$NFM_{it} = \alpha_{10} + \alpha_{11}PROS_{it} + \alpha_{12}QLTY_{it} + \alpha_{13}DIST_{it} + \alpha_{14}FN\_CORR_{it} + \alpha_{15}DCYCLE_{it} + \alpha_{16}LCYCLE_{it} + \alpha_{17}REG_{it} + \varepsilon_{18it}.$$

[c] Of the 2,882 firm-year observations, we successfully classify 2,156 firm-year observations based on time-horizon (see Table 3).

inconsistent with those of Bushman et al. (1996) on individual measures. The positive coefficient of *REG* supports the claim that regulated firms are more likely to use nonfinancial measures than nonregulated firms, consistent with Bushman et al. (1996) and Ittner et al. (1997). The results fail to support a significant relationship between the use of nonfinancial measures and the level of noise in financial measures (*FN_CORR*).

We use model 3 to test the second set of hypotheses examining performance consequences contingent on the extent of mismatch between the use of nonfinancial measures and firm characteristics. Table 7 reports the results of the association between the residuals from the logit regression model (model 2) and current accounting-based and market-based performance using fixed effects regressions. While the coefficient signs are as predicted,

TABLE 7
Regressions Examining the Association between Residuals from the Nonfinancial Measures Prediction Model and Current Performance (Model 3)[a]
(t-statistics in parentheses)

Variables[b]	Expected Sign	Accounting-Based Model[c]	Market-Based Model[d]
$POSNFM_{it}$	−	−0.020	−0.192
		(−0.95)	(−2.81)***
$NEGNFM_{it}$	+	0.745	0.564
		(1.53)	(3.84)***
$IROA_{it}/IRET_{it}$	+	0.168	0.551
		(2.23)**	(1.74)*
ROA_{it-1}	+	0.108	
		(3.78)***	
LEV_{it}	−	−0.007	−0.029
		(−3.97)***	(−1.65)*
$SIZE_{it}$	+	0.179	0.231
		(1.88)*	(2.79)***
$GROWTH_{it}$	+	0.213	0.342
		(1.80)*	(2.37)**
REG_{it}	No prediction	−0.538	0.412
		(−0.87)	(3.70)***
$ACTVOL_{it}/SCTVOL_{it}$	No prediction	−0.240	0.220
		(−1.37)	(0.720)
Adjusted R^2		0.401	0.424
F-Statistic		135.53***	149.00***
Durbin-h		1.602	
Durbin-Watson			2.058
F-Statistic for no fixed effects		2.90***	3.40***

*, **, *** Significant at the 0.10, 0.05, and 0.01 levels, respectively. Based on one-tailed tests for signed coefficients and two-tailed tests otherwise.

[a] Fixed effects models are based on a sample of 2,156 firm-year observations covering the period 1993–1998. Standardized coefficients are calculated by multiplying the estimated coefficient by the ratio of the standard deviation of the associated right-hand side variable to the standard deviation of the left-hand side variable.

[b] Variables definitions: $POSNFM_{it}$ is the residual from the logit model in Table 6 if the residual is positive, and 0 otherwise; $NEGNFM_{it}$ is the residual from the logit model in Table 6 if the residual is negative, and 0 otherwise; other variables are as previously defined in Tables 2 and 4.

[c] Using model 3:

$$ROA_{it} = \alpha_{10} + \beta_{11}POSNFM_{it} + \beta_{12}NEGNFM_{it} + \beta_{13}IROA_{it} + \beta_{14}ROA_{it-1} + \beta_{15}LEV_{it} + \beta_{16}SIZE_{it} + \beta_{17}GROWTH_{it} + \beta_{18}REG_{it} + \beta_{19}ACTVOL_{it} + \varepsilon_{20it}.$$

[d] Using model 3:

$$RET_{it} = \alpha_{20} + \beta_{21}POSNFM_{it} + \beta_{22}NEGNFM_{it} + \beta_{23}IRET_{it} + \beta_{24}LEV_{it} + \beta_{25}SIZE_{it} + \beta_{26}GROWTH_{it} + \beta_{27}REG_{it} + \beta_{28}SCTVOL_{it} + \varepsilon_{29it}.$$

the results using current accounting-based measures of performance reflect no association between the performance consequences of using nonfinancial measures and the extent of mismatch between the firm's operational characteristics and its use of nonfinancial measures. However, corresponding results using the current market-based measures of performance provide strong evidence that the association between nonfinancial measures and market performance is a function of the match between the firm's operational characteristics and the use of nonfinancial measures. The significant negative coefficient on *POSNFM* indicates that when firms over-invest in nonfinancial measures (relative to the prediction of the benchmark model), these positive deviations are associated with lower current market-adjusted stock returns. Conversely, the significant positive coefficient on *NEGNFM* indicates that firms that do not use nonfinancial measures, when the model predicts they should, experience lower current market-adjusted stock returns.

Although the residuals from model 2 explain little of the variation in firms' current accounting performance, they do have significant explanatory power with respect to firms' future accounting performance. Table 8 reports the results of the associations between the residuals from model 2 and future economic performance (model 3). The significant negative coefficients on *POSNFM* in both accounting-based and market-based models indicate that firms making more extensive use of nonfinancial measures than predicted by model 2 experience lower future accounting and market-adjusted stock returns. Moreover, the positive coefficients of *NEGNFM* in both the accounting-based and market-based models indicate that firms that do not use nonfinancial measures when the model predicts that they should also experience lower future accounting and market-adjusted stock returns. The results in Tables 7 and 8 provide support for H3 and H4. The overall evidence suggests that the association between performance and the use of nonfinancial measures varies with the firm's economic circumstances, and that performance is maximized when the choice of performance measures is consistent with the company's operational and competitive environment.

Sensitivity Analysis

We conduct additional tests to check the robustness of the results for possible specification errors. One potential source of error in measuring the use of nonfinancial measures is our use of a dummy variable (*NFM*), which does not fully capture the actual reliance on, and relative importance of, nonfinancial measures. Among firms using nonfinancial measures in evaluating performance, the weight assigned to the nonfinancial measures may vary significantly across firms and across different types of nonfinancial measures. The preceding analysis uses *NFM*, a dichotomous variable indicating the use or nonuse of nonfinancial measures. Alternatively, estimating the relative weights assigned to nonfinancial measures may provide a better understanding of the impact of the use of nonfinancial measures on firm performance. Therefore, we next replace *NFM* with the relative weights assigned to the nonfinancial measures (*WNFM*) in both the accounting-based and market-based models.

It is not possible to estimate relative weights on nonfinancial measures for all firms in our sample.[16] However, from the compensation committee report included in the proxy statement for the sample of firms relying on nonfinancial performance measures, we are able to identify a subsample of 91 firms (324 firm-year observations) that provided the

[16] Although some firms explicitly assigned relative weights to the nonfinancial measures, they do not necessarily disclose the precise weights they use. For example, Boise Cascade Corporation in 1997 disclosed that they employ relative weights for each financial and nonfinancial measure without disclosing the specific weights.

TABLE 8
Regressions Examining the Association between Residuals from the Nonfinancial Measures Prediction Model and Future Performance (Model 3)[a]
(t-statistics in parentheses)

Variables[b]	Expected Sign	Accounting-Based Model[c]	Market-Based Model[d]
$POSNFM_{it}$	−	−0.192 (−2.85)*	−0.131 (−5.19)***
$NEGNFM_{it}$	+	0.564 (3.84)***	0.151 (6.41)***
$IROA_{it+1}/IRET_{it+1}$	+	0.551 (1.74)*	0.015 (1.96)**
ROA_{it}	+	0.160 (5.35)***	
LEV_{it+1}	−	−0.029 (−1.65)*	−0.013 (−0.18)
$SIZE_{it+1}$	+	0.231 (2.79)***	0.018 (0.831)
$GROWTH_{it+1}$	+	0.342 (5.37)***	0.083 (6.82)***
REG_{it+1}	No prediction	0.412 (3.07)***	0.428 (3.09)***
$ACTVOL_{it+1}/SCTVOL_{it+1}$	No prediction	0.220 (2.62)***	−0.003 (−0.35)
Adjusted R^2		0.481	0.523
F-Statistic		149.00***	131.82***
Durbin-h		1.689	
Durbin-Watson			2.001
F-Statistic for no fixed effects		3.40***	1.73

*, **, *** Significant at the 0.10, 0.05, and 0.01 levels, respectively. Based on one-tailed tests for signed coefficients and two-tailed tests otherwise.

[a] Based on a sample of 2,156 firm-year observations covering the period 1993–1998. Standardized coefficients are calculated by multiplying the estimated coefficient by the ratio of the standard deviation of the associated right-hand side variable to the standard deviation of the left-hand side variable.

[b] Variables are as previously defined in Tables 2, 4, 5, and 7.

[c] Fixed effect model using model 3:

$$ROA_{it+1} = \alpha_{10} + \beta_{11}POSNFM_{it} + \beta_{12}NEGNFM_{it} + \beta_{13}IROA_{it+1} + \beta_{14}ROA_{it} + \beta_{15}LEV_{it+1} + \beta_{16}SIZE_{it+1} + \beta_{17}GROWTH_{it+1} + \beta_{18}REG_{it+1} + \beta_{19}ACTVOL_{it+1} + \varepsilon_{20it+1}.$$

[d] Pooled weighted OLS models using model 3 (the fixed effect test shows no evidence of the fixed effect):

$$RET_{it+1} = \alpha_{20} + \beta_{21}POSNFM_{it} + \beta_{22}NEGNFM_{it} + \beta_{23}IRET_{it+1} + \beta_{24}LEV_{it+1} + \beta_{25}SIZE_{it+1} + \beta_{26}GROWTH_{it+1} + \beta_{27}REG_{it+1} + \beta_{28}SCTVOL_{it+1} + \varepsilon_{29it+1}.$$

explicit weights placed on nonfinancial measures. We use this subsample for additional analysis. We substitute *WNFM* in models 1, 2, and 3 to examine the research hypotheses using the relative weights for the subsample.

The performance effects of using weighted nonfinancial performance measures, *WNFM* (model 1), are presented in Table 9. Using the weighted measures enhances the explanatory

TABLE 9
Estimating the Performance Consequences Using Weighted Nonfinancial Measures (Model 1)[a]
(t-statistics in parentheses)

Variables[b]	Expected Sign	Accounting-Based Model[c]		Market-Based Model[d]	
		Current	Future	Current	Future
$WNFM_{it}$	+	0.204 (0.65)	0.216 (4.21)***	0.368 (6.64)***	0.131 (10.95)***
$IROA_{it}/IROA_{it+1}/IRET_{it}/IRET_{it+1}$	+	0.611 (3.61)***	0.58766 (2.56)**	0.003 (0.76)	−0.002 (−0.65)
ROA_{it-1}/ROA_{it}	+	0.241 (3.00)***	0.0525 (2.62)***		
LEV_{it}/LEV_{it+1}	−	−0.711 (−4.05)***	−0.056 (−4.75)***	−0.111 (−4.64)***	−0.004 (−4.68)***
$SIZE_{it}/SIZE_{it+1}$	+	0.006 (10.30)***	0.023 (5.65)***	0.011 (2.95)***	0.0132 (7.86)***
$GROWTH_{it}/GROWTH_{it+1}$	+	0.676 (2.26)**	0.054 (6.57)***	0.014 (3.59)***	0.103 (7.30)***
REG_{it}/REG_{it+1}	No prediction	0.017 (1.98)**	0.002 (2.51)**	0.031 (2.92)***	0.022 (4.59)***
$ACTVOL_{it}/ACTVOL_{it+1}$ $SCTVOL_{it}/SCTVOL_{it+1}$	No prediction	2.172 (0.86)	0.046 (0.36)	0.615 (1.09)	0.21254 (0.84)
Adjusted R^2		0.769	0.838	0.756	0.795
F-Statistic		231.04***	476.11***	315.4***	348.7***
Durbin-h		1.823	2.312		
Durbin-Watson				1.801	1.910
F-Statistic for no fixed effects		2.94***	4.70***	6.73***	8.23***

, * Significant at the 0.05 and 0.01 levels, respectively. Based on one-tailed tests for signed coefficients and two-tailed tests otherwise.

[a] Fixed effects models are based on a subsample of 648 firm-year observations (324 firm-year observations using explicit weights of nonfinancial measures and 324 firm-year observations using only financial measures). Standardized coefficients are calculated by multiplying the estimated coefficient by the ratio of the standard deviation of the associated right-hand side variable to the standard deviation of the left-hand side variable.

[b] Variables definitions: $WNFM_{it}$ is the weight assigned to the nonfinancial measures; other variables are as previously defined in Tables 2, 4, and 5.

[c] Using model 1:

$$ROA_{it} = \alpha_{10} + \beta_{11}WNFM_{it} + \beta_{12}IROA_{it} + \beta_{13}ROA_{it-1} + \beta_{14}LEV_{it} + \beta_{15}SIZE_{it} + \beta_{16}GROWTH_{it} + \beta_{17}REG_{it} + \beta_{18}ACTVOL_{it} + \varepsilon_{19it}.$$

$$ROA_{it+1} = \alpha_{30} + \beta_{31}WNFM_{it} + \beta_{32}IROA_{it+1} + \beta_{33}ROA_{it} + \beta_{34}LEV_{it+1} + \beta_{35}SIZE_{it+1} + \beta_{36}GROWTH_{it+1} + \beta_{37}REG_{it+1} + \beta_{38}ACTVOL_{it+1} + \varepsilon_{39it+1}.$$

[d] Using model 1:

$$RET_{it} = \alpha_{20} + \beta_{21}WNFM_{it} + \beta_{22}IRET_{it} + \beta_{23}LEV_{it} + \beta_{24}SIZE_{it} + \beta_{25}GROWTH_{it} + \beta_{26}REG_{it} + \beta_{27}SCTVOL_{it} + \varepsilon_{28it}.$$

$$RET_{it+1} = \alpha_{40} + \beta_{41}WNFM_{it} + \beta_{42}IRET_{it+1} + \beta_{43}LEV_{it+1} + \beta_{44}SIZE_{it+1} + \beta_{45}GROWTH_{it+1} + \beta_{46}REG_{it+1} + \beta_{47}SCTVOL_{it+1} + \varepsilon_{48it+1}.$$

power of the current and future accounting-based and market-based models slightly (with *WNFM*: adjusted R^2s are 0.77 and 0.84 for accounting-based models; 0.76 and 0.80 for market-based models, whereas with *NFM*: adjusted R^2s are 0.73 and 0.80 for accounting-based models; 0.69 and 0.75 for market-based models). Although the results from our additional analyses (using *WNFM*) are similar to the initial analyses (using *NFM*), the coefficients, signs, significance levels, and the models' explanatory power are all greater using *WNFM*. In conclusion, the use of relative weight strengthens the results, suggesting that the relative weight placed on nonfinancial measures has a greater impact on performance than the mere presence of nonfinancial measures in the compensation contract.

To test the robustness of the measurement fit or match results, we reexamine this relation using the weighted nonfinancial measure (*WNFM*) as the dependent variable in the match model (model 2). Table 10 shows the results of the pooled weighted OLS. The results indicate that the weight placed on nonfinancial measures is greater for firms adopting a prospector strategy, with a quality management focus, and with firms with longer product

TABLE 10
Pooled Weighted OLS Predicting the Choice of Using Nonfinancial Measures (Model 2)[a]
(t-statistics in parentheses)

Variables[b]	Expected Sign	Match Model (*WNFM*)[c]
PROS	+	0.007 (1.96)**
QLTY	+	0.068 (6.65)***
DIST	−	−0.006 (−1.74)*
FN_CORR	−	0.017 (1.61)
DCYCLE	+	0.014 (4.33)***
LCYCLE	+	0.002 (0.77)
REG	+	0.041 (2.97)***
Pseudo R^2		0.303
Chi-square/F-value		98.23***
Number of observations[d]		638

*, **, *** Significant at 0.10, 0.05, and 0.01 levels, respectively (on one-tailed tests).

[a] Standardized coefficients are calculated by multiplying the estimated coefficient by the ratio of the standard deviation of the associated right-hand side variable to the standard deviation of the left-hand side variable.

[b] Variables are as previously defined in Tables 6 and 9.

[c] Using model 2:

$$WNFM_{it} = \alpha_{10} + \alpha_{11}PROS_{it} + \alpha_{12}QLTY_{it} + \alpha_{13}DIST_{it} + \alpha_{14}FN\_CORR_{it} + \alpha_{15}DCYCLE_{it} + \alpha_{16}LCYCLE_{it} + \alpha_{17}REG_{it} + \varepsilon_{18it}.$$

[d] Of the 648 firm-year observations placing weights on nonfinancial measures, we successfully classify 638 firm-year observations based on time-horizon (see Table 3).

development cycle. Moreover, the results indicate that distressed firms place less weight on nonfinancial measures, while regulated firms place more emphasis on nonfinancial measures. The results fail to support significant relationships for the noise in financial measures or product life cycles.

Performance results for model 3 using the residuals from model 2 of the weighted nonfinancial measures are presented in Table 11. The significant negative coefficients on *POSWNFM* in both accounting-based and market-based models indicate that firms placing more weight on nonfinancial measures than predicted are associated with lower current and future accounting and market returns. The positive coefficients on *NEGWNFM* in both accounting-based and market-based models indicate that firms that place less weight on nonfinancial measures than predicted are also associated with lower current and future accounting and market returns.

The overall results using the relative weight on nonfinancial performance measures confirms the basic results in our initial analysis (we find significant results even for the current accounting-based model). The results again suggest that the performance consequences associated with the weight placed on nonfinancial measures is a function of the firm's operational and competitive environment. In conclusion, with the exception of some of the results for the current accounting-based models, we find consistent performance results across all of our models. Using market-based measures, we find that nonfinancial measures have a significant impact on the economic performance of our sample firms.

SUMMARY AND CONCLUSION

The objective of this study is to examine the current and future performance consequences of incorporating nonfinancial measures in a set of performance metrics. The empirical results indicate that using nonfinancial measures in evaluating performance affects market performance. Although we find some evidence for future accounting-based performance, the overall evidence on nonfinancial measures' impact on accounting-based performance is mixed. Our results are consistent with results of previous studies, which provide evidence that nonfinancial performance measures are associated with subsequent firm economic performance (Anderson et al. 1994; Banker et al. 2000; Foster and Gupta 1997). The results also indicate that nonfinancial measure use is significantly associated with: (1) an innovation-oriented strategy; (2) a quality-oriented strategy; (3) the length of the product development cycle; (4) industry regulation; and (5) the level of financial distress. More importantly, the association between nonfinancial measures and firm performance is contingent on whether the use of nonfinancial measures matches the firm's characteristics.

A limitation of our study is that we considered the use of nonfinancial measures in aggregate terms. It may be the case that a specific nonfinancial measure (e.g., cost control, quality, customer satisfaction, etc.) affects performance in a different fashion than an alternate nonfinancial measure. Ittner and Larcker (2002), for example, find variation in the specific factors influencing the use of different types of nonfinancial measures, suggesting that the aggregate performance measure classification commonly used in compensation research provides somewhat misleading inferences regarding performance measurement choices. Similarly, the performance implications associated with the use of different nonfinancial measures in different circumstances is also likely to vary. A further limitation is our exclusive reliance on the use of nonfinancial measures in compensation, as opposed to other potential uses of nonfinancial measures, which we do not address here. Further, we did not consider the potential and likely impact of target setting with regard to both financial and nonfinancial performance measures.

TABLE 11
Regressions Examining the Association between Residuals from the Weighted Nonfinancial Measures Prediction Model and Performance (Model 3)[a]
(t-statistics in parentheses)

Variables[b]	Expected Sign	Accounting-Based Model[c]		Market-Based Model[d]	
		Current	Future	Current	Future
$POSWNFM_{it}$	−	−0.775 (−2.65)***	−0.205 (−2.87)***	−0.072 (−2.92)***	−0.392 (−5.53)***
$NEGWNFM_{it}$	+	0.267 (2.54)**	0.584 (3.87)**	0.308 (4.32)***	0.135 (4.96)***
$IROA_{it}/IROA_{it+1}/IRET_{it}/IRET_{it+1}$	+	0.402 (2.12)**	0.365 (2.45)**	0.086 (2.73)***	0.026 (1.98)**
ROA_{it-1}/ROA_{it}	+	0.068 (1.16)	0.103 (1.32)		
LEV_{it}/LEV_{it+1}	−	−0.005 (−0.92)	−0.018 (−2.83)***	0.003 (0.88)	−0.008 (−0.44)
$SIZE_{it}/SIZE_{it+1}$	+	0.023 (1.17)	0.463 (0.503)	0.026 (0.58)	0.03 (1.25)
$GROWTH_{it}/GROWTH_{it+1}$	+	0.303 (1.69)*	0.523 (2.39)**	0.048 (4.46)***	0.021 (3.56)***
REG_{it}/REG_{it+1}	No prediction	0.468 (1.51)	0.246 (2.10)**	0.149 (2.17)**	0.382 (4.75)***
$ACTVOL_{it}/ACTVOL_{it+1}$ $SCTVOL_{it}/SCTVOL_{it+1}$	No prediction	0.233 (2.62)***	0.150 (1.86)*	0.003 (1.41)	0.001 (0.993)
Adjusted R^2		0.434	0.541	0.566	0.642
F-Statistic		63.41***	85.94***	89.76***	92.69***
Durbin-h		1.611	1.698		
Durbin-Watson				2.008	2.028
F-Statistic for no fixed effects		1.13	1.04	2.93***	3.51***

*, **, *** Significant at the 0.10, 0.05, and 0.01 levels, respectively. Based on one-tailed tests for signed coefficients and two-tailed tests otherwise.

[a] Based on a subsample of 638 firm-year observations. Standardized coefficients are calculated by multiplying the estimated coefficient by the ratio of the standard deviation of the associated right-hand side variable to the standard deviation of the left-hand side variable.

[b] Variables definitions: $POSWNFM_{it}$ is the residual from the logit model in Table 10 if the residual is positive, and 0 otherwise; $NEGNFM_{it}$ is the residual from the logit model in Table 10 if the residual is negative, and 0 otherwise; other variables are as previously defined in Tables 2, 4, and 5.

[c] Pooled weighted OLS models using model 3:

$$ROA_{it} = \alpha_{10} + \beta_{11}POSWNFM_{it} + \beta_{12}NEGWNFM_{it} + \beta_{13}IROA_{it} + \beta_{14}ROA_{it-1} + \beta_{15}LEV_{it} + \beta_{16}SIZE_{it} + \beta_{17}GROWTH_{it} + \beta_{18}REG_{it} + \beta_{19}ACTVOL_{it} + \varepsilon_{20it}.$$

$$ROA_{it+1} = \alpha_{10} + \beta_{11}POSWNFM_{it} + \beta_{12}NEGWNFM_{it} + \beta_{13}IROA_{it+1} + \beta_{14}ROA_{it} + \beta_{15}LEV_{it+1} + \beta_{16}SIZE_{it+1} + \beta_{17}GROWTH_{it+1} + \beta_{18}REG_{it+1} + \beta_{19}ACTVOL_{it+1} + \varepsilon_{20it+1}.$$

[d] Fixed effects models using model 3:

$$RET_{it} = \alpha_{20} + \beta_{21}POSWNFM_{it} + \beta_{22}NEGWNFM_{it} + \beta_{23}IRET_{it} + \beta_{24}LEV_{it} + \beta_{25}SIZE_{it} + \beta_{26}GROWTH_{it} + \beta_{27}REG_{it} + \beta_{28}SCTVOL_{it} + \varepsilon_{29it}.$$

$$RET_{it+1} = \alpha_{20} + \beta_{21}POSWNFM_{it} + \beta_{22}NEGWNFM_{it} + \beta_{23}IRET_{it+1} + \beta_{24}LEV_{it+1} + \beta_{25}SIZE_{it+1} + \beta_{26}GROWTH_{it+1} + \beta_{27}REG_{it+1} + \beta_{28}SCTVOL_{it+1} + \varepsilon_{29it+1}.$$

Our findings suggest several fruitful areas of future research. Research is needed to capture different dimensions of the contextual impact on firm performance. A host of implementation issues concerning the adoption of nonfinancial measures has not been addressed in the literature. Although prior survey research identifies several contingent factors, we are limited to those measures that are publicly available. Future research has the potential to combine these complementary methodologies, thus drawing from the relative strengths of each method (Libby et al. 2002). In this way, a combination of survey and archival evidence can potentially provide a richer understanding of the impact of nonfinancial measures on firm performance.

APPENDIX
Representative Proxy Statements

Panel A: Weighted Nonfinancial Measures Including Specific Description of How the Measures Are Used

Example: Bausch & Lomb, Inc. (1995).

"Under the annual incentive plan, objectives are established at the beginning of each year. Minimum and maximum performance levels are also defined. An individual's objectives may include corporate, division, or individual goals or some combination of these. The CEO's goals are based solely on the overall performance of the Company. Company goals include the following criteria and weightings: sales growth, 30 percent; earnings growth, 30 percent; return on equity, 30 percent; and **improvement in aggregate customer satisfaction ratings from operating divisions, 10 percent.**"

Panel B: Weighted Nonfinancial Measures without Specific Description of How the Measures Are Used

Example: Atlantic Energy, Inc. (1996).

1996 ANNUAL INCENTIVE PERFORMANCE RESULTS

For 1996, the target corporate performance indicators and relative **weights** of each indicator at the target level were as follows:

Performance Indicators:

- 45 percent related to earnings per share of the Company's Common Stock;
- 10 percent related to ACE lost time accident record;
- 15 percent related to cash flow per share of the Company's Common Stock;
- 10 percent related to ACE **customer satisfaction.**

"The annual incentive portion of the Enterprise Compensation Program provides for incentive opportunities linked to a combination of AEE business plan goals, the Company's performance indicators, and goals specific to a subsidiary's financial and operating results. Performance measures and **relative weights are unique** to each executive officer of AEE based on his respective job accountabilities. In 1996, bonuses were paid to the executive officers of AEE under the Enterprise Compensation Program. These bonuses ranged from 31 percent to 35 percent of the executive officers' base salaries."

Panel C: Unweighted Nonfinancial Measures without Specific Mention of How They Are Used

Example: Andrew CORP (1995).

"Board of Directors also recommends that the MIP be amended to set forth the performance-based criteria which the Compensation Committee of the Board of Directors

(the "Committee") may impose to exempt grants of stock awards and performance units, including the following: revenue, earnings, earnings per share, return on assets, return on capital, return on investment, return on sales, *productivity, market share,* cash flow, generation of free cash, Common Stock price, operating expense ratios, **quality, delivery performance, or level of improvement** in any of the foregoing. The Committee would select one or more of these criteria and establish the performance goals prior to, or at the time that, the stock awards or performance unit awards are made (or within a permissible period thereafter), and the Committee would determine whether the goals have been satisfied prior to any vesting or distributions."

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