

HOW MUCH DO CEOS MATTER--REALLY?

ALISON MACKEY

Assistant Professor of Management
Orfalea College of Business
California Polytechnic State University
San Luis Obispo, CA 93407
Tel: (805) 756-1232
Fax: (805) 756-1473
mackey@calpoly.edu

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ABSTRACT

The extent to which CEOs influence firm performance is fundamental to scholarly understanding of how organizations work; yet, this linkage is poorly understood. Previous empirical efforts to examine the link between CEOs and firm performance using variance decomposition, while provocative, nevertheless suffer from methodological problems that systematically understate the relative impact of CEOs on firm performance compared to industry and firm effects. This paper addresses these methodological problems and re-examines the percentage of the variance in firm performance explained by heterogeneity in CEOs. The results of this paper suggest that the “CEO effect” on corporate-parent performance is substantially more important than that of industry and firm effects, but only moderately more important than industry and firm effects on business-segment performance.

Do CEOs have an impact on firm performance? And if they do, where in a firm do they matter most—at the corporate or segment level? These questions have captured the attention of business scholars and practitioners for over a century (Bass, 1991; Carpenter, Geletkanycz, and Sanders, 2004; Yukl, 2002). On the one hand, some theorists (Barnard, 1938) and many practitioners (e.g., Drucker 1954; Collins, 2001) have argued that leadership—especially in a firm’s senior positions—has an important impact on firm performance and survival at all levels. Barnard (1938), for example, argued that top leaders formulate a collective purpose that binds participants in an organization; Selznick (1957) described how top leaders infuse an organization with values; Schein (1992) argued that top leaders help create an organization’s culture; and Tichy and Cohen (1997) argued for the crucial role of top leaders in deciding an organization’s course of action—especially in the face of technical and environmental change (Woodward, 1965; Lawrence and Lorsch, 1967; Thompson, 1967). All these effects of leadership are thought to be leveraged throughout an organization (Rosen, 1990), resulting in a substantial impact on a firm’s performance.

On the other hand, some scholars have argued that leadership influence on firm outcomes is limited by environmental, organizational, and legitimacy constraints, which restrict executive choice (e.g., Hannan and Freeman, 1989; Pfeffer and Salancik, 1978; DiMaggio and Powell, 1983). Without choice, CEOs can do little to influence firm outcomes (Hambrick & Finkelstein, 1987). From quite a different perspective, other scholars suggest that leaders, such as CEOs, play more of a symbolic than substantive role in organizations (Pfeffer, 1981). In this view, performance outcomes are attributed to CEOs as a way to make sense out of complex organizational outcomes (Calder, 1977; Pfeffer, 1977; Meindl, Ehrlich, and Dukerich, 1985). Empirical support for these perspectives is often linked to a body of research that estimates the percentage of variance in firm performance explained by a firm’s CEO (e.g. Lieberman and

O'Connor, 1972; Weiner, 1978; Thomas, 1988). Overall, reviews of this empirical literature suggest that the impact of CEOs on firm performance is modest, at best (e.g. Finkelstein and Hambrick, 1996), which has led some scholars to conclude that the search for explanations of variance in firm performance needs to focus on other variables, since “factors outside the control of any single individual drive organizational performance” (Podolny, Khurana, and Hill-Popper's, 2005: 2).

This paper investigates the possibility that conclusions about the modest impact of CEOs on firm performance may be premature. In particular, much of this previous work (e.g. Lieberman and O'Connor, 1972; Weiner, 1978; Thomas, 1988) suffers from some important methodological weaknesses, weaknesses that have had the effect of systematically understating the impact of CEOs on firm performance. By addressing these weaknesses, this paper shows that CEOs can, in fact, have a substantial impact, explaining as much as 29.2% of the variance in a firm's performance. In addition, this paper shows that much of this effect occurs at the corporate level of analysis and that at the segment level, corporate CEOs have much less impact on performance than other factors. CEOs are also shown to be much more influential on firm outcomes in diversified firms than in focused firms.

The paper begins by identifying four weaknesses of previous research on the impact of CEOs on firm performance. Then, an approach that addresses each of these weaknesses is proposed and implemented with results that suggest CEO effects substantially larger than the previous literature. The paper concludes by discussing the theoretical and methodological implications of this research.

PRIOR CEO EFFECTS RESEARCH

Perhaps the most influential work on the impact of CEOs on firm performance applies variance decomposition methods (O'Reilly, Caldwell, Chatman, 2005). The first of these papers was published in 1972 by sociologists Stanley Lieberman and James O'Conner in the *American Sociological Review* and was based on a sample of 167 firms in 13 different industries over a 20 year time period (1946-1965). This paper utilized sales, earnings, and profit margins as performance metrics and concluded that industry (18.6% to 28.5% variance explained) and firm effects (22.6% to 67.7% variance explained) are far more important than leadership (6.5% to 14.5% variance explained) in explaining variance in firm performance.

This initial study generated intense criticism from organizational scholars (e.g. Hambrick and Mason, 1984; Romanelli and Tushman, 1988) and multiple empirical critiques and extensions. Weiner (1978) published the first follow-up study using 193 manufacturing firms and replicated Lieberman and O'Conner's (1972) results using sequential ANOVA but found radically different results by reversing the sequence of the decomposition (e.g. decomposing CEO effects before industry or firm effects). Then, Thomas (1988) studied the CEO-performance relationship in twelve firms in one industry in the United Kingdom. Unable to estimate an industry effect, Thomas (1988) found that firm effects accounted for 72.7% to 89.6% of the variance in firm performance while CEO effects accounted for 3.9% to 7% of this variance.¹

¹ Some reviews of this empirical literature cite Thomas (1988) as finding CEO effects ranging from 51% to 66% instead of the 3.9% to 7% as reported in this paper (e.g. Waldman and Yammarino, 1999). Thomas (1988) converted his reported CEO effects from the percent of explained total variance in firm performance to the percent of unexplained variance in the firm performance (what percent of the residual was the CEO effect). In other words, a CEO effect of 3.9% was converted into a CEO effect of 61.4% because only 6.3% of the total variance in firm performance remained for the CEO effect to explain after the year and firm effects were estimated. This paper, as the majority of papers citing this study, elects not take such an interpretation of Thomas (1988).

More recently, Wasserman, Nohria, and Anand (2001) used a sample of 531 companies across 42 industries and found that CEO effects accounted for 14.7% of the variance in firm profitability (using return on assets as the dependent variable)—still, relatively less explanatory power than industry and company effects. A recent paper by Crossland and Hambrick (2007) further extends this line of inquiry into a global setting and finds CEO effects consistent with previous work—varying from 4.6% (in Japan) to 13.4% (in the U.S.) when ROA is used to proxy firm performance.²

Limitations of Previous Empirical Studies

The methodology of some of these studies, e.g., Lieberman and O'Connor (1972), has already been extensively criticized (e.g. Hambrick and Mason, 1984; Pfeffer and Davis-Blake, 1986; Day and Lord, 1988; Romanelli and Tushman, 1988). However, at least some of the additional methodological limitations discussed here apply to all the papers in this line of research. These limitations have the effect of systematically reducing the reported level of the CEO effect on firm performance, thus making it difficult to evaluate where in an organization the CEO effect is most likely to manifest itself.

CEO Movement and Estimating CEO Effects. The ability to identify different kinds of effects using variance decomposition techniques depends critically on the extent to which different effects in the data are nested in other effects. For example, it is not possible to isolate industry effects if all the firms in a sample are in the same industry (see Thomas, 1988); it is also not possible to estimate firm effects if there is only one firm in each industry (i.e., if each firm studied is a monopoly). Of course, these two forms of nesting are relatively rare in real data

² Crossland and Hambrick (2007) also use a random effects model with maximum likelihood estimation in their paper. This approach has not before been used in the CEO effects literature, but has been used at some length in the strategic management debate on industry versus firm effects (e.g. Schmalensee, 1985; Rumelt, 1991; McGahan and Proter, 1997). This approach came under heavy criticism from Brush and Bromiley (1997) because of problems with the interpretation of variance estimates created with variance components methods and because this approach

sets and so most of the time it is possible to apply variance decomposition techniques to identify industry and firm effects.

However, many researchers in this tradition have failed to recognize that CEO effects can be nested in either industry or firm effects. This will be the case when CEO movements across firms or across industries either do not exist or are not tracked in a data set. In these data sets, each CEO is identified with a single firm or industry, and it becomes difficult to disentangle CEO effects from firm and industry effects.

Consider the implications of this nesting for estimating the effects of CEOs that change firms or industries. A single individual that is a CEO in multiple firms or industries is exactly the context within which the effects of CEOs on firm performance should be the easiest to estimate. However, by having data sets that do not have these kinds of employment changes, or by not tracking these employment changes when they exist, prior scholars have effectively treated each CEO/firm and CEO/industry combination as if they are independent data points, ignoring the fact that a single CEO links these data. This nests the potential effect of CEOs within either firm or industry effects and significantly reduces the size of the reported CEO effect.

CEO Turnover and Estimating CEO Effects. A second form of nesting can also exist in data sets used to examine CEO effects. In particular, if firms in a sample have the same CEO during the entire time when the data was collected, then for these firms, there is no difference between a CEO effect and a firm effect on firm performance. Failing to eliminate firms without CEO turnover from the sample is likely to systematically bias results against finding a CEO effect. Of course, eliminating such firms from the sample may create sample selection bias problems that would also need to be controlled for in statistically appropriate ways.

Corporate and Segment CEO Effects. Since most of the previous research in this tradition has failed to identify large CEO effects, overall, it is not surprising that most of this work has not gone on to examine where in a firm these effects are likely to manifest themselves—at the corporate level or at the segment level. In fact, since previous work in this area has collected data at only the firm, and not the segment, level, even if scholars were interested in where within a firm the CEO effect is manifest, the potential impact of CEOs at the segment level could not have been examined.

Sequential ANOVA. Finally, with one exception (Crossland and Hambrick, 2007), previous variance decomposition studies in the CEO effects literature have used sequential ANOVA techniques. This estimation procedure has at least two important limitations.

First, sequential ANOVA assumes that each estimated effect is independent and thus covariance between effects is not modeled. This assumption does not seem appropriate in this context where, for example, industry and corporate effects have been shown to be highly correlated (McGahan and Porter, 1997).

Second, and perhaps more importantly, the order in which variables are entered in a sequential ANOVA model can have a significant impact on the percentage of variance explained associated with each variable. This is especially the case when there is serious nesting in the data set, of the type described previously. For example, Lieberman and O'Connor (1972) found relatively small CEO effects by entering their CEO variable last into the variance decomposition procedure. By reversing the order of entry, Weiner and Mahoney (1978) dramatically changed these results from, 8.7-19.0% of explained variance to 77.5-96.1% variance explained by the CEO. This very large change suggests significant nesting of the CEO variable in Lieberman and

O'Connor's (1972) and Weiner's (1978) data sets, i.e., that either CEOs in their samples did not change firms or industries, or that these changes were not tracked at the individual level.

For these reasons, most current variance decomposition studies (e.g. McGahan and Porter, 2002)—including the most recent work on CEO effects done by Crossland and Hambrick (2007)—abandons sequential ANOVA in favor of simultaneous ANOVA methods.

METHODOLOGY

These four limitations of prior research on the size of the CEO effect—not tracking CEOs across changes in firms and industries, including firms in the sample where CEOs did not change, not including segment data, and using sequential ANOVA estimation procedures—are likely to have significantly understated the size of the reported CEO effect and made it difficult to identify where within a firm this effect is likely to manifest itself. Addressing these limitations of prior work is the objective of the remainder of this paper.

Model

As previously suggested CEOs can affect firm performance at two levels—at the corporate level and at the business-unit or segment level. In this paper, CEO effects are estimated for both these levels.

Consider first a model of the CEO's influence on the variance in corporate-parent performance across firms:

$$R_{i,j,k,t} = \alpha_i + \beta_j + \delta_k + \gamma_t + \varepsilon_{i,j,k,t} \quad (1)$$

In this equation, $R_{i,j,k,t}$ is the corporate-parent accounting profit (ROA) in year t of corporate-parent j 's business in industry i , which corporate-parent is led by CEO k . The other variables in the model are α_i , the industry effect; β_j , the corporate effect; δ_k , the CEO effect; γ_t , the year effect, and $\varepsilon_{i,j,k,t}$, the residual. Note that the observations in the data are at the business-

segment level of analysis (for estimating accurate industry effects), but the dependent variable is corporate-parent performance—that is, each observation is a unique business-segment instead of a corporate-parent but the dependent variable is corporate ROA.³

The specification for assessing the CEO’s influence on the variance in business-segment performance across firms is as follows:

$$r_{i,j,k,t} = \alpha_i + \beta_j + \delta_k + \gamma_t + \varphi_{i,j} + \varepsilon_{i,j,k,t} \quad (2)$$

In this equation, $r_{i,j,k,t}$ is the business-segment accounting profit (ROA) in year t of corporate-parent j ’s business in industry i , which corporate-parent is led by CEO k . The other variables in the model are α_i , the industry effect; β_j , the corporate effect; δ_k , the CEO effect; γ_t , the year effect; φ_{ij} , the segment effect, and $\varepsilon_{i,j,k,t}$, the residual. Although some prior work in variance decomposition in strategic management has specified models with interaction effects (e.g. Rumelt, 1991), other work elects not to do so because of *overspecification* from including all interaction effects instead of just one set of interaction effects (see, McGahan and Porter, 1997: 18 for further discussion). Regardless, there are not sufficient degrees of freedom to include transient industry effects (industry-year interaction) or corporate-executive effects in this study.

Both models are estimated using simultaneous ANOVA (e.g. McGahan and Porter, 2002) unlike much of the previous work that used sequential ANOVA (e.g. Lieberman and O’Connor, 1972; Weiner, 1978; Thomas, 1988). Unlike sequential ANOVA, simultaneous ANOVA methods allow for covariance among effects. Since common variance is captured by covariance effects, estimates from simultaneous ANOVA are usually smaller than estimates from sequential ANOVA.

³ Note that business-segment effects are excluded from this model since the dependent variable is corporate-parent performance. We would not expect business-segments to significantly impact the variance in corporate ROA.

Data and Sample

Business-segments are identified from the Compustat Business-Segment reports, which include all companies that are publicly traded in the United States since 1983. This dataset numbers each segment that belongs to a particular corporate parent, and hence by combining the segment number and the corporate identifier, business segments are uniquely identified.

Criteria for inclusion in the sample were based on the conventions in the strategic management literature (e.g. McGahan and Porter, 1997). Namely, segments in financial institutions were deleted as returns are not comparable to other industries (SIC in 6000's), segments in government or unclassifiable industries were deleted as firms in these segments are not direct competitors (SIC greater than 9000), and segments with less than 20 million in assets were deleted.

These data were merged with the Compustat Executive Compensation database, which reports compensation variables for executives in the S&P 500, S&P MidCap 400, and S&P SmallCap 600. The available years were 1992-2002 since 2002 is the last fully populated year in the business segment file⁴. In this paper, leaders are defined as CEOs and not other members of the executive team or members of the board. As suggested earlier, CEO effects cannot be separated from corporate effects if the same CEO is running a corporation for the entirety of the data range. Thus, firms were omitted from the sample if there were no changes in the CEO position—avoiding a common limitation of prior empirical work in this area. Dropping companies without a leadership event resulted in 496 firms and 5028 segment year observations

⁴ Due to Statement 131 of the Financial Accounting Standards Board, companies began reporting information related to operating segments differently. One significant change was a switch from reporting SIC codes for operating segments to instead using NAICS codes. To be consistent with prior research, only SIC codes were used to identify industries and hence, 2002 was the last year of data for the study.

being deleted from the sample. The remaining sample is comprised of 520 firms and 8522 segment year observations.⁵

Lastly, to avoid the problem of nesting CEO effects in corporate or industry effects, only firms that had a CEO who worked (as CEO) for *more than one* company in the dataset were included in the sample. All observations for these firms are included in the sample—that is, the CEOs that worked at the firm before or after the “mobile” CEOs were also included in the sample so that all years of observations for these firms will be in the dataset (required for accurate firm effects). Hence, this is not just a study of “outsider” CEOs and their impact on firm performance.

In the end, this sample contains 801 segment year observations—92 CEOs and 51 firms across ten years and represents the activities of 181 distinct business segments in a total of 98 four-digit SIC code industries. The average business segment reports 4.43 years of data. The majority (83%) of the observations are associated with diversified firms. Table 1 reports descriptive statistics for this sample and for the sample without the mobility restriction.

[Insert Table One Here]

RESULTS

The main hypothesis of this paper is that the previous empirical work using variance decomposition to estimate CEO effects underestimates the size of this effect. To demonstrate that the methodological issues identified in this paper are in fact impacting the size of the CEO effect, the results in this paper are first reported without correcting for these methodological limitations. The results for this model are presented in Table 2.

[Insert Table Two Here]

⁵ Potential sample selection bias from the exclusion of these firms is discussed and results from a Heckman 2-step procedure correcting for sample selection bias are detailed in the results section.

This model represents analysis conducted with sequential ANOVA for a nested sample of executives—including firms without CEO turnover and with corporate level observations for multi-segment firms (biases industry effect). The results are consistent with prior variance decomposition studies within the leadership literature—namely, industry (18.0%) and firm influences (29.5%) are significantly higher than CEO effects (12.9%) on corporate performance.

Table 3 presents the main results of the paper—with all the methodological corrections identified in the previous section. CEO effects on corporate performance (shown in table as “DV: Corporate ROA”) are quite substantial (29.2%)—almost four times larger than the corporate effect (7.9%) and almost five times larger than the industry effect (6.2%). CEO influence on the variance in business-segment performance (shown in Table 3 as “DV: Segment ROA”) is smaller (12.7%) than on corporate performance; however, the CEO effect on segment performance is still greater than the industry and corporate effect (7.74% and 6.76% , respectively). Thus, these results suggest that CEOs do have a large impact on firm performance, and that this impact is manifest primarily at the corporate level.

Corporate effects estimated in this model (Table 3) are consistent with prior empirical work that has found, on average, a nine percent corporate effect (Schmalensee, 1985; Rumelt, 1991; Roquebert, Phillips, and Westfall, 1996; McGahan and Porter, 1997, 1999, 2002, 2003). Industry effects, though smaller than early work in variance decomposition (Rumelt, 1991; Roquebert, Phillips, and Westfall, 1996; McGahan and Porter, 1997, 2002) are consistent with recent empirical work that suggests that the industry effect declined in the 1990s (McNamara, Vaaler, and Devers, 2003; Mackey, Kioussis, and Barney, 2005; Misangyi, Elms, Greckhamer, and Lepine, 2006). Since the data used in this paper is from the years 1992-2002 and early work in variance decomposition utilizes data for years in which the industry effect was more substantial (e.g. Rumelt, 1991; Roquebert, Phillips, and Westfall, 1996; McGahan and Porter,

1997, 2002), it is not surprising to find small industry effects. Additionally, due to the small sample size, many of the firms in the sample are the only representatives of their respective industries (48% of the observations). This creates a problem for estimating accurate industry effects; however, the size of the industry effect is only of secondary interest in this paper.

Business-segment effects are not estimated for the model in which corporate performance is the dependent variable because including these effects in a model with corporate effects mathematically changes the analysis from simultaneous ANOVA to sequential ANOVA (See McGahan and Porter, 2002 for a more technical explanation) and, more importantly, because the business-segment effect on corporate ROA would be understandably insignificant.

[Insert Table Three Here]

Robustness Checks

Two sample restrictions were imposed on the data—only firms with CEO turnover during the time of the study and only firms with CEOs that had worked for more than one firm in the dataset—were selected for the final sample. Such choices may create sample selection bias and thus alter the results of the analysis. The impact of these and other methodological choices are evaluated in this section.

Sample Selection Bias. Skepticism about the CEO effect reported in this paper might center on the potential selection biases created from restrictions placed on the original sample. For example, it could be argued that the more substantial CEO effect reported in this paper is due systematic differences between firms with CEO turnover and those without turnover.

The Heckman 2-step procedure (1979) to correct for sample selection bias is used to ascertain whether the results presented in this paper are an artifact of sample selection bias. The first step of this procedure predicts what variables impact whether or not a firm has any turnover during the years it is in the sample. Identifying appropriate instruments to predict CEO turnover

is based on Finkelstein and Hambrick's (1996) theoretical work on the determinants of executive turnover. Turnover is thus modeled as a function of firm performance (corporate ROA relative to the segment's median competitor), firm size (corporate sales), firm structure (diversification status), and environmental conditions (number of firms in a segment's industry as well as the percent of a segment's competitors in an industry that have had executive turnover during their time in the sample). The probit estimates for this step are shown in Table 4.

[Insert Table Four Here]

The second step of the Heckman procedure is an ANOVA which includes the Mills ratio estimated in step one as a continuous regressor. This step revealed no significant bias in the estimated effects reported in this paper. Table 5 reports these "new" ANOVA estimates based on the Heckman procedure. The Mills ratio (lambda coefficient) is significant at a 90% confidence level for both the model in which corporate performance is the dependent variable and the model in which business-segment performance is the dependent variable. However, even though there is some statistical significance for the lambda coefficient which indicates the presence of a sample selection bias, this bias is not practically significant as the reported effects (in the corrected model) do not change from models in which the selection bias is not corrected. In short, the sample restriction that a firm must have a CEO turnover event to be selected for the sample in this paper is not significantly influencing the results of this paper (as shown in Table 3).

[Insert Table Five Here]

There is another selection restriction further imposed on the data—that is, the restriction that only firms with CEOs working for more than one company in the sample can be included in the final sample. The same specification from the probit in the previous sample selection model was used for the first step of the Heckman procedure (results in Table 6). The Mills ratio is

significant ($p < 0.04$) for the model in which corporate performance is the dependent variable, but not for the model in which business-segment performance is the dependent variable ($p < 0.08$). As expected, correcting for sample selection does not impact the reported size of the CEO effect on business-segment performance (see Table 7 as well). And, even though the Mills ratio is significant in the model for corporate performance, the impact on the reported CEO effect is minimal (a decrease of 1.6% to the CEO effect). Thus, the models run with the Heckman procedure correcting for sample selection bias do not significantly impact the outcome of the estimation; therefore, the results in Table 3 are appropriate estimations of the impact of the CEO effect on firm heterogeneity.

[Insert Table Six Here]

[Insert Table Seven Here]

Expanded Sample. The initial model (Table 3) was estimated from a sample with a two selection restrictions—only firms with CEO turnover and only firms with CEOs that worked (as CEO) at more than one firm in the sample could be included in the sample. Although the resulting sample is smaller than ideal ($n = 801$), the sample size is sufficiently large for estimation. Nevertheless, the restriction on executive mobility is relaxed to examine the impact on the results. Relaxing this restriction increases the sample size substantially—8522 firm years (1176 CEOs in 520 corporations across ten years). (Refer to Table 1 for more descriptive statistics on both samples.) However, the limitation of this “expanded” sample is the nesting of CEOs within corporate and industry effects—effectively understating the CEO effect on performance.

The results from re-estimating the original model with only one sample selection restriction have already been reported in Table 5. The largest influence on corporate performance

is now the corporate effect which has increased from 7.5% (Table 5) to 24.4%⁶ (Table 7). CEO effects, as expected, have decreased to 23.8% (Table 7)--down from 29.2% in the initial model (Table 5) because of the introduction of CEO observations that are nested within corporate and industry data. Since some of the observations of CEOs are not nested and since firms without turnover are still excluded from this sample, CEO effects on corporate performance are more than in the prior literature.

A similar impact to the CEO effect from introducing nested observations is seen for the model predicting business-segment performance. As the variance decomposition work in strategic management would predict, business-segment effects are the most important influence over business-segment performance (34.4%, Table 7) and CEO effects have decreased from 12.7% (Table 5) to 7.6% (Table 7). Nevertheless, because of the vast majority of the observations in this model are nested, results from this “expanded” sample and previous studies that have used samples of CEOs that only worked in one industry and for one firm in the sample should be interpreted with caution.

Business-Segment Effects. In accordance with convention in the variance decomposition work in strategic management, business-segment effects are estimated for the model in which business-segment performance is the dependent variable (Table 3). The size of the impact is estimated at 17.81%-- a smaller number than that reported in other studies. For example, McGahan and Porter (1997) report segment effects of 35.1 percent and Rumelt (1991) reports slightly lower business-unit effects of 33.9 percent. However, the business-segment effect reported for the “expanded” sample (34.4%, Table 5) is very similar to the prior literature.

⁶ Corporate effects of 24.4 percent are only slightly higher than those reported by McGahan and Porter (2002) who also used simultaneous ANOVA (corporate effects in their study ranged from 12.0 to 23.7 percent).

It is reasonable to expect that the business-segment effect might be larger in the “expanded” sample compared to the sample in which executives are not nested within industry and corporate effects for the following reason. When corporate and business-segment effects are included in variance decomposition, the simultaneous ANOVA reverts to sequential ANOVA. The impact of this estimation change on the business-segment effect is that this effect essentially becomes a residual of the effects decomposed first. Thus industry, corporate, and CEO effects are all “taking away” from the business-segment effect. In the “expanded” sample, the impact of CEOs is systematically understated because of its nesting within industry and corporate effects. Consequently, the CEO effect takes less away from the business-segment effect in this scenario making business-segment effects higher than in a sample in which CEO effects are not understated and can take away more from the business-segment effect.

DISCUSSION

The empirical analysis conducted in this paper suggests that CEOs account for 29.2% of the variance in corporate profitability while only accounting for 12.7% of the variance in business-segment profitability. These results suggest that CEOs significantly influence corporate-level performance, perhaps through corporate strategies such as diversification, mergers, and acquisitions, but only exert limited influence on business-segment performance. It is easy to see how executive influence over product market strategies would usually be limited as choices about whether a firm will compete on the basis of cost leadership or product differentiation at the segment level are typically difficult to change.

While suggestive, there are limitations in this study which can be addressed in additional research. Also, some of the issues raised in this study have implications beyond the literature on CEO effects. These issues and opportunities are discussed below

Other Methodologies for Examining CEO-Firm Performance Linkage

Variance decomposition is not the only methodology for examining the linkage between CEO leadership and organizational outcomes. Structural models using theoretical variables to capture the specific industry, corporate, or individual leadership effects on performance have also been used (e.g. Weiner and Mahoney, 1981; Pfeffer and Davis-Blake, 1985). Of course, empirical studies of the CEO-performance linkage with structural methodologies are limited by their measures (e.g. Weiner and Mahoney, 1981), samples (e.g. Gamson and Becker, 1964; Eitzen and Yetman, 1972; Allen, Panian, and Lotz, 1979; Brown, 1982), and some of the same methodological limitations identified in this paper (e.g. nested samples). Nevertheless, more structural studies of leadership effects are needed to explain the source of the CEO effect documented in this paper. Structural methodologies will be instrumental in explaining the phenomenon identified in this paper—namely, that leaders can have substantial impact on firm outcomes. Additionally, because of the significance of the CEO effect identified in this paper, scholars should be cautious to accept empirical studies with structural methodologies not finding leadership effects.

Top Management Team Effects

Some empirical work on leadership effects on firm performance suggest that top management teams are better predictors of firm outcomes than individual executives (e.g. Hage and Dewar, 1973; Ancona, 1990; Haleblan and Finkelstein, 1993). A growing body of literature on leadership effects, however, has found important individual-level effects on firm performance (e.g. Bertrand and Schoar, 2003; Jensen and Zajac, 2004). Even though this paper examines only changes in the position of CEO and not in the top management team, it is likely that the CEO effect in this paper is capturing part of the top management team influence on firm performance (Hambrick and Mason, 1984) since when a CEO succession event occurs, changes are likely to be made in the top management team as well. Future research could disentangle how much of the

leadership effect on firm performance is from the CEO and how much is from the entire top management team effect to better understand the relative importance of the CEO to the entire top management team for influencing organizational outcomes and vice versa.

Industry versus Firm Effects Debate in Strategic Management Literature. The variance decomposition literature in strategic management has grown rapidly over the last several years (see Bowman and Helfat, 2001 for a comprehensive review). Most of this work has focused on the percentage of firm performance explained by industry, corporate, and firm effects (e.g. Schmalensee, 1985; Rumelt, 1991; Roquebert, Phillips, and Westfall, 1996; McGahan and Porter, 1997, 1999, 2002, 2003). This work has not examined the percentage of variance in firm performance explained by CEO effects. The results of this paper suggest that CEO effects would be an important addition to this line of inquiry.

Nested Effects in Other Literatures

One of the reasons that the CEO effect reported in this paper is so much larger than in other papers is that the sample used here eliminated the effects of nesting the CEO effect in the firm or industry effect. This nesting probably is likely to be a problem in other areas of research within executive leadership as well, including work on executive compensation, succession, and the effects of top management teams. Data sets in these literatures in which executive movements across firms or across industries either do not exist or are not tracked may confound individual, corporate, and industry heterogeneity. Without executive mobility, for example, efforts to decompose the determinants of executive compensation into industry-, firm-, and individual-level effects would be difficult to interpret.

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Table 1
Descriptive Statistics

	<i>Firms with CEO Turnover Median</i>	<i>Firms With CEO Turnover and Mobile CEOs Median</i>
Executive Characteristics		
Salary	\$588,939	\$ 609,087
Salary + Bonus	\$930,148	\$1,049,597
Total Compensation	\$1,840,359	\$2,404,170
Firm Characteristics		
Return on Assets	4.89%	4.2%
Employees	9,907	14,868
Sales	1,882,193,000	2,326,876,000
Segment Year Observations	8522	801
Industries	459	98
Corporate-parents	520	51
Business-segments	1802	181
CEOs	1176	92

*Total compensation includes salary, bonus, restricted stock, stock options, long-term incentive payout, and other forms of compensation.

Table 2
Replication of Prior Empirical Studies*

	Lieberson and O'Connor (1972)	Weiner (1978)	Thomas (1988)	Wasserman, Nohria, Anand (2001)	Current Replication <i>with Limitations</i>	
Year Effect	1.8%	2.4%	5.6%	2.6%	1%	1%
Industry Effect	28.5	20.5	n/a	6.3	18.0	n/a
Corporate Effect	22.6	45.8	83.2	25.5	29.5	47.5
CEO Effect	14.5	8.7	5.7	14.7	12.9	12.9
Error	32.6	22.6	5.4	50.9	38.5	38.5
Total	100	100	100	100	100	100

*ROA as dependent variable.

Table 3
How Much Do CEOs Firm Performance?
A Comparison of CEO Impact on Corporate Versus Business-Segment Performance

	<i>DV: Corporate ROA</i>		<i>DV: Segment ROA</i>	
	ANOVA Estimate	% of total	ANOVA Estimate	% of total
Year Effect	0.0181	0.66%	0.405	1.15%
Industry Effect	0.1712	6.20	2.63	7.47
Corporate Effect	0.2168	7.86	2.38	6.76
CEO Effect	0.8063	29.21	4.47	12.7
Segment Effect	--	--	6.27	17.81
Residual SS	0.6030	21.84	12.06	34.26
Total SS	2.7604	100.00	35.2	100.0
<i>N</i>	801		801	

Table 4
Probit Estimates for Table 5

	<i>Coefficient</i> <i>Std Errors in Parentheses</i>
Corporate Sales	0.00 ^{***} (0.00)
Corporate Diversification	0.082 ^{**} (0.027)
Industry Competitors	-0.002 ^{**} (0.001)
Competitors with CEO Turnover	1.94 ^{***} (0.055)
Relative Corporate ROA	0.25 (0.128)
Constant	-0.35 ^{***} (0.029)
N	13,550
Log Likelihood	-8117.743
Likelihood Ratio ~ χ^2 (5)	1638.12
Prob > χ^2	0.000

*** p<.001, ** p<.01, * p<.05

Table 5
Do Sample Restrictions Create Sample Selection Bias?
A Comparison of ANOVA Estimates with and without Correcting for Selection Bias
From Restricting Sample to only with Firms with CEO Turnover

	Models Corrected for Sample Selection Bias			
	<i>DV: Corporate ROA</i>		<i>DV: Segment ROA</i>	
	ANOVA estimate	% of total	ANOVA estimate	% of total
Year Effect	0.2688	0.8%	0.955	0.05%
Industry Effect	0.5515	1.6	90.26	4.5
Corporate Effect	0.8361	24.4	153.92	7.7
CEO Effect	8.1645	23.8	150.19	7.6
Segment Effect	--	--	684.52	34.4
Lambda	0.0053 [†]	0.02	0.468	0.1 [†]
Residual	9.6753	28.2	806.9	40.6
Total SS	34.311	100.0	1988.89	100.0
<i>N</i>	8522		8522	
	Models Not Corrected for Sample Selection Bias			
	<i>DV: Corporate ROA</i>		<i>DV: Segment ROA</i>	
	ANOVA estimate	% of total	ANOVA estimate	% of total
Year Effect	0.274	0.8%	0.491	0.02%
Industry Effect	0.546	1.6	90.92	4.6
Corporate Effect	8.387	24.4	154.45	7.8
CEO Effect	8.166	23.8	150.21	7.6
Segment Effect	-	-	685	34.4
Residual	9.681	28.2	807.4	40.6
Total SS	34.311	100.0	1988.9	100.0
<i>N</i>	8522		8522	

* p < .05, † p < .1

Table 6
Probit Estimates for Table 7

	<i>Coefficient</i> <i>Std Errors in Parentheses</i>
Corporate Sales	4.74 X 10 ⁻⁶ *** (1.22 X 10 ⁻⁶)
Corporate Diversification	0.206*** (0.044)
Industry Competitors	0.005*** (0.001)
Competitors with CEO Turnover	0.228** (0.072)
Relative Corporate ROA	-0.252 (0.194)
Constant	-1.86*** (0.49)
N	13550
Log Likelihood	-3135.37
Likelihood Ratio ~ $\chi^2(5)$	71.10
Prob > χ^2	0.000

*** p<.001, ** p<.01, * p<.05

Table 7
Do Sample Restrictions Create Sample Selection Bias?
A Comparison of ANOVA Estimates with and without Correcting for Selection Bias
From Restricting Sample to only Firms with Mobile CEOs

	Models Corrected for Sample Selection Bias			
	<i>DV: Corporate ROA</i>		<i>DV: Segment ROA</i>	
	ANOVA estimate	% of total	ANOVA estimate	% of total
Year Effect	0.018	0.7%	0.454	1.3%
Industry Effect	0.1728	6.3	2.63	7.5
Corporate Effect	0.2035	7.4	2.43	6.9
CEO Effect	0.7624	27.6	4.53	12.9
Segment Effect	--	--	6.21	17.6
Lambda	0.0039*	0.1	0.064 [†]	0.2
Residual	0.5991	21.7	12.0	34.1
Total SS	2.761	100.0	35.19	100.0
<i>N</i>	848		848	
	Models Not Corrected for Sample Selection Bias			
	<i>DV: Corporate ROA</i>		<i>DV: Segment ROA</i>	
Year Effect	0.0181	0.66%	.405	1.15%
Industry Effect	0.1711	6.20	2.63	7.47
Corporate Effect	0.2168	7.86	2.38	6.76
CEO Effect	0.8063	29.21	4.47	12.7
Segment Effect	--	--	6.27	17.81
Residual	0.6030	21.84	12.06	34.26
Total SS	2.760	100.00	35.2	100.0

* p < .05, [†] p < .1