CORPORATE EFFECTS AND DYNAMIC MANAGERIAL CAPABILITIES

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Corporate effects in variance decomposition capture heterogeneity of business performance derived from factors internal to firms at the corporate level. Most estimates of corporate effects do not include effects associated with fluctuations in returns over time, except insofar as the fluctuations affect the average corporate return for the time period in question. Exclusion of the time-varying dimension of the corporate effect makes it difficult to fully understand the effect of corporate strategy and the actions of corporate managers, particularly in response to a changing environment. The evidence in this article shows that within a single industry, where managers face the same external environment, time-varying corporate effects associated with corporate level managerial decisions are statistically significant. We introduce the concept of dynamic managerial capabilities to underpin the finding of heterogeneity in managerial decisions and firm performance in the face of changing external conditions. Copyright © 2003 John Wiley & Sons, Ltd.

INTRODUCTION

Is there a corporate effect on profitability? The collective research of the past two decades suggests that the answer is clearly yes (see Bowman and Helfat, 2001, for an analysis and review). Although studies such as those of Schmalensee (1985) and Rumelt (1991) found negligible corporate effects, many other studies have reported larger and statistically significant corporate effects. Most studies, however, have omitted time-varying corporate effects that reflect important aspects of corporate strategy. In this paper, we estimate time-varying corporate effects associated with corporate-level managerial decisions, and introduce the concept

of *dynamic managerial capabilities* to underpin our findings.

In variance decomposition, corporate effects generally derive from differences between multi-business firms in the average of returns to individual businesses within each firm. Because variance decomposition captures *differences* between firms, the technique provides a means of documenting sources of heterogeneity in business performance. Thus, the finding of a large business effect on profitability (e.g., Rumelt, 1991) points to the important impact of differences between firms in their business-level resources. Similarly, a nontrivial and statistically significant corporate effect implies that firms differ in the impact that their corporate-level resources have on profitability.

Although corporate effects are by now well documented, with few exceptions (e.g., Bercerra, 1997; McGahan and Porter, 1999), most variance

decomposition studies estimate corporate effects based only on the average of returns over the time period of each study.[1] These studies generally do not provide estimates of corporate effects that derive from fluctuations in returns over time, except insofar as the fluctuations affect average corporate returns for the time period of study. This approach precludes explicit consideration of corporate effects that vary systematically through time. Important aspects of corporate strategy, however, involve strategic decisions, which almost by definition reflect the perceived or actual need for changes over time. Therefore, the omission of the time-varying dimension of the corporate effect hampers our ability to fully understand the effect of corporate strategy. Given the attention paid to corporate strategy in both the theoretical and applied literature in strategic management, this omission is striking.

Strategic decisions at the top of an organization do not emerge from a disembodied decision-making process—managers make these decisions. We examine whether corporate management and strategy affect the variance of business performance by analyzing the impact of corporate-level strategic decisions over time. In doing so, we ask two related questions: Do corporate decisions differ across firms and, if so, does it matter?

The setting for this study involves a single industry where managers faced a similar but changing set of external conditions. The single-industry setting permits a relatively clean test of the proposition that managerial decisions at the corporate level are associated with heterogeneity in business performance. The analysis shows that corporate-level managers in different firms made different decisions in response to changes in the external environment. In addition, the inclusion of a time-varying corporate effect associated with corporate-level decisions leads to a statistically significant increase in the explained variance of business profitability, after controlling for year, industry segment, 'stable' corporate, business, and segment-year effects.

To help explain differences in managerial decisions that in turn lead to heterogeneity in firm performance, we introduce the concept of *dynamic*

managerial capabilities. Dynamic managerial capabilities are the capabilities with which managers build, integrate, and reconfigure organizational resources and competences. The concept of dynamic managerial capabilities is a direct analogy to more general organizational 'dynamic capabilities,' which Teece, Pisano, and Shuen (1997: 516) define as capabilities that enable an organization 'to integrate, build, and reconfigure competences.'

The article proceeds as follows. The first section deals with the relationship between corporate effects, corporate strategy, and dynamic managerial capabilities. The second section explains the estimation of time-varying corporate effects associated with corporate managerial decisions. The next sections describe the industry setting, data, and empirical methodology. Empirical results then follow. Finally, we elaborate on the concept of dynamic managerial capabilities and make suggestions for future research.

CORPORATE EFFECTS, CORPORATE STRATEGY, AND DYNAMIC MANAGERIAL CAPABILITIES

Corporate influence on profitability results from factors associated with the participation of an individual firm in multiple businesses. Corporate-level factors thought to influence profitability include core competencies that span businesses within a company (Prahalad and Hamel, 1990), the organizational structure of a multi-business corporation (Chandler, 1962; Williamson, 1975), organizational climate (Hansen and Wernerfelt, 1989), and corporate systems of planning and control (Goold and Campbell, 1987), to name just a few. To the extent that these factors remain unchanged during the sample period, the 'stable' corporate effect should pick up their influence on business profitability.

Corporations, however, may change their organizational structures, control systems, and other corporate attributes over time. The 'stable' corporate effect may reflect some corporate-level changes over time, because the 'stable' corporate effect derives from an average of business returns in each corporation over the sample time period. Nevertheless, the stable corporate effect does not fully capture the influence of time-varying corporate-level factors. For example, if corporate-level factors cause firms to differ in the pattern of

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[1] A few studies use a corporate focus variable to estimate corporate effects (Wernerfelt and Montgomery, 1988; McGahan, 1997). In these studies, the average corporate focus for each corporation over the time period of the study forms the basis for the corporate effect.

their returns over time but the firms also have the same average returns over the total time period, the 'stable' corporate effect will be zero.

Many changes in corporate-level factors over time involve decisions by corporate managers. Major corporate-level strategic and operational decisions include, for example, those regarding firm scale and scope, boundaries of the firm, investments, organizational structure, and financial goals. In other words, corporate managers perform a resource governance function, broadly defined. This resource governance function includes the allocation of resources between businesses. When corporate managers shift resources between businesses or make decisions that affect all businesses in a similar manner (e.g., company-wide lay-offs), these actions may contribute to a time-varying corporate effect.

Variance decomposition studies have neglected the effect of managerial decisions on firm performance. Managers who participate in a similar set of businesses may make different decisions both with regard to content and timing. Under conditions of uncertainty, managers must make judgments about the correct course of action. These judgments may differ if managers have different assessments regarding the correct course of action. It therefore makes sense to ask why managers have these different assessments. Put another way, an inquiry into corporate strategy extends to the individuals responsible for strategic decision making. An answer to the question of 'what makes firms different' requires an answer to the question of 'what makes managers different.'

As noted earlier, we introduce the concept of dynamic managerial capabilities to help explain differences in managerial decisions and corporate strategy. Most research on dynamic capabilities to date has focused on organizational factors that enable firms to adapt to change (e.g., Zollo and Winter, 2001). Beyond these factors, however, guidance from the top of organizations may have a critical impact on how well firms cope with changing circumstances. Recent studies, for example, have documented the strong influence of top management on firm response to external change at NCR (Rosenbloom, 2000) and Polaroid (Tripsas and Gavetti, 2000). Indeed, Rosenbloom (2000: 1102) has suggested that leadership by individuals may be a 'central element' in the more general dynamic capability of an organization to change.

We propose that dynamic managerial capabilities are rooted in three underlying factors: managerial human capital (Castanias and Helfat, 1991, 2001), managerial social capital (Burt, 1992; Gelatkanycz, Boyd, and Finkelstein, 2001), and managerial cognition (Hambrick and Mason, 1984; Huff, 1990; Hoopes and Johnson, 2003). These factors, separately and in combination, influence the strategic and operational decisions of managers. Little research on managers has analyzed all three of these factors together. After presenting our empirical results, we outline an agenda for research on dynamic managerial capabilities that highlights the need to explore the interactions among managerial human capital, social capital, and cognition.

VARIANCE DECOMPOSITION AND CORPORATE EFFECTS

Variance decompositions of business-level performance generally include many of the following elements in a descriptive model:

$$r_{ijt} = \mu + \alpha_i + \beta_j + \gamma_t + \varphi_{ij} + \delta_{it} + \varepsilon_{ijt} \qquad (1)$$

where r_{ijt} denotes the rate of return to a business active in industry i in time period t owned by corporation j. The α_i are industry effects, the β_j are corporate effects, the γ_t are year effects, the φ_{ij} are business effects (from company operations contained within a particular industry), the δ_{it} are industry-year interaction effects, and the ε_{ijt} are random disturbances. Some studies omit the industry-year interaction or use other subsets of these effects, but the core model remains one that includes year, industry, business, and corporate effects. Some studies also have utilized alternate measures such as market share for business effects or corporate focus variables for corporate effects. Bowman and Helfat (2001) offer a comprehensive review and analysis of these studies.

Studies often interpret the industry, business, and corporate effects as reflecting 'stable' differences in business returns associated with each of these classes of effects. In practice, estimation of these effects derives from differences in average returns over the sample time period. Industry effects, for example, derive from differences between industries in the average of returns to individual businesses within each industry. Business effects typically derive from differences between

businesses in the average of annual returns to each business. And corporate effects generally derive from differences between multiple-business firms in the average of returns to individual businesses within each corporation.

Equation 1 also includes two effects associated with variation in returns over time. Year effects derive from differences between years in the average of returns to individual businesses for each year. In addition, industry-year effects reflect the possibility that industry effects may vary by year. These interaction effects derive from differences between distinct industry-year combinations in the average of returns to individual businesses in each industry-year.

Although Equation 1 includes time-varying industry effects, it omits time-varying corporate effects. Such time-varying corporate effects may reflect an important element of corporate strategy that 'stable' corporate effects do not capture. Two prior studies have incorporated time-varying corporate effects, either by including a corporate-year interaction term (Bercerra, 1997) or by including intertemporal persistence in the corporate effect (McGahan and Porter, 1999). Neither of these approaches, however, directly captures the influence of corporate strategy or of corporate strategic decisions.

The following descriptive model adds a simple form of the time-varying corporate effect of managerial decisions to the model in Equation 1:

$$r_{ijt} = \mu + \alpha_i + \beta_j + \gamma_t + \varphi_{ij} + \delta_{it} + \beta_{j\Delta t} + \varepsilon_{ijt}$$
(2)

where $\beta_{j\Delta t}$ is the time-varying corporate effect from one particular type of managerial decision (subscript for the type of decision is suppressed for clarity). This effect reflects the likelihood that corporate managers may make a series of decisions over time. For example, corporate management may alter a company's organizational structure and then subsequently alter it again if conditions change. Δ_t represents a multiple-year time period that begins with the year in which a decision occurs in corporation j and ends in the year prior to the next decision of the same type made by the same corporation. Thus, $\beta_{j\Delta t}$ derives from differences between these corporation–time period combinations in the average of returns to the individual businesses in each corporation–time period. $\beta_{j\Delta t}$ is a type of corporate-year interaction effect that is tied directly to corporate managerial decisions.

A non-negligible time-varying corporate effect from managerial decisions would indicate that executive discretion (Hambrick and Finkelstein, 1987) affects differences in business performance. If managers have no latitude in making decisions, perhaps due to constraints in the external or internal firm environment, then corporate managers might make no decisions at all. As another possibility, if the external environment virtually dictates particular managerial decisions, then corporate managers who operate in similar businesses might all make the exact same decisions. In either case, lack of executive discretion would result in a negligible time-varying corporate effect associated with managerial decisions. In addition, if managers made different but inconsequential decisions, we again would not observe any time-varying corporate effects associated with these decisions. A finding of time-varying corporate effects from managerial decisions would therefore imply heterogeneity in corporate decisions among firms and would document the impact of managerial discretion on profitability.

EMPIRICAL SETTING

The U.S. petroleum industry from 1977 through 1997 provides the empirical setting for this study. The financial data come from the Financial Reporting System (FRS), which the U.S. Department of Energy established in 1976. This data source contains uniquely detailed and confidential annual financial information on the activities of the largest U.S. energy producers, broken down by lines of business.

The FRS companies all faced the same market environment in each of their primary businesses. Perhaps the major factor in the external environment that affected the profitability of the various FRS company businesses was (and still is) the world price of crude oil. Prices of other energy sources, particularly natural gas (often co-produced with crude oil) and refined oil products, tend to follow the direction of crude oil prices (Helfat, 1988). In addition, crude oil is the primary raw material input for refined oil production, and refined oil and natural gas products are the primary raw material inputs for the production of petrochemicals. Thus, crude oil prices directly or indirectly affect the profitability of the major businesses of the FRS companies. When crude

oil prices increase, the profitability of upstream petroleum exploration and production rises. The profitability of downstream oil-refining and petrochemical operations often falls, however, as oil or natural gas input costs rise.

The petroleum industry experienced a major oil price shock in 1973–74 as a result of the OPEC oil embargo. The price of Saudi Arabian light crude oil quadrupled in real terms.[2] The price remained at roughly this level until 1978–79, when a second OPEC embargo almost doubled the real price of crude oil on the world market (Energy Information Administration, 1980). In 1980, the real price of Saudi Arabian crude oil stood at seven times its value in 1973. After this enormous run-up in prices, beginning in the early 1980s, oil prices started to decline as energy conservation reduced demand. The decline continued until the mid 1980s. Prices then fluctuated substantially throughout the remainder of the sample period. As an example of these fluctuations, between the beginning of 1994 and the end of 1995, the U.S. price of imported crude oil rose by 50 percent (Energy Information Administration, 1996). Real crude oil prices also dropped below pre-1973–74 embargo levels at other points in time.

Due to the large and continuing price fluctuations, managers faced high uncertainty about the likely extent and permanence of changes in oil prices. This amount of uncertainty suggests that the price changes, while easy to observe, did not provide clear signals about exactly what actions managers should take and when. In such a setting, managerial discretion may affect the type and timing of corporate responses to price and other changes in the external environment.

DATA

Financial data

Companies that are required to report to the FRS have at least 1 percent of either the production or the reserves of oil, gas, coal, or uranium in the United States or 1 percent of U.S. refining capacity or petroleum product sales. The database includes companies that merged with, acquired, or became

energy business spin-offs of the original set of FRS companies. Most of the revenues and income for the FRS companies derive from petroleum operations, including natural gas. For example, in 1994, 82 percent of revenues for the FRS companies as a group derived from energy sales, nearly all of which involved petroleum and natural gas (Energy Information Administration, 1996). Essentially, the FRS database contains information about the major U.S. petroleum companies.

The FRS companies rank among the largest in the United States, with combined sales roughly equal to 10 percent of the sales of the *Fortune* 500 largest U.S. corporations (Energy Information Administration, 1996). Most of the FRS companies participate in multiple businesses. The companies report their financial data according to lines of business and accounting procedures that are specified by the FRS reporting forms that the companies must use. The companies also must allocate corporate-level expenditures to individual lines of business to the fullest extent possible. Companies then allocate any remaining small amount of corporate expenses to a nontraceable category not analyzed here.

The Department of Energy subjects the company reports to a rigorous data quality assurance program that includes over 800 computerized checks for mathematical accuracy as well as routine desk audits by FRS staff (accountants, lawyers, and financial analysts) and petroleum engineers. The high degree of accuracy, consistent line of business definitions, and standardized accounting procedures across firms make these data especially useful for variance decomposition of financial performance.

The lines of business defined by FRS vary in the level of aggregation of product-markets. We constructed five industry segments from the FRS line of business data that each correspond to approximately a 3–4-digit level of product-market in the Standard Industrial Classification (SIC) codes. The five industry segments are: upstream petroleum, downstream petroleum, coal, other energy, and non-energy. Upstream petroleum includes crude exploration and production, as well as transportation of crude oil. Downstream petroleum includes oil refining, marketing, and transportation of refined oil products. A supplementary analysis included international marine (crude oil transportation) and rate-regulated pipelines (refined oil transportation) as separate industry segments, with little change

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[2] In the United States, government regulation enacted by Congress prohibited companies initially from charging the full amount of the new higher prices, reducing the price increases for several years.

in the results reported here.[3] The coal segment reflects mostly coal mining, and other energy represents a catchall category for businesses such as electricity generation. The non-energy segment consists primarily of petrochemical and other chemical operations. Many of the companies have petrochemical businesses, which use refined oil products as inputs. Other non-energy operations include the railway businesses of two companies, the steel operations of one company, and small amounts of mining other than coal, such as gold and copper. FRS does not disaggregate non-energy operations into more fine-grained segments. A supplementary analysis removed the railroad companies (who had substantial oil and coal reserves) from the analysis and the results reported here changed little.

Our data include a total of 30 companies over a 21-year time period. Some of the companies reported data for only part of this period, due to acquisitions, spin-offs, and additions of companies to the database who met the reporting requirements part way through the time period. If a company reported financial information for only part of a year due to an acquisition or spin-off, we excluded the company's data for that year from the analysis. In addition, the analysis excludes U.S. subsidiaries of foreign-owned corporations. Since FRS does not include data on the non-U.S. subsidiaries of these corporations, we cannot correctly ascertain corporate and other effects for the foreign parent companies. Table 1 lists the companies in our analysis.

The dependent variable used in the decomposition of variance is annual return on assets (ROA) of individual businesses within each corporation.[4] The numerator is a measure of cash flow that consists of operating income before DD&A (debt, depreciation, and amortization), interest, taxes, and extraordinary items. The use of cash flow in the

Table 1.   Energy company sample

Company name	Years in the sample
Amerada Hess	1977–97
Amoco	1977–97
Anadarko Petroleum	1991–97
Ashland	1977–97
Atlantic Richfield (ARCO)	1977–97
Burlington Northern	1977–87
Burlington Resources	1989–97
Chevron	1977–97
Cities Service	1977–81
Coastal	1977–97
Conoco	1977–80
Du Pont	1982–97
Enron	1992–97
Exxon	1977–97
Getty Oil	1977–83
Gulf Oil	1977–83
Kerr-McGee	1977–97
Marathon	1977–81
Mobil	1977–97
Occidental Petroleum	1977–97
Oryx Energy	1989–97
Phillips Petroleum	1977–97
Standard Oil Co. (Ohio) (SOHIO)	1977–86
Sun Company	1977–96
Superior Oil	1977–83
Tenneco	1977–87
Texaco	1977–97
Union Pacific	1977–95
Unocal	1977–97
USX	1983–97

numerator improves the comparability of the measure across firms that may have different asset, debt, and tax structures. The denominator is PP&E (property, plant, and equipment).[5]

Data on corporate-level decisions

In order to identify corporate-level managerial decisions, we relied on articles in the *Wall Street Journal* from 1977 through 1997. The *Wall Street Journal* is one of the most comprehensive sources of publicly available information on the activities of U.S. corporations, with especially good coverage of large corporations such as those in the FRS database. We coded all announcements in the

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[3] The FRS lines of business do not contain a separate category for nonrate-regulated crude and refined oil pipelines. These pipelines are usually dedicated to particular crude oil fields or refineries, and are reported in the upstream and downstream petroleum lines of business, respectively.

[4] The numerator and the denominator do not include income or assets from investments in unconsolidated affiliates (i.e., other firms). Because these investments are managed by other firms, it seems unwise to attribute the income and assets solely to the firm receiving the income or making the investments. Therefore, we take a conservative approach and omit investments and advances to unconsolidated affiliates.

[5] The results reported here use the accounting data as reported to FRS, without changes to the way in which companies report dry hole expenses. A sensitivity analysis that allocated dry hole expenses as capital expenditures left the results virtually unchanged.

Wall Street Journal that, by the nature of the decisions, had to have come from the corporate level of management. These announcements generally affected a large portion of a company's operations. One clearly identifiable category of decisions involved downsizing, including cost cutting, lay-offs, and financial as well as organizational restructuring. Some of these decisions included company-wide downsizing and others targeted particular (but often multiple) businesses within the firm.

The following examples of downsizing announcements illustrate both company-wide types of actions and shifts in resource allocation between company businesses:

> Exxon, citing a drastic drop in oil prices... offered... more than one-quarter of its total workforce the option to retire early or resign with compensation. (Sullivan, 1986)

> [Atlantic Richfield] unveiled a massive restructuring plan designed to confront weakening oil markets; it includes ... the sale of all refining and marketing operations in the East. (Rose and Schmitt, 1985)

As these examples demonstrate, the announcements reflect decisions at the corporate level of management, including strategic decisions regarding resource allocation and choice of businesses within the corporation. Some of the announcements would have affected extraordinary items, such as charges for financial restructuring, which do not enter into the ROA measure used here. Instead, the analysis takes a more conservative approach of assessing only longer-lived effects on cash flows.

The sample of downsizing decisions includes 77 announcements during the 21-year time period. For purposes of this analysis, announcement of multiple downsizing actions by one company in a given year counted as one downsizing decision. The announcements did not contain sufficiently detailed information to permit finer distinctions. Nine of the companies made no downsizing announcements during the sample period and other companies made several. Each year in the sample included between one and eight downsizing decisions, with the exception of 1997, which had no announcements.

The large scale of the announced downsizings reported in the *Wall Street Journal*, as well as the size of the companies making these announcements, suggest that we have a fairly comprehensive sample of major downsizing decisions by the FRS companies. The decisions had potentially large financial implications for the companies, necessitating that the companies announce the planned changes to their shareholders. The *Wall Street Journal* generally reports changes of these magnitudes by large, publicly held U.S. corporations.

Many of the announcements dealt with actions that the companies planned to take in the months ahead. It is difficult to verify the extent to which the companies did or did not fully implement the announced actions. We note, however, that if the companies did not in fact undertake the planned downsizing actions, the coded decisions would not have had an effect on either the level of firm performance or on differences between firms in their performance. Indeed, the presence of aborted downsizings in the sample would result in a more conservative test for a time-varying corporate effect from these particular corporate-level decisions.

The results of the planned downsizings, if implemented on a permanent basis, would have had long-lasting effects on firm performance. Hence, in this analysis, each downsizing decision by a company represents the start of a downsizing 'regime' that lasts until the next downsizing decision by that company.

The downsizing decisions generally reflected efforts by corporate management to increase profits, either by reducing costs (e.g., from lay-offs) or boosting revenues, including by reallocating resources to more profitable divisions. Variance decomposition, however, does not provide information about the effects of these decisions on the *level* of business performance. Rather, the analysis shows whether the decisions account for a portion of the *variance* in performance, indicative of *differences* between businesses in the level of performance. If all firms responded to changes in the external environment in the same way at the same point in time, then downsizing decisions would have no correlation with the variance of performance. The downsizing data, however, indicate that corporations did not respond similarly to the external environment. As noted earlier, nine of the 30 companies made no downsizing announcements during the sample period and other companies made several. Variance decomposition can answer the question of whether this heterogeneity in managerial responses accounts for a portion of heterogeneity in performance.

EMPIRICAL METHODOLOGY

Variance decomposition studies of business performance have used both analysis of variance and variance components estimation (Bowman and Helfat, 2001). As shown in Bowman and Helfat (2001), the studies are roughly split in their usage of the two techniques. Here we use a simple analysis of variance (Anova), analogous to a hierarchical OLS regression, to decompose the variance of the return on assets at the business level. The six classes of effects on the variance of business performance analyzed here are: year, industry segment, corporation ('stable' effects), business, segment-year, and corporate downsizing decisions. A business denotes an individual industry segment within each company (the interaction of segment and corporation), and segment-year denotes the interaction of industry segment and year. In this study, the Anova methodology progressively enters dummy variables for each class of effects into the analysis. After the addition of each set of variables, the 'effect' of that class of variables is measured as the increment to R^2, an estimate of the fraction of variance 'explained.' We used the SAS GLM procedure to perform the estimation using the method of least squares.

As in all hierarchical sorts of regression analyses, the order of entry affects the increment to R^2 for each class of effects. Additionally, correlation between the effects can cause misattribution of the increment to R^2, because the first of the correlated effects entered into the analysis may pick up some of the increment actually associated with effects entered later. Most importantly, the business-level dummy variables are completely collinear with the corporate-level dummy variables, since each corporation has a dummy variable for every business within the firm.

In recognition of these issues regarding collinearity, we enter the 'stable' corporate-level variables before the business-level variables, and enter corporate downsizing decisions last. Although this approach may overstate stable corporate effects due to correlation with business effects, it provides an upper-bound estimate of the stable corporate effect that also serves as a benchmark for comparison with the time-varying corporate effect from downsizing decisions. The main variable of interest, downsizing, is entered last, ensuring that the increment to R^2 does not reflect the other variables in the analysis. As Rumelt (1991: 176)

notes, in fixed effects estimation (including Anova) 'strict tests for the presence of effects are possible only for the last [class of] effects fitted.' We have exactly this sort of conservative test for the corporate-level downsizing effect.

The downsizing decisions capture one sort of time-varying effect, in this case at the corporate level. The analysis also accounts for time-varying industry segment effects by including a segment-year variable. Although the model does not incorporate time-varying business effects, the downsizing decisions should not reflect any such business effects, since the decisions occurred at the corporate level.

RESULTS

Table 2 presents the empirical results. The table first shows the main results with the downsizing effect entered last. The table also reports the results of a secondary analysis with the downsizing effect entered before the segment-year effect but after all of the other effects in the model. The table reports the increment to ordinary R^2 and a standard F-statistic for the addition of each set of variables to the model. The F-statistic indicates whether the increment to R^2 from the addition of each set of variables in the model is statistically significant.[6]

As reported in Table 2, the F-statistics indicate that all of the effects in the model are statistically significant. Consistent with other variance decomposition studies (see Bowman and Helfat, 2001), business effects contribute the largest increment, in this case of almost 20 percent. Smaller but highly significant industry segment and stable corporate effects each account for an increment to R^2 of 2 and 2.7 percent respectively. Year effects are small and somewhat less significant. The small but significant stable corporate effects using Anova conform to the results of prior studies, as do the very

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[6] As a comparison with prior research, Rumelt (1991) reported this same statistical information for his Anova results. Schmalensee (1985) reported this information as well as the adjusted R^2 for the addition of each set of variables to his model. The adjusted R^2 statistic adjusts for degrees of freedom and is used to account for the fact that adding 'nuisance' variables to a model can increase the R^2. This issue is unlikely to affect the downsizing decisions that are of interest here. All of these decisions involved changes of very large magnitude that clearly qualify as relevant to the dependent variable of business performance. In addition, the average number of downsizing decisions per firm over the 21-year period is small, only about 2.5.

Table 2. Anova decomposition of variance of ROA

Source	d.f.	Increment to R^2	Fraction of full model variance	F-Value	Pr > F
Model with the downsizing effect entered last					
Year	20	0.0126	0.0349	1.49	0.0754
Industry segment	4	0.0205	0.0567	12.05	0.0001
Corporation	29	0.0274	0.0758	2.22	0.0002
Business	99	0.1942	0.5374	4.61	0.0001
Segment-year	80	0.0610	0.1688	1.79	0.0001
Downsizing	77	0.0457	0.1264	1.39	0.0154
Full model	309	0.3614	1.0000	2.75	0.0001
Error	1500	0.6386			
Total	1809				
Model with the downsizing effect entered before the segment-year effect					
Year	20	0.0126	0.0349	1.49	0.0754
Industry segment	4	0.0205	0.0567	12.05	0.0001
Corporation	29	0.0274	0.0758	2.22	0.0002
Business	99	0.1942	0.5374	4.61	0.0001
Downsizing	77	0.0460	0.1272	1.40	0.0137
Segment-year	80	0.0607	0.1680	1.78	0.0001
Full Model	309	0.3614	1.0000	2.75	0.0001
Error	1500	0.6386			
Total	1809				

small year effects. Other studies have found somewhat larger industry segment type of effects (e.g., for FTC or Compustat lines of business). Because this analysis includes only five industry segments, it is not surprising that the industry segment effect explains a smaller portion of the variance than in other studies.

In the first set of results in Table 2 with the downsizing effect entered last, immediately after the segment-year effect, the downsizing effect accounts for an increment to R^2 of 4.5 percent and the segment-year effect accounts for an increment of 6 percent. The results remain virtually unchanged when the order of entry of the last two effects is reversed, suggesting that the downsizing and segment-year effects operate independently.

Notably, the increment to R^2 from just one type of corporate management decision is statistically significant. It is more than twice that of the industry segment effect and over one and a half times that of the stable corporate effect.[7] This occurs when the time-varying corporate downsizing effect is entered last, permitting a strict test of the effect.

Relative to other studies, the estimated model contains a good deal of unexplained variance. Rumelt (1991), for example, reported an R^2 for the full model of 0.76, as opposed to 0.36 here. In gauging the explanatory power of the individual components, it is therefore useful to consider the proportional contribution of each effect to the total variance explained by the full model, particularly for the smaller effects. Not surprisingly, the business effect accounts for half of the variance explained by the full model. But in addition, the stable corporate effect accounts for approximately 7.5 percent of the explained variance, and the downsizing effect contributes an even larger 12.5 percent.

A number of factors make these results regarding the time-varying corporate effect from downsizing decisions relatively clean. First, as noted above, entry of this effect last in the Anova permitted a strict test of this effect. Furthermore, the estimated effect changed little when the order of entry was reversed with the other main time-varying effect in the model of segment–year. Second, the business performance data are accurate and comparable across corporations. The data do not suffer from complications in other studies that include differences between corporations in business definitions or accounting procedures. Third,

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[7] Even when using adjusted R^2, the increments to the model of the stable and time-varying corporate effects are approximately the same.

the downsizing decisions clearly occurred at the corporate level, and therefore do not reflect omitted time-varying business effects. Fourth, the analysis controlled for other time-varying effects associated with years and segment-year interactions. Inspection of the residuals provided no evidence of auto-correlation.

DISCUSSION: DYNAMIC MANAGERIAL CAPABILITIES

The preceding analysis has shown that heterogeneous managerial decisions have an effect on the variance of business performance. We suggested earlier that the concept of dynamic managerial capabilities could help to explain differences in managerial decisions. Dynamic managerial capabilities are the capabilities with which managers build, integrate, and reconfigure organizational resources and competences. The building, integrating, or reconfiguring of an organization requires that managers make the sort of high-level decisions examined in this study. As argued below, managers may differ in their dynamic capabilities and therefore may make different decisions. In addition, because managerial decisions operate on the resource and capability base of an organization, differences between firms in their resources and capabilities may lead to differences in managerial decisions.

In what follows, we focus on managerial capabilities rather than on differential resource bases as sources of heterogeneity in managerial decisions.[8] The analysis broadens the resource-based research agenda to include greater attention to the role of managers in strategic and organizational change. The discussion also applies to both business-level and corporate-level managers.

As noted earlier, dynamic managerial capabilities reflect three underlying factors: managerial human capital, managerial social capital, and managerial cognition. In order to provide the basis for a research agenda on dynamic managerial capabilities, we next discuss these three underlying drivers more explicitly. We first summarize research trends

in each of these areas and consider potential interactions among them. In the discussion, we focus on research pertaining to individual managers rather than to organizations or organizational subunits. Then we pose some challenges for future research on dynamic managerial capabilities.

Managerial human capital

Human capital refers to learned skills that require some investment in education, training, or learning more generally (Becker, 1964). Following Becker (1964), a good deal of research on human capital has dealt with on-the-job training. Similarly, managers acquire knowledge, develop expertise, and perfect their abilities in part through prior work experience. Like any other task, effective management involves learning-by-doing and requires practice (Mintzberg, 1973).

Becker (1964) distinguished between general and specific training for a job. General training increases the marginal productivity of workers by the same amount in the firm providing the training as in all other firms. In contrast, completely specific training has no effect on the productivity of workers of use to other firms. Much on-the-job training falls in between these two extremes.

In a generalization of Becker's work to top managers, Castanias and Helfat (1991) distinguished between generic (or general), industry-specific, and firm-specific skills. An expansion of this framework includes a category of related-industry skills that transfer to firms in other industries that make related products or utilize related resources and capabilities (Castanias and Helfat, 2001). The expanded framework also includes the full range of managers in an organization, from the lowest to the highest level.

The managerial human capital framework provides a means to assess heterogeneity in managerial skills. Managers may differ in both the mix of their skills and in the level of ability for each type of skill. All but generic skills have limits to their transferability between businesses, whether within or between corporations. As managers progress in their careers, they take new job positions. Differences in managerial career paths in turn produce differences in the human capital that managers bring to, and acquire, on the job.

Until recently, empirical analyses that included managerial human capital often used indicators such as age and education. Age in particular may

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[8] In the variance decomposition just performed, the inclusion of 'stable' business and corporate effects provided a partial control for differences between firms in their resource and capability bases that might underlie some of the differences in managerial decisions.

capture many aspects of managerial human capital, and therefore masks differences between managers in their work experience. Recent research, however, has suggested that differences between managers in their industry-specific human capital are associated with differences in firm performance (Bailey and Helfat, 2003). To the extent that managers differ in their human capital, they will have different bases of expertise that may lead them to make different decisions.

Managerial social capital

Social capital results from social relationships and can confer influence, control, and power (for a comprehensive review, see Adler and Kwon, 2002). The concept of social capital reflects the idea that social ties (e.g., friendships, social club memberships), and the goodwill that these ties may confer, transfer to other settings such as work. Social ties also may help to transfer information from one setting to another. Adler and Kwon (2002) distinguish between external social capital and internal social capital that derive from ties outside of and within an organization, respectively.

Strategy research on the social capital of managers has tended to focus on external ties, often in the form of directorships of other companies. Gelatkanycz and Hambrick (1997) have noted that external ties of managers can improve firm performance in two ways. First, the ties can provide access to external resources that firms need in order to operate (e.g., financing). Secondly, directorship ties in particular provide information about practices in different firms. Greater diversity of information in turn improves executive decision making. Research shows that external ties improve firm performance (Gelatkanycz and Hambrick, 1997).

In addition to external ties, managers generally possess internal social capital. Burt (1992), for example, analyzed the internal social capital of managers in a large high-technology corporation, arguing that formal and informal work relations provide managers with a network that they can use to obtain information and other resources. Corporate managers depend upon information from division managers in order to make decisions. Business-level managers depend on corporate and sometimes other business-level managers for resources and information. To the extent that managers differ in their network ties, both internal and external to the corporation, they will have different social capital and access to information. Differences in information sources thus may lead managers to make different decisions.

Managerial cognition

Managerial cognition refers to managerial beliefs and mental models that serve as a basis for decision making (for a review, see Walsh, 1995) In early research, March and Simon (1958) and Cyert and March (1963) argued that the cognitive base for decisions consists of knowledge or assumptions about future events, knowledge of alternatives, and knowledge of consequences of the alternatives. Due to bounded rationality, managers may not have full information about future events, alternatives, and consequences. Managerial value systems also affect the preferential ordering of alternatives and consequences. Building on this research, Hambrick and Snow (1977) and Hambrick and Mason (1984) argued that the cognitive base and value systems form the basis for a sequential perceptual process of decision making. Similarly, Prahalad and Bettis (1986, 1995) refer to the dominant logic within a company that reflects managerial belief structures and frames of reference. A manager's limited field of vision, selective perceptions, and interpretations filtered by the cognitive base and value system combine to produce managerial perceptions of a situation (Huff, 1990). These perceptions in turn form the basis for managerial decisions, which also may be affected by more general cognitive biases in decision making (Schwenk, 1984).

Recent empirical work suggests that managerial cognition shapes strategic decisions and outcomes, including responses to changes in the external environment. Tripsas and Gavetti (2000) have documented the difficulty that Polaroid experienced in its new digital imaging business due to an inappropriate mental model held by top management. Holbrook *et al.* (2000) found that the different cognitive beliefs of top management in early U.S. semiconductor firms affected firm survival as the industry evolved. Kaplan, Murray, and Henderson (2003) also have shown that pharmaceutical companies differed in the timing of top management recognition of the importance of biotechnology and in the associated strategic responses. In addition, Acha (2002) provided exploratory evidence that major oil companies had different interpretive 'technology frames' that were associated with their

level of technological output in the form of patents and publications. Together these studies suggest that differences in managerial cognition may lead to different strategic decisions and outcomes.

Linkages among managerial human capital, social capital, and cognition

Each of the three managerial attributes offers a rationale for observed differences in managerial assessments and decisions under similar circumstances. In addition, these attributes may interact in ways that further drive observed heterogeneity as depicted in Figure 1. A number of factors link the three managerial attributes to one another.

Although research on managerial cognition does not necessarily use the term human capital, the research does suggest that managerial work experience shapes managerial cognition (see, for example, Hambrick and Mason, 1984). At a fundamental level, managerial human capital includes the knowledge gained from prior work experience that forms part of the cognitive base for managerial decisions. In addition, mental models held by managers provide direction in the process of learning from experience. This suggests that managerial cognition and information processing shape the acquisition of new human capital via experiential search and learning.

With regard to managerial cognition and social capital, external and internal ties provide access to information that augments the cognitive base for decision making. For example, social ties may influence managerial beliefs about the structure of the demand environment that in turn affect competitive positioning choices and the evolution of competition (i.e., Adner, 2002; Adner and Zemsky, 2003). We also expect that managerial cognition would shape the social ties that lead to social capital. For example, Krackhardt (1990) has found that greater accuracy of employees'
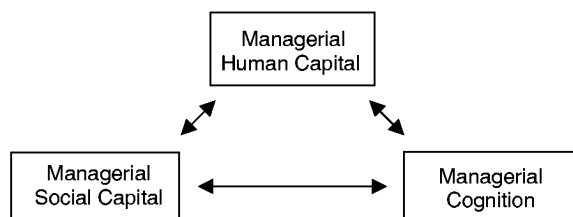
perceptions of informal network ties increased the influence that individuals had on others in the network.[9]

Finally, a manager's social capital affects the manager's human capital by providing information that augments his or her knowledge base.[10] The human capital of a manager also may affect his or her social capital, for example by making the manager more valuable and sought after as a board member of other companies (Castanias and Helfat, 2001). As Gelatkanycz *et al.* (2001) note, managerial human and social capital complement one another, since they both may constitute important resources for the corporation. Pennings, Lee, and van Witteloostuijn (1998) have found that greater amounts of both managerial human and social capital had a positive affect on the survival of Dutch accounting corporations.

In combination, managerial human capital, managerial social capital, and managerial cognition shape the resource and capability base of the corporation through the action of dynamic managerial capabilities. Top management in particular plays an important role in strategic reorientations in response to changing conditions in the external environment (Virany, Tushman, and Romanelli, 1992; Tushman and Rosenkopf, 1996). These strategic reorientations would tend to reflect all three elements that underpin dynamic managerial capabilities: the expertise and human capital required in decision making, the social capital that provides relevant information, and the cognition that creates biases in the actions taken.

As outlined above, the concept of dynamic managerial capabilities has the potential to help us understand why corporate strategy differs between firms. Future research into this aspect of competitive heterogeneity could benefit from several avenues of inquiry. As a conceptual matter, we need to know more about how interactions between managerial human capital, social capital, and cognition affect organizational adaptation and change. For example, under what conditions are these three attributes complements and under what conditions

Figure 1. Dynamic managerial capabilities: underlying attributes

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[9] Nahapiet and Ghoshal (1998) also included shared cognition as part of social capital.

[10] Burt (1997) suggested that managers with greater social capital may earn higher returns to their human capital, because social capital enables managers to identify promising opportunities. Boxman, DeGraaf, and Flap (1991), however, in their study of factors that affect the compensation of Dutch managers, found that human and social capital are substitutes.

are they substitutes in the managerial decision-making process? Under what conditions do each of the three managerial attributes and their interactions facilitate or impede strategic change? Additionally, as an empirical matter, we require a better understanding of how the three managerial attributes and their interactions affect strategic change. Both statistical and case study evidence can help in this regard.

CONCLUSION

Our analysis adds to the study of competitive heterogeneity by measuring the effect of specific corporate-level managerial decisions, driven by dynamic managerial capabilities, on the variance of performance. The analysis builds on the variance decomposition literature and focuses on the corporate effect on profitability. In particular, a complete understanding of the corporate effect requires that research account for the impact of corporate strategy on firm performance. By definition, corporate strategy includes strategic decisions at the corporate level of the organization. Strategic decisions generally reflect a need for change over time. For these reasons, this study investigated the impact of corporate strategic decisions on business profitability over time. We found that even after accounting for other effects on the variance of profitability, corporate strategic decisions of just one type added a statistically significant increment to explained variance. This finding provides further evidence that corporate strategy does in fact matter.

The results also strongly suggest that corporate managers matter. The downsizing decisions analyzed in this study clearly came from the top of the organization. Despite facing similar conditions in the external environment, corporate managers in different companies made different decisions. We propose that the new concept of dynamic managerial capabilities can help to explain differences in how managers respond to changes in the external environment. Three attributes of managers underpin their dynamic capabilities, namely, managerial human capital, managerial social capital, and managerial cognition. Although research has investigated each of the three attributes separately, much less research has focused on their interactions and how they affect the ability of corporations to adapt and change. A fuller understanding of dynamic managerial capabilities, and of how these capabilities contribute to the time-varying corporate effect, awaits future research.

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