



Organization Science

Publication details, including instructions for authors and subscription information:
<http://pubsonline.informs.org>

Attention as the Mediator Between Top Management Team Characteristics and Strategic Change: The Case of Airline Deregulation

Theresa S. Cho, Donald C. Hambrick,

To cite this article:

Theresa S. Cho, Donald C. Hambrick, (2006) Attention as the Mediator Between Top Management Team Characteristics and Strategic Change: The Case of Airline Deregulation. *Organization Science* 17(4):453-469. <http://dx.doi.org/10.1287/orsc.1060.0192>

Full terms and conditions of use: <http://pubsonline.informs.org/page/terms-and-conditions>

This article may be used only for the purposes of research, teaching, and/or private study. Commercial use or systematic downloading (by robots or other automatic processes) is prohibited without explicit Publisher approval, unless otherwise noted. For more information, contact permissions@informs.org.

The Publisher does not warrant or guarantee the article's accuracy, completeness, merchantability, fitness for a particular purpose, or non-infringement. Descriptions of, or references to, products or publications, or inclusion of an advertisement in this article, neither constitutes nor implies a guarantee, endorsement, or support of claims made of that product, publication, or service.

Copyright © 2006, INFORMS

Please scroll down for article—it is on subsequent pages



INFORMS is the largest professional society in the world for professionals in the fields of operations research, management science, and analytics.

For more information on INFORMS, its publications, membership, or meetings visit <http://www.informs.org>

Attention as the Mediator Between Top Management Team Characteristics and Strategic Change: The Case of Airline Deregulation

Theresa S. Cho

Rutgers Business School, Rutgers University, Janice Levin Building, Piscataway, New Jersey 08854,
cho@rbs.rutgers.edu

Donald C. Hambrick

Smeal College of Business Administration, Pennsylvania State University, 414 Business Building,
University Park, Pennsylvania 16802-1914, dch14@psu.edu

We integrate the upper-echelons perspective with the attention-based view of the firm by examining the role of attentional orientation of top management teams (TMTs). In the context of airline deregulation, we find that deregulation caused a shift in managerial attention, but that this shift in attention was the greatest for firms that changed the composition and compensation of their TMTs in ways that favored the deregulated regime. We also find that attention partially mediated the relationship between TMT changes and strategy changes. The results of this study shed light on the transformation of industry attention patterns following an environmental shift, and the role of TMT composition and incentive systems in that process.

Key words: top management team; managerial attention; executive compensation; organizational demography; strategic change; airline industry

Research over the past 20 years has yielded substantial evidence that top management team (TMT) characteristics affect organizational outcomes (e.g., Bantel and Jackson 1989). Although some researchers have attempted to show how these associations occur (e.g., Walker 1985, Tyler and Steensma 1998), the social and psychological processes that mediate between TMT characteristics and strategic choices are still not well understood (Lawrence 1997). One particular void in this causal chain is particularly noteworthy: the lack of understanding of how executives' characteristics affect how they notice and attend to the stimuli around them (March and Simon 1958, Starbuck and Milliken 1988) and, in turn, how those interpretations become manifested in choices (Ocasio 1997). Our paper addresses this gap by integrating Hambrick and Mason's (1984) upper-echelons perspective with Ocasio's (1997) attention-based view of the firm.

The upper-echelons view, as set forth by Hambrick and Mason (1984), and as drawn on by others (e.g., Bantel and Jackson 1989), has as its foundation the concept of bounded rationality (Cyert and March 1963), the premise that managers are confronted with far more information than they can handle, much of it ambiguous and complex, and will fall back on their experiences, preferences, and other biases to deal with this barrage. That is, the upper-echelons perspective is principally a theory of information processing, with managers acting

on the basis of their filtered construals of the situations they face.

Ocasio's theory is complementary, arguing that "what decision-makers do depends on what issues and answers they focus their attention on" (p. 188). His attention-based view, similar to upper-echelons theory, rests on precepts of the Carnegie School (Cyert and March 1963). Ocasio further integrates and extends prior theory on managerial and organizational cognition (e.g., Daft and Weick 1984, Dutton and Jackson 1987), proposing numerous mechanisms that can influence attention, including characteristics of the players. He notes a major role for top executives: "The most critical players in attention regulation are typically the CEO and the top management group" (Ocasio 1997, p. 197). Ocasio's hypothesized mechanisms of attention regulation, however, are all expressed at a relatively general level (e.g., "attentional focus is shaped . . . [in part by] the structured interests and identities of decision-makers" (p. 201)). He does not set forth any hypotheses that invoke specific decision maker (or executive) characteristics.

In addition to this TMT composition-attention linkage, another area conspicuously overlooked in the literature is how incentive systems influence and shape executives' mental models. Although agency theorists (e.g., Fama and Jensen 1983) have studied the effects of reward systems on managerial behavior and decision making, no studies have specifically focused on how compensation

structure (e.g., the proportion of pay dependent on firm performance) influences managerial attention. This is an important gap in the literature that needs to be filled.

The context of our study is deregulation in the airline industry, a natural experiment in which top executives were abruptly confronted with substantially new stimuli. We examine how environmental change affects attention directly, as well as indirectly through TMT change. Conceptualizing TMT demography and TMT compensation arrangements as antecedents of TMT attention we explore, for the first time, the integrated associations among TMT demography, TMT compensation, management attention, and strategic change. We examine four facets of executive team demographic composition: average industry tenure, proportion of executives with output-oriented functional experience, heterogeneity in industry tenure, and functional backgrounds. We extend beyond the customary focus on TMT composition by including the TMT's compensation profile—particularly the degree of incentive pay. Moreover, we introduce the idea that an alignment of TMT compositional characteristics and compensation profile will influence TMT attention more than the additive effects of composition and compensation alone. Finally, we examine the commonsense but so far unexplored idea that managerial attention acts as a mediator between TMT characteristics and strategic change. That is, we argue that TMT characteristics will only be reflected in strategy insofar as they are first reflected in attention.

Prior research on the railroad industry illustrates, even epitomizes, the theoretical gap we seek to fill. In the upper-echelons vein, Smith and Grimm (1987) found that deregulation caused railroads to alter their TMTs toward younger, shorter-tenured, and more highly educated executives. Later, Guthrie et al. (1991) found that railroads that most changed the composition of their TMTs following deregulation also most changed their strategies. From a more cognitive perspective, Barr et al. (1992) argued that, following an environmental change, changes in top managers' mental models would be associated with (even a precondition for) adaptive strategic change. Using content analysis of letters to shareholders for two railroads over a 20-year period, the authors found support for their hypotheses. The authors were interested in the influence of mental models on strategy, but not in how or why mental models change. The authors implied that mental models are causally detached from executive characteristics when they concluded, "Our study suggests that *mental models* of managers are a better predictor than *managerial characteristics*... of whether [there will be] changes in strategy" (p. 33, italics in original). But this view ignores the possibility that TMT characteristics greatly influence mental models; conversely, the other two railroad studies omit any consideration of the mechanisms that convert TMT characteristics into strategic choices. These prior

works, then, stop short of providing the integration we present here—the idea that TMT characteristics influence managerial attention, which in turn leads to strategic choices.

In the next section, we develop several hypotheses based on Carnegie School and upper-echelons perspectives. The view that organizational choices are a function of human bias and preference was stimulated by Carnegie theorists, who argued that organizational decision makers are only boundedly rational and engage in personalized selective perception of their task contexts in making choices (e.g., March and Simon 1958, Cyert and March 1963). This emphasis on human factors in strategy was extended by Hambrick and Mason's (1984) upper-echelons theory, which posited that executives inject their personal cognitive bases and values into their decisions.

Theory and Propositions

The Concept of Attentional Orientation

Top managers are confronted with more information than they can comprehend (Cyert and March 1963, Mintzberg 1973). This fact of organizational life has stimulated a sizeable literature on managerial cognition, in which such constructs as categorization (Jackson and Dutton 1988), causal maps (Huff 1990), and cognitive complexity (Hitt and Tyler 1991) have been invoked. As a way of modeling information overload, some theorists have adopted the view that managers engage in a tripartite information processing sequence: attention, interpretation, and action (Daft and Weick 1984, Dutton and Jackson 1987). In a refinement, Ocasio (1997) argued that, although attention and interpretation can be conceptually distinguished, they are so intertwined that a distinction is not meaningful. Drawing from LaBerge's (1995) model of information processing, Ocasio asserted that interpretation of stimuli greatly influences how much attention is devoted to those stimuli. We adopt Ocasio's (1997) view, as well as his definition of attention:

the noticing, encoding, interpreting, and focusing of time and effort by organizational decision-makers on both (a) *issues*: the available repertoire of categories for making sense of the environment: problems, opportunities, and threats; and (b) *answers*: the available repertoire of action alternatives: proposals, routines, projects, programs, and procedures. (p. 189)

Although this definition is oriented to an organizational setting, it is consistent with a more general psychological view that attention is the degree to which something (an event, trend, idea, category, etc.) occupies the consciousness of individuals (Fiske and Taylor 1984, p. 184).

It is reasonable to think of managers as paying attention to sectors (Hambrick 1981), categories (Dutton and

Jackson 1987), or bundles (Corner et al. 1994) of stimuli, rather than piecemeal stimuli. For example, a management team may pay great attention to matters of efficiency that they would manifest in their environmental scanning activities (Aguilar 1967, Hambrick 1981), their degree of effort in comprehending and interpreting stimuli about efficiency (Starbuck and Milliken 1988), and their generation of initiatives in the efficiency domain. We would refer to this TMT as having a heavy attentional orientation toward the efficiency sector. Attentional orientation, then, is the degree of attention paid to some category of stimuli.

Because of human and organizational limits, attention cannot be dedicated aggressively to all sectors. Rather, some sectors attract more attention than others. In part, attentional orientation will depend on the objective reality facing managers (Cialdini et al. 1990). For example, if a major development confronts an industry, industry publications and associations will dwell on it and managerial attention will be drawn to it. In this vein, Daft et al. (1988) found that when uncertainty was high in a specific environmental sector, executives scanned that sector intensively. As Ocasio (1997) noted, “[attention]...depends on the particular context or situation” (p. 188).

Top Management Team as the Locus of Attention

Drawing from research in the upper-echelons tradition (Hambrick and Mason 1984), we view attentional orientation as a property of a TMT, or the strategic decision-making unit of the organization. This is not to say that every manager on the team has identical attention patterns. Rather, as a result of the collective experiences of the executives, the distribution of influence among them, and their processes for sharing information and making decisions, some attentional orientations will prevail and others will be secondary or even nonexistent. Our focus on attentional patterns within TMTs is consistent not only with the upper-echelons tradition, but also with theorists who have primary interest in organizational cognitive processes. For instance, Daft and Weick (1984) said:

When one speaks of organizational interpretation one really means interpretation by a relatively small group at the top of the organizational hierarchy.... Many participants may play some part in scanning or data processing, but the point at which information converges and is interpreted for organization action is assumed to be at the top manager level. (p. 285)

Consistent with the upper-echelons perspective, we view attention as an outgrowth, a result, of the personal givens, (March and Simon 1958)—executive characteristics—that members of a TMT bring to an administrative situation. These include psychological properties such as values and personality, as well as experiences such

as tenure and functional backgrounds. Executives’ characteristics affect what they scan and the intensity with which they seek new information (Aguilar 1967, Daft and Weick 1984). Moreover, executive characteristics affect perception and interpretation. Through their biases, executives see what they want to see, filtering out information inconsistent with their cognitive scheme (Weick 1979). This process of perceptual screening (England 1967) has been documented by numerous psychologists, but primarily derives from work by Postman et al. (1948). In sum, then, executive characteristics serve to filter and distort the abundant information that confronts executives (Ocasio 1997).

Deregulation as a Trigger for Attentional Change

Deregulation amounts to an environmental change for the actors in an industry. For the airline industry in the United States, this change—as mandated in the Airline Deregulation Act of 1978—was relatively abrupt. Observers generally have concluded that airline deregulation did not have a long gestation or implementation period (Levine 1987). Moreover, deregulation greatly altered the strategic context faced by airline executives. With new freedom to fly wherever they could obtain passengers and gates, to charge whatever prices they wished, to promote their offerings in new ways, to vary their onboard services, and to enter into alliances with other airlines (Levine 1987), airline executives newly faced both the latitude and the rigors of product-market discretion (Hambrick and Finkelstein 1987). Success was no longer solely a matter of regulatory compliance and managing to keep costs below mandated levels (Levine 1987).

This environmental shift can be described as a change from the primacy of the engineering problem to the primacy—or at least the rise—of the entrepreneurial problem (Miles and Snow 1978). The entrepreneurial problem, according to Miles and Snow, is the task of adjusting the product-market domain—deciding which offerings to provide to which customers and how to attract customers away from competitors. The engineering problem is the challenge of efficiently and effectively generating the product and getting it to the customer, or “creation of a system which puts into actual operation management’s solution to the entrepreneurial problem” (p. 22). Organizations can be classified in terms of whether their strategies emphasize attention to the entrepreneurial (*Prospectors*) or to the engineering problem (*Defenders*) (Miles and Snow 1978, Thomas et al. 1991). Similarly, environments can be considered as imposing primarily one or the other of these challenges on member organizations (Hambrick 1981).

When airline deregulation occurred, it is likely that managerial attention shifted from a primarily engineering focus to more of an entrepreneurial focus. Although efficiency did not become unimportant, it was no longer

sufficient for success. Airlines now had to meet new market tests, please customers, surpass competitors, and decide for themselves where they wanted to fly. Not only was the entrepreneurial problem of increased substantive importance (Smith and Grimm 1987), but because it was a novel environmental change, it was also highly salient (Starbuck and Milliken 1988).¹ The shift toward more of an entrepreneurial focus away from a strict engineering focus can be expected in any industry experiencing major deregulation (including banking, trucking, electric utilities—all occurring in the 1980s in the United States, and more recently or selectively in other countries), thus making our arguments applicable beyond the U.S. airline industry. Thus, we propose the following:

HYPOTHESIS 1. *Following substantial deregulation, there will be a general shift in managerial attention toward more of an entrepreneurial orientation (relative to an engineering orientation).*

Changes in Top Management Team Composition

Deregulation amounts to a relatively permanent shift in the environment, as opposed to a temporary jolt (Meyer 1982) or cyclic turn. As such, when deregulation occurs, there will tend to be a corresponding shift in the characteristics of top executives in the industry's firms (Grimm and Smith 1991). This change in TMTs occurs through two mechanisms. The first is through intentional efforts to realign managerial profiles with the changed industry requirements. This might be triggered by the board's awareness that a new type of CEO is needed, as well as the CEO's awareness that new skills and perspectives are needed on the TMT (Pfeffer and Salancik 1978). In response to the new environmental conditions, the board may also recruit executives whose expertise and skills fill the existing gaps among the incumbent executives, resulting in greater demographic heterogeneity at the top team level.

The second avenue is more emergent. Without edict or design, executives who are ill suited to the new environment will tend to depart, either because of discomfort or outright failure; they will tend to be replaced with executives who are attracted to, and whose skills fit, the new conditions (Grimm and Smith 1991, Finkelstein and Hambrick 1996). As such, both exits and entries among executives will lead to change in top team composition. From prior research, as elaborated below, we anticipate that deregulation brought about considerable recomposition of airline TMTs, including increased experience in output functions (marketing, sales, customer service), short tenures in the airline industry, and increased heterogeneity. But some airlines probably exhibited more of these TMT changes than others, and those are the airlines that we anticipate exhibited the greatest changes in their managerial attention.

From prior research, we envision three forces that cause a change in TMT composition to affect managerial

attention patterns. First, a change in TMT composition will cause a change in environmental scanning and the field of vision of the senior group. Depending on their experiences, executives differ in their access to external information and their attentiveness to various environmental sectors (e.g., Aguilar 1967, Daft et al. 1988). Second, changes in TMT composition that are responsive to changes in the environment will cause a shift in power within the team, generally favoring the newcomers. New arrivals tend to be those who have capabilities to cope with the new contingencies (Pfeffer and Salancik 1978, Finkelstein 1992); the attentional patterns of these individuals will hold great sway in influencing the collective attention of the whole team. Third, in the face of a given set of stimuli, even the incumbent executives will differ in how many of the stimuli they notice, the degree to which they draw connections among the stimuli, and the degree to which they develop elaborated and rich interpretations (as opposed to simple and crude interpretations) (Starbuck and Milliken 1988); although prior knowledge and experience greatly affect the degree to which new knowledge can be interpreted and assimilated (Cohen and Levinthal 1990, Chattopadhyay et al. 1999).

Output-Function Experience. Functional experiences create a lens through which executives see business problems and solutions (Dearborn and Simon 1958, Waller et al. 1995, Beyer et al. 1997). As such, there is a tendency for executives to select strategies that align with their functional repertoires (Chaganti and Sambharya 1987). For instance, Thomas et al. (1991) found that the *Prospectors* in their sample of computer firms overwhelmingly had CEOs with experience in output-oriented functions (marketing, sales, product R&D), whereas almost all of the *Defender*-company CEOs were from throughput-oriented functions (operations, accounting, finance).

The distinction between output- and throughput-oriented functional experiences has been extensively drawn on in prior research (e.g., Hambrick 1981, Thomas et al. 1991), and it is particularly relevant to understanding the required changes in executive capabilities brought about by deregulation. Prior to deregulation, a primary emphasis on efficiency and reliability is required, tending to favor TMTs with throughput-oriented skills and perspectives. Deregulation allows a new level of product-market discretion, bringing about the need for more output-oriented experiences (Grimm and Smith 1991). To the extent that companies increase the proportion of output-oriented experiences on their TMTs, we expect that they engage in more scanning of entrepreneurial-oriented stimuli (Hambrick 1981), attach more weight to such stimuli, and generally increase their attention to the entrepreneurial-oriented domain.

HYPOTHESIS 2A. *Following substantial deregulation, the greater the increase in the proportion of executives*

with output-oriented functional experiences, the greater the shift in managerial attention toward more of an entrepreneurial orientation (relative to an engineering orientation).

Industry Tenure. Entire industries develop shared recipes (Spender 1989), and executives with long service in their industries adhere the closest to these recipes (Geletkanycz and Hambrick 1997). For example, Goodman (1988) and Newell (1989) studied transitions in the banking and steel industries, respectively, concluding that in each case a well-developed industry knowledge had arisen that long-tenured executives had difficulty abandoning.

In the face of radically altered environmental requirements such as deregulation, there is a need for extra-industry executive perspectives. TMTs that import experience from outside industry will be less likely to adhere to the customary scripts of the industry and more likely to comprehend the contingencies of the new regime (O'Reilly et al. 1989). Moreover, top teams with the greatest experience outside the industry will tend to have access to information and models that lie outside industry conventions (e.g., Geletkanycz and Hambrick 1997). Thus, to the extent that average industry tenure decreases, TMTs in a newly deregulated industry will be more likely to engage in scanning, discourse, and conceptualizations involving the entrepreneurial problem:

HYPOTHESIS 2B. *Following substantial deregulation, the greater the decrease in average focal industry tenure of executives, the greater the shift in managerial attention toward more of an entrepreneurial orientation (relative to an engineering orientation).*

Heterogeneity. Although upper-echelons researchers have long included TMT heterogeneity—the degree of diversity among executives' experience manifested in tenure, functional background, and so forth—within their analytic scope (e.g., Murray 1989), the implications of heterogeneity are still unclear (summarized in Kilduff et al. 2000). On the one hand, heterogeneity is found to discourage social integration (O'Reilly et al. 1989) and efficient decision-making process (Tuckman 1965). Michel and Hambrick (1992) even suggested that TMT homogeneity, not heterogeneity, is a necessary organizational binding force that integrates business units of a diversified firm. On the other hand, TMTs that have a wider range of experience will attend to a broader range of stimuli. The team's diversity, while possibly causing social friction (Smith et al. 1994) and protracted decision making (Hambrick et al. 1996), helps to open up debate and expand problem solving (Eisenhardt and Bourgeois 1988). Diverse teams are more likely to acknowledge new stimuli and incorporate them in their discourses.

Previous research has shown that TMTs in regulated industries tend to be homogenous in their demographic

backgrounds (Grimm and Smith 1991). This is because environmental stability and predictability buffer regulated firms from having to make deliberate attempts to undertake adaptive changes; sociopolitical forces tend to dominate, resulting in incremental executive selection based on demographic similarity (Shen and Cho 2005). Accordingly, we expect that airline TMTs—which were relatively homogeneous during the regulated era—would become more diverse after deregulation. Moreover, the degree of such change would lead to the TMT's increased entrepreneurial attention.

HYPOTHESIS 2C. *Following substantial deregulation, the greater the increase in demographic heterogeneity of executives, the greater the shift in managerial attention toward more of an entrepreneurial orientation (relative to an engineering orientation).*

Changes in Top Management Team Compensation

Altering the compositional makeup of the TMT is not the only way to bring about a new managerial mindset for dealing with a changed environment. Another approach is to change the way in which managers are paid (Lawler 1990, Leonard 1990). Indeed, agency theorists and other incentive theorists see reward programs as instrumental in shaping managerial outlooks and behaviors (e.g., Fama and Jensen 1983, Balkin and Gomez-Mejia 1990). According to such a view, a change in incentives can bring about a change in managerial mindsets—even in a given group of managers. Thus, quite apart from our expectation that changes in the composition of airline TMTs bring about new attentional patterns, we additionally expect that changes in TMT compensation arrangements cause changes in attention. Below we will introduce the additional idea that changes in TMT composition and compensation in tandem can be expected to engender particularly great shifts in attention patterns.

Under strict regulation, executives have little strategic leeway, and the pathway to suitable performance—cost control and regulatory compliance—are well understood. Under such conditions, behavior-based compensation, typically consisting of straight salary and little or no incentive component, is appropriate (Eaton and Rosen 1983). On deregulation, however, the avenues to high performance become more varied, unprogrammed, and uncertain (Hambrick and Finkelstein 1987), thus favoring the use of output-based compensation, with substantial incentives for firm performance. Indeed, researchers have found that the performance-based component of executive pay (e.g., bonuses and stock options) increase following deregulation of an industry (e.g., Hubbard and Palia 1995, Rajagopalan and Finkelstein 1992).

An increase in performance-based pay following deregulation will cause executives to engage in more aggressive environmental scanning, expanded search for

novel solutions to the newly important entrepreneurial problem, and a generally heightened awareness of the market-customer domain (Finkelstein and Boyd 1998). We can anticipate that those companies that introduce the greatest amount of performance-based pay will engender from their executives the greatest shift in managerial attention:

HYPOTHESIS 3. *Following substantial deregulation, the greater the increase in the proportion of performance-based pay for executives, the greater the shift in managerial attention toward more of an entrepreneurial orientation (relative to an engineering orientation).*

Alignment of TMT Composition and Compensation

A central premise among compensation theorists is that pay programs must align with other elements of the organizational context (Lawler 1990). Surprisingly, however, the idea that pay programs need to align with the characteristics of the executives themselves has rarely been considered (McLaughlin 1991 is an exception), nevertheless various mismatches between TMT composition and compensation can occur. For example, if a company modifies its pay in an effort to alter behavior, but the executives—because of their experiences or values—are unable to engage in the new behaviors, then the effects of the pay program will be severely muted. Another example would be if a company greatly alters the composition of the TMT in an effort to bring in talents needed to cope with new contingencies, but then fails to adequately adjust the pay program to encourage the new behaviors, the new talents will not be fully tapped.

In the context of deregulation, we anticipate that the interaction, or combination, of changes in TMT composition and compensation will have a significant effect on attention beyond what occurs due to the independent main effects of the two. That is, we expect that modifying the composition of the TMT will have some effect on altering attention (as in Hypotheses 2A–2C), and that increasing performance-based pay will also have some effect (Hypothesis 3). But changing TMT composition and compensation in tandem creates an ideal combination of executive talent oriented toward the new entrepreneurial regime and incentives for those executives to fully apply their talents. This combination will bring about disproportionately great attentional change, beyond the simple additive effects of changing TMT composition and compensation, in an interaction effect:

HYPOTHESIS 4. *Following substantial deregulation, there will be an interaction effect between changes in TMT composition (in the directions described in Hypotheses 2A–2C) and increases in performance-based pay on the increase in entrepreneurial attention. In other words, TMT composition changes combined with compensation change will lead to a greater increase in*

entrepreneurial attention than will the separate additive effects of the two.

Attentional Change as a Precondition for Strategic Change

Bounded rationality, as set forth by Carnegie theorists (e.g., March and Simon 1958), is not merely a way to describe the cognitive limits of decision makers: It is also a way to understand why decision makers make the choices they do. Managers act on the basis of what they know, perceive, and believe—what is in and on their minds (Ocasio 1997). Upper-echelons theory (Hambrick and Mason 1984) similarly argues that executives make strategic choices on the basis of their personalized perceptions of their situations.

In the context of deregulation, we expect that some TMTs make greater strides than others in comprehending the significance of the new regime, and that this understanding is reflected in their strategic changes. That is, some TMTs devote considerable new attention to the entrepreneurial problem, and this shift in attention leads them to the most entrepreneurial strategies. They have a cognitive wealth of concepts, models, even vocabulary they can draw on in generating and implementing new choices (Cohen and Levinthal 1990). Other TMTs stay more cognitively rooted in the prior, regulated regime, with less understanding of the requirements, alternatives, and subtleties of the new era. These latter TMTs have less of a cognitive basis for making entrepreneurially oriented changes in their strategies. As Smith and Grimm (1987) found in their study of railroad deregulation, we expect that some companies adapt to the new regime more than others. Specifically, those companies that exhibit the greatest attention to the new industry imperatives will be the ones that change their strategies the most:

HYPOTHESIS 5. *Following substantial deregulation, the greater the increase in managerial attention toward an entrepreneurial orientation, the greater the change in strategy toward more of an entrepreneurial orientation.*

Finally, attention is the conduit by which TMT characteristics are converted into strategic outcomes. As Ocasio (1997) noted, “what decision makers do depends on how they selectively focus on certain characteristics of the organization and its environment, and ignore others” (p. 203). TMT composition and compensation affect attention, but it is attention that affects choice:

HYPOTHESIS 6. *Following substantial deregulation, change in managerial attention mediates the relationship between change in TMT characteristics (composition and compensation) and change in strategy.*

Methods

Sample

Our sample consists of all publicly traded airlines that had sales over \$100 million in 1973 and continued in operation until at least 1986, for a total of 30 companies. This sampling introduces left- and right-censoring, but has the advantage of allowing pre- versus postderegulation analysis of a constant set of firms.² The airline industry has several positive features for our purpose. First, airline deregulation was a discrete environmental shift that can be relatively precisely placed in time, so as to allow reliable pre- versus postderegulation analyses. Second, the industry includes a viable number of public companies for which information is available. Third, almost all airlines are single-business companies, not diversified, thus providing enhanced data validity.

Data Sources and Measures

Entrepreneurial Attention. The measurement of managerial cognitions presents a major challenge for researchers (Huff 1990, Lant and Shapira 2001). Qualitative inference of cognitions from interviews or other sources (e.g., Vidaillet 2001) has the problems of uncertain reliability and replicability, and it is impractical for anything beyond a small number of case studies. Surveys of top managers (e.g., Waller et al. 1995) are often limited by low response rates from executives in major companies (samples tend to be drawn from smaller firms), and of course, this method cannot be used to study past cognitions.

A third approach, which we take here, is to use automated text analysis of company documents to gauge attention patterns. Widely used throughout the social sciences for measuring cognitions, automated text analysis is based on the Whorf-Sapir hypothesis that the cognitive categories through which individuals attend to the world are embedded in the words they use (Sapir 1944, Whorf 1956). Words that are frequently used are cognitively central and reflect what is most on the user's mind; words that are used infrequently or not at all are at the cognitive periphery, perhaps even representing uncomfortable or alien concepts (Huff 1990). Content analysis of public speech has been used to measure cognitions and personalities of U.S. presidents (Emrich et al. 2001) and other public figures (Levi and Tetlock 1980).

Text analysis has been used in numerous organizational studies, primarily drawing from the letter to shareholders in publicly traded companies' annual reports (e.g., Bowman 1984, Clapham and Schwenk 1991, Abrahamson and Park 1994). Several studies have directly tested the validity of analyzing the letters, with positive results. For instance, Huff and Schwenk (1990) found that the patterns of managerial attributions in these letters accurately reflect executives' attempts at making sense, especially during uncertain, turbulent times.

Similarly, Daly et al. (2004) analyzed 59 mergers and acquisitions between 1989 and 1996 and found that the greater the difference in the espoused values of the acquiring and acquired firms, as measured by text analysis of letters to shareholders, the lower the postmerger performance. Osborne et al. (2001) conducted content analysis of more than 400 letters to shareholders and found empirical linkages between cognitive groups clustered by themes in their letters and between strategic groups clustered by performance. Similarly, D'Aveni and MacMillan (1990) found that measures of top managers' cognitions drawn from the letters to shareholders were highly correlated with measures derived from other types of data. Although these letters have multiple purposes, including conveying a positive impression, they still reflect major managerial initiatives, concerns, and points of view. Even though professional writers are involved, we can expect that senior executives direct the writers and carefully review and refine their drafts (Abrahamson and Hambrick 1997).

As a confirmatory step, we interviewed communications executives in five publicly traded companies, as well as the head of a communications consulting firm, and verified that it is typical for several of a company's executives—not only the CEO or the communications executive—to be involved in developing the letter to shareholders. In some cases, all major executives are asked to submit their ideas about the points that should be conveyed. In essentially every case, multiple drafts are circulated to all top executives for review or refinement. Thus, the letter is not the province of only one or two people, and certainly not of outsiders alone.

To measure entrepreneurial attention, we conducted automated text analysis of shareholder letters for each airline for every year in our timeframe, similar to the approach taken by D'Aveni and MacMillan (1990) and Abrahamson and Hambrick (1997). We sought to measure the degree to which each letter contained words associated with the entrepreneurial problem, as opposed to the engineering problem, as conceptualized by Miles and Snow (1978). To develop our dictionary of words associated with these two constructs, we went through several steps. First, we used Miles and Snow (1978) to generate a set of seed words that are closely identified with the entrepreneurial problem (e.g., market, innovate, growth) and the engineering problem (e.g., efficiency, accounting, productivity). We then turned to thesauruses to identify major synonyms of the seed words, generating about 100 words in each of the two categories. Then, to enhance validity, we used three judges (all of whom are familiar with Miles and Snow's framework; a coauthor was among the judges but was not involved in generating the lists) to rate all the items, along with a number of filler words (e.g., announce, integrate) on a scale ranging from 1 (definitely engineering) to 7 (definitely entrepreneurial), with a midpoint of 4 (unsure or

neither). The interrater reliability for the three judges was 0.81. We retained any entrepreneurial word that received a score of six or more from all three judges (for a total of 75 words) and any engineering word that had scores of two or lower (a total of 69).³

We then examined each letter to count how frequently words from the two sets appeared. Because we were conceptually interested in how much managerial attention was devoted to the entrepreneurial problem relative to the engineering problem, we calculated entrepreneurial attention as the ratio of the number of entrepreneurial words divided by the sum of both entrepreneurial and engineering words. For example, if a letter included 20 entrepreneurial words and 20 engineering words, it received an entrepreneurial attention score of 0.50 (i.e., 20/40).⁴

Entrepreneurial Strategy. We used objective indicators of each airline's realized strategy (Mintzberg 1978). Using *Airport Activities Statistics of Certified Route Carriers*, published annually by the U.S. Department of Transportation, we identified a set of four strategic dimensions that indicate an airline's manifested commitment to the entrepreneurial problem as conceptualized by Miles and Snow (1978): (a) number of city-pairs served, (b) number of planes, (c) passenger service expenditures (including food and beverages, other onboard amenities, and club lounges), and (d) advertising and sales expenditures. These four variables were standardized over all firm-years and summed to create an annual index (interitem correlation coefficient of 0.72).

TMT Composition. We used the *Dun and Bradstreet Reference Book of Corporate Management* and proxy statements to identify the annual compositional characteristics of each TMT (defined as all executives above the level of vice president, for an average of about seven; see Finkelstein and Hambrick 1996 for a review of alternatives and issues in defining TMTs). Average industry tenure was measured as the mean number of years the executives had worked in the airline industry until the focal year. Output-orientation was the proportion of executives on the team whose primary experience had been in output-related functions such as marketing, sales, and customer relations. Industry-tenure heterogeneity was measured as the coefficient of variation of the airline industry tenures of team members; and functional heterogeneity was the Blau's (1977) index, based on the percentages of TMT members whose experiences were primarily in each of the following: finance, accounting, planning, personnel, public affairs, legal, operations and maintenance, marketing, sales, and customer service, information systems, and general management. A widely used measure of heterogeneity when categories are used (Allison 1978, Finkelstein and Hambrick 1996), the Blau's index is calculated as $(1 - \rho_i^2)$, where ρ_i is

the percentage of individuals in the i th category. The higher the score, the greater the TMT's heterogeneity.

Performance-Dependent Pay. This variable reflects the extent to which executive pay depended on company performance and other incentive factors, as opposed to a fixed level of salary. The measure was calculated as total compensation — base salary divided by total compensation. Total compensation included salary, bonus, long-term and deferred compensation, stock grants, and option grants (valued by Black-Scholes formula). Although this measure does not indicate how onerous the hurdles were for receiving incentive pay, a high score indicates that pay was largely unguaranteed or tied to performance. This measure has been used before to indicate the degree to which executive compensation is performance based (e.g., Finkelstein and Boyd 1998).

Control Variables. For our analysis, we included several control variables that may affect the degree of a firm's strategic adaptation: firm size, organizational slack, firm profit, and TMT size. First, firm size can affect strategic change through economies of scale, resources, and urgency to change (Chandler 1962, Chen and Hambrick 1995). In addition, firm size affects the relationship between executive characteristics and organizational outcomes (Miller 1991). Therefore, organizational size was included as a control, measured as the log of total employees. Other measures of size, such as sales and assets, yielded substantively identical results. Next, resource endowments have been shown to affect strategic change amid environmental shifts (e.g., Kraatz and Zajac 2001). Organizational slack, therefore, was calculated as the current ratio (current assets divided by current liabilities). Previous research has also shown that a firm's profit level influences its level of resources and urgency to change (Kim and McIntosh 1999). Therefore, return on equity was included as a control variable. Because TMT size is an important covariate of other TMT variables, including team heterogeneity (i.e., larger teams tend to be more diverse) and cognition (Amason and Sapienza 1997), we controlled for TMT size—measured as the total number of executives on the top team. (The size of TMTs ranged from 5 to 14 members.)

Our analysis consists of multiple stages. As a way to maintain clarity, we will discuss each analytic step (including timing, lags, and econometrics) and then present the corresponding results.

Analysis and Results

Deregulation and Attentional Change

Our baseline hypothesis was that deregulation causes a shift in managerial attention toward the entrepreneurial problem (relative to the engineering problem). To control for the possibility that attention patterns may have changed in the broader business community, for this

hypothesis (and only for this hypothesis) we supplemented our airline sample by examining two additional industries: branded foods and natural gas. Food companies had considerable product-market discretion over this entire time frame, and thus could be expected to show persistently high levels of entrepreneurial attention; in contrast, the natural gas industry was expected to show relatively low levels of entrepreneurial attention. Although the natural gas industry became less stable in the mid-1980s, it still provides a suitable low-discretion comparison industry.⁵ Our samples consisted of any firm listed in Compustat in 1973 whose primary three-digit standard industrial classification (SIC) was in the respective industry and that operated autonomously until 1986, for a total of 35 natural gas and 28 branded food companies. If the expected patterns are borne out—persistently high levels of entrepreneurial attention in the food industry, persistently low levels in natural gas, and a significant increase in airlines—we will have additional evidence of the construct validity of our measure of entrepreneurial attention.

Figure 1 shows annual mean entrepreneurial attention scores for all three industries, confirming a sharp increase in entrepreneurial attention in the airline industry at the time of its deregulation in 1978. As a concise way to consider the trends in these entrepreneurial attention scores, we calculated averages for the four years preceding (1973–1976) and four years following (1979–1982) airline deregulation, for all three industries. The natural gas companies had low scores (0.29 and 0.38) for both periods; the branded foods companies had high scores (0.61 and 0.57) for both periods; the airline companies, as hypothesized, had low levels of entrepreneurial attention prederegulation (0.31, about the same as natural gas) and significantly higher levels ($p < 0.001$) postderegulation (0.59, about the same

Table 1 TMT Composition, Compensation and Managerial Attention in Three Industries, 1973–1978 vs. 1979–1984

	1973–1978	1979–1984	<i>t</i>
Airline			
Average industry tenure	24.40	18.88	1.70***
Output-oriented executives %	0.16	0.28	1.72***
Tenure heterogeneity	2.05	7.86	1.61**
Functional heterogeneity	0.72	0.86	1.86***
Performance-based pay %	0.24	0.36	2.12***
Entrepreneurial attention	0.32	0.68	1.59**
<i>N</i> = 30			
Natural gas			
Average industry tenure	29.05	27.45	0.29
Output-oriented executives %	0.15	0.16	1.24
Tenure heterogeneity	5.42	6.23	1.25
Functional heterogeneity	0.65	0.72	1.02
Performance-based pay %	0.24	0.28	1.10
Entrepreneurial attention	0.30	0.41	1.11
<i>N</i> = 35			
Processed food			
Average industry tenure	15.45	16.58	1.53
Output-oriented executives %	0.25	0.30	0.92
Tenure heterogeneity	9.35	11.24	1.16
Functional heterogeneity	0.87	0.89	1.05
Performance-based pay %	0.39	0.42	1.05
Entrepreneurial attention	0.62	0.69	1.09
<i>N</i> = 28			

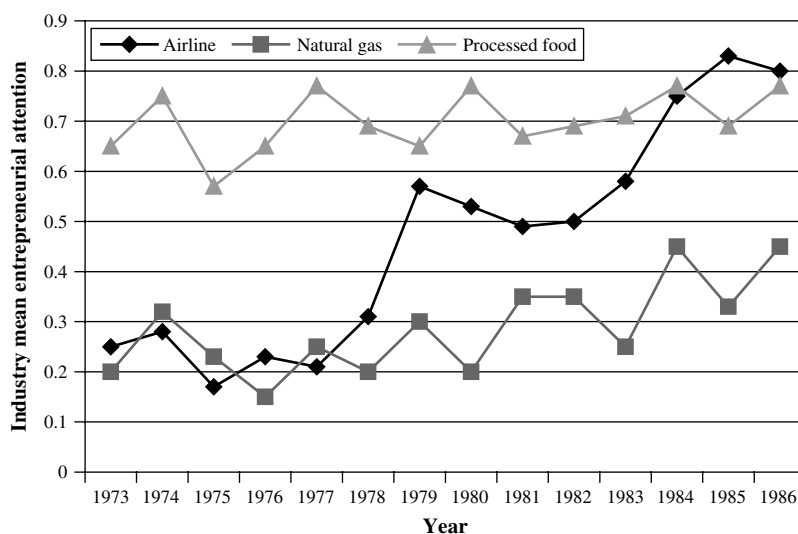
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

as the food industry). Thus, our baseline hypothesis is strongly supported.

TMT Characteristics and Attentional Change

As a backdrop to our remaining tests, it is informative to examine the general tendencies for airlines to change their TMT composition and compensation. Table 1 presents pre- and postderegulation averages for the TMT variables, again for all three industries. For airlines, all

Figure 1 Annual Entrepreneurial Attention Scores in Three Industries



the variables exhibited significant changes in the directions expected for firms that abruptly faced increased product-market discretion: shorter focal industry tenures, more experience in output functions, increased heterogeneity in both industry tenure and functional background, and increased performance-based pay. Neither of the two control industries, the branded foods and natural gas companies, made significant changes in any of these TMT characteristics.⁶ Moreover, for every dimension, the airlines had a prederegulation score close to that for natural gas and a postderegulation score close to the branded food companies.

Of course, not all airlines made these TMT changes uniformly. We hypothesized that those that made the greatest TMT changes showed the greatest shifts in managerial attention, to which we now turn.

Because our hypotheses deal expressly with changes, we converted all independent and control variables into pre- versus postderegulation change scores, and we pooled three longitudinal panels. Bearing in mind that each change score must bracket 1978 (the year of deregulation), our first panel of 30 observations consisted of simple arithmetic changes in our independent and control variables between 1975 (year t) and 1979 (year $t + 4$); our dependent variable, entrepreneurial attention, was measured as its level in 1981 ($t + 6$), while its value at the beginning of the panel, 1975, was included as a control variable. The second panel was constructed identically, but one year forward, starting in 1976 (t) and extending the entrepreneurial attention measure through 1982 ($t + 6$). The third panel commenced in 1977 (t) and extended through 1983 ($t + 6$). Thus, the lagging structure was set up so that four-year changes in TMT composition and compensation (and in the control variables) were linked to entrepreneurial attention two years later, while also controlling for prior entrepreneurial attention. Other lagging structures yielded results similar to those we report here. Changes in independent and control variables were calculated as simple differences between the appropriate pre- and postderegulation year: post- minus pre-, so that positive values indicate increases.

Our use of change scores for our independent and control variables is consistent with prior studies (e.g., Feitler et al. 1998, Laschinger et al. 2004). As Chan (2003, p. 347) pointed out, the difference score has sometimes been criticized for “its purported inability to be reliable and valid, its frequent negative correlation with initial status, and its relatively low reliability” (e.g., Bereiter 1963, Cronbach and Furby 1970, Linn and Slinde 1977) (p. 347). Many of these criticisms, however, have been subsequently shown to be overstated. In fact, Rogosa and others (e.g., Rogosa et al. 1982, Rogosa and Willett 1983, Zimmerman and Williams 1982) showed that the difference score can be an unbiased simple measure of change. Furthermore, Chan (2003) argued that the most significant problem with difference scores is the

Limitation of the two-wave design (measuring change at two points in time) rather than in any inherent deficiency in the difference score itself . . . [Such] designs are problematic for assessing change over time because measurements are repeated at only two points in time and, as such, they provide no precise information on intraunit change over time. That is, no precise individual growth curves (trajectories) can be plotted for the units. (p. 347)

To address two-wave problems, researchers recommend taking repeated measurement from individuals over multiple time points (Chan 2003, Zumbo 1999)—as we do here. Multiwave repeated measurement within a longitudinal design allows the assessment of the intraunit change process as it unfolds over time. In our study, we take this approach and derive repeated measurement from airlines over multiple time periods. Notwithstanding the challenges in using change scores (Bergh and Fairbank 2002), our basic theoretical setup deals expressly with change, and therefore we believe the use of change scores was appropriate (Gottman and Rushe 1993, Rogosa 1988). We sought to minimize the most serious problem in using change scores—regression to the mean—by statistically controlling for the initial level of the dependent variable.

Pooling of cross-sectional time series data, discussed by Kmenta (1986) and illustrated by Carpenter (2000), allowed for the possibility that firms differed in when they made their TMT, attentional, and strategic changes. In addition, pooling provides more statistical degrees of freedom, thus providing more robust results. The intercorrelations among the three time panels ranged between 0.32 and 0.61 for all variables, indicating that the three panels were not redundant. In order to test for the associations between TMT changes and attention change, we used generalized least squares (GLS) regression, which accommodates the pooling of nonindependent observations. Kmenta's (1986) autoregressive heteroskedastic model was used to correct for serial correlation and heteroskedasticity. We attempted the use of structural equation modeling but our sample was not of sufficient size to yield stable parameter estimates (Kline 1998, p. 12). We instead used a lagged dependent variable model in which we included the prior value of the dependent variable as a control variable. This was done because we needed to control for prior values of the dependent variable in our repeated-measure data.

Table 2 presents descriptive statistics and correlations. Table 3 presents GLS results, with entrepreneurial attention as the dependent variable. Model 1 includes only the control variables. Prior entrepreneurial attention was negatively associated with current entrepreneurial attention (reflecting regression to the mean); change in firm size, slack, and profit were positively associated with entrepreneurial attention; the overall model was significant. Model 2 includes the TMT variables, yielding a significant model and individual coefficients that

Table 2 Descriptive Statistics and Correlations—Airline Sample

Variables	Mean	s.d.	1	2	3	4	5	6	7	8	9	10
1. Δ Firm size	0.14	0.89										
2. Δ Slack	0.11	0.18	−0.14*									
3. Δ Profit	0.04	0.11	−0.13*	0.20**								
4. Δ TMT size	2.34	3.01	0.21**	0.08	0.04							
5. Δ Industry tenure	−1.52	4.68	−0.13*	−0.10	0.15*	0.26***						
6. Δ Output-function experience	0.13	0.16	0.08	0.04	0.07	0.32***	−0.34***					
7. Δ Functional heterogeneity	0.07	0.08	0.29***	0.05	−0.06	0.37***	0.28***	0.26***				
8. Δ Industry-tenure heterogeneity	0.11	0.06	0.28***	−0.04	0.07	0.26***	0.29***	0.27***	0.25***			
9. Δ Performance-based pay	0.15	0.12	0.38***	0.24***	0.16*	0.20**	−0.06	0.31***	0.16*	0.28**		
10. Entrepreneurial attention	0.62	0.53	−0.02	0.16*	0.18**	0.25***	−0.27***	0.29***	0.22***	0.18**	0.26***	
11. Entrepreneurial strategy	0.01	0.09	0.06	0.05	0.27***	0.08	−0.24**	0.28***	0.20**	0.09	0.27***	0.28***

Note. Variables 1–9 are calculated as arithmetic changes between t and $t + 4$; entrepreneurial attention is measured in $t + 6$; and entrepreneurial strategy is measured in $t + 8$.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, $N = 90$.

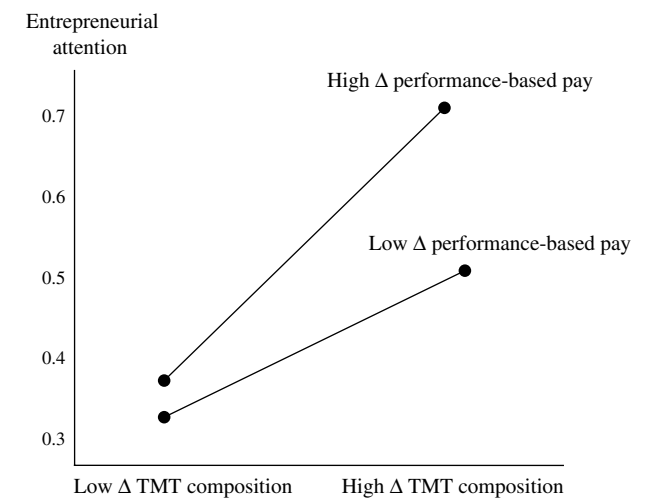
widely support our hypotheses. Entrepreneurial attention was significantly related to change in TMT industry tenure (−), change in proportion of output-function experience (+), change in industry-tenure heterogeneity (+), change in functional heterogeneity (+), and change in performance-based pay (+).

To parsimoniously test for the interactive effects of changes in TMT composition and compensation, we constructed a summary index, Δ composition, which was the average of the standardized values for all the TMT composition variables (reverse-scoring Δ industry tenure) (interitem correlation coefficient of 0.73). As

Table 3 GLS Regression: Entrepreneurial Attention

	Entrepreneurial attention			
	(1)	(2)	(3)	(4)
Intercept	0.35*** (0.03)	0.28*** (0.02)	0.30*** (0.02)	0.26*** (0.03)
Prior entrepreneurial attention	−0.09*** (0.02)	−0.08*** (0.02)	−0.05*** (0.01)	−0.06*** (0.01)
Δ Firm size	0.06* (0.03)	0.04* (0.03)	0.05** (0.02)	0.04** (0.01)
Δ Slack	0.08* (0.04)	0.03 (0.04)	0.05 (0.06)	0.04 (0.05)
Δ Profit	0.06** (0.02)	0.04* (0.02)	0.03** (0.01)	0.04** (0.01)
Δ TMT size	0.01 (0.02)	0.02 (0.03)	0.03** (0.01)	0.02* (0.01)
Δ Industry tenure		−0.03** (0.01)		
Δ Output-function experience		0.07*** (0.02)		
Δ Industry-tenure heterogeneity		0.04* (0.02)		
Δ Functional heterogeneity		0.03** (0.01)		
Δ Composition			0.10*** (0.03)	0.05** (0.02)
Δ Performance-based pay		0.08** (0.03)	0.07** (0.02)	0.06* (0.03)
Δ Composition × Δ Performance-based pay				0.08*** (0.02)
Pseudo- R^2	0.16	0.28	0.32	0.35
F	4.05***	6.72***	9.20***	12.67***

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, $N = 90$.

Figure 2 Interaction Results

Note. High scores are one standard deviation above the mean; low scores are one standard deviation below the mean.

seen in Model 3, this index was significantly associated with entrepreneurial attention. To test our interaction hypothesis, we then constructed a multiplicative term, Δ composition \times Δ performance-based pay. In Model 4, this term was significantly and positively related to change in entrepreneurial attention, indicating that TMT composition and compensation reinforce each other in affecting managerial attention. In order to reveal the exact nature of this interaction effect, we developed the graph shown in Figure 2, using one standard deviation above and below the mean to capture high and low levels of composition and compensation changes (Cohen and Cohen 1983). As seen in the graphs, high levels of change in TMT composition and TMT compensation each exerted an upward effect on change in attention; but the combination of the two yielded disproportionately great change in attention, beyond the simple additive effects.

Strategic Change

To test our remaining hypotheses, which dealt with the effects of TMT characteristics and attention patterns on strategy, we again constructed and pooled three data panels. All scores were constructed as above, with the following exceptions. First, change in entrepreneurial attention (between t and $t + 6$) was included as an independent variable. Second, the dependent variable, entrepreneurial strategy, was measured in $t + 8$, and its initial value (in year t) was included as a control variable. Thus, the lags were set up so that changes in TMT composition and compensation (t to $t + 4$) preceded changes in entrepreneurial attention (t to $t + 6$), which in turn preceded our measurement of strategy ($t + 8$) (all while controlling for initial strategy in t).

GLS results are reported in Table 4. With entrepreneurial strategy as the dependent variable, Model 1

includes only the control variables, several of which were significant: prior entrepreneurial strategy (–), change in firm size (+), change in slack (+), and change in profits (+). Model 2 adds the TMT composition and compensation variables, all of which were significantly related to strategy change in the expected directions: change in average industry tenure (–), change in proportion of output-function experience (+), change in industry-tenure heterogeneity (+), change in functional heterogeneity (+), and change in performance-based pay (+).

To test for the mediating effect of managerial attention, we added change in entrepreneurial attention to our analysis (Model 3). If change in attention was a mediator, then (a) the changes in TMT variables should have significant effects in Model 2 (as they did), and (b) change in attention should have significant effects in Model 3, and (c) coefficients for the TMT variables that were significant in Model 2 should either become insignificant (complete mediation) or decrease in their significance (partial mediation) in Model 3 (Baron and Kenny 1986).

The results for Model 3 show that change in attention was significantly related to entrepreneurial strategy; moreover, the significance of all the TMT variables diminished, and several of those variables—changes in industry tenure, industry-tenure heterogeneity, and performance-based pay—ceased being significant. The appearance of considerable mediation is confirmed when we calculate the Goodman II test statistic, which provides an unbiased estimate of mediation (Goodman 1960). That statistic was 2.42, $p < 0.016$, indicating that partial mediation was occurring. Similar results were obtained from the Sobel test (Baron and Kenney 1986) and Goodman I tests (Goodman 1960).

Models 4 and 5 allow a similar examination, but using our index variable, Δ composition. In Model 4, the TMT variables— Δ composition, Δ performance-based pay, and Δ composition \times performance-based pay (again capturing the interactive effects of these two separate aspects of TMTs)—were all significantly related to change in strategy. However, when change in entrepreneurial attention, a hypothesized mediator, was added in Model 5, only Δ composition remained significant—but only marginally. Here again, the Goodman II statistic for mediation was significant (1.98, $p < 0.021$), indicating partial mediation.

In sum, we find evidence that managerial attention at least partially mediated between TMT characteristics and strategy. In other words, changing the composition or compensation of a TMT will tend to bring about a change in managerial attention, which in turn contributes substantially to bringing about changes in strategy. Although our limited sample size did not allow a test of full mediation, the results indicate that managerial

Table 4 GLS Regression: Entrepreneurial Strategy

	Entrepreneurial strategy				
	(1)	(2)	(3)	(4)	(5)
Intercept	1.26** (0.09)	0.86*** (0.07)	0.59*** (0.06)	1.35*** (0.06)	0.98*** (0.04)
Prior entrepreneurial strategy	−0.12** (0.04)	−0.11** (0.04)	−0.14** (0.05)	−0.07** (0.03)	−0.09*** (0.02)
Δ Firm size	0.09** (0.03)	0.05* (0.03)	0.04* (0.02)	0.08** (0.03)	0.05** (0.02)
Δ Slack	0.04* (0.02)	0.02 (0.04)	0.02 (0.03)	0.03 (0.05)	0.02 (0.04)
Δ Profit	0.07** (0.03)	0.05** (0.02)	0.04* (0.02)	0.08** (0.03)	0.05* (0.03)
Δ TMT size	0.10 (0.11)	0.06* (0.03)	0.03 (0.04)	0.06* (0.03)	0.04* (0.02)
Δ industry tenure		−0.04* (0.02)	−0.01 (0.02)		
Δ Output-function experience		0.09** (0.04)	0.05* (0.02)		
Δ Industry-tenure heterogeneity		0.04* (0.02)	0.02 (0.03)		
Δ Functional heterogeneity		0.08** (0.03)	0.04* (0.02)		
Δ Composition				0.04* (0.02)	0.03+ (0.03)
Δ Performance-based pay		0.06* (0.04)	0.02 (0.03)	0.06* (0.03)	0.04 (0.05)
Δ Composition × Δ Performance-based pay				0.07* (0.04)	0.03 (0.04)
Δ Entrepreneurial attention			0.07** (0.03)		0.06** (0.02)
Pseudo- R^2	0.10	0.19	0.25	0.20	0.28
F	3.02***	11.38***	16.13***	14.90***	18.02***

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, $N = 90$.

attention plays an important role in converting managerial demography and pay arrangements into company strategy.

Discussion

Our primary objective has been to examine attention patterns as a conduit by which managerial profiles are converted into organizational outcomes. However, our project also sheds light on the transformation of industry attention patterns in the wake of an environmental shift. A common image in the literature on industrywide cognition is that members of an industry not only share the same common wisdom and recipes (Spender 1989, Huff 1990), but also become entrenched in these ways of thinking far beyond their periods of relevance (Goodman 1988). Our results indicate, however, that attention patterns in the airline industry changed sharply in a relatively short period. In 1977, one year before deregulation, airlines exhibited the same low level of entrepreneurial attention as the

regulated natural gas industry. Entrepreneurial attention increased dramatically by 1979, and by 1984—just six years after deregulation—airlines had increased their entrepreneurial attention to the same level as in the highly differentiable branded foods industry.

It is possible that the airline industry made a relatively swift and complete change in collective attention because of the specific nature of the environmental change they faced. In contrast to shifts in some other industries, airline deregulation had every sign of being permanent. Whereas U.S. auto industry executives in the 1970s might have assumed that consumer interest in small cars and fuel economy was transitory, airline executives probably could not deny the permanence of deregulation; they were thus inclined to cognitively come to grips with it quickly. Moreover, airline deregulation was relatively abrupt. In contrast, gradual environmental shifts, such as the rise of the personal computer in the computer industry during 1980s, are more easily ignored—at least for a time. Indeed, other types of environmental changes—for instance,

changes that are gradual, temporary, or affect only a subset of firms in an industry—might yield very different results than we found for the abruptly deregulated airline industry.

Not all airlines changed their attention equally, however, which takes us to our second major finding. In line with the upper-echelons perspective (Hambrick and Mason 1984), we found that changes in TMT composition were associated with attentional change. Airlines increased their attention to the entrepreneurial problem to the extent that they had altered overall TMT membership toward shorter industry tenures, more output-function experiences, and greater heterogeneity. Thus, we provide evidence that TMT characteristics influence what is noticed and attended to. Changing the composition of a TMT can be expected to bring about new information sources and environmental scanning practices (Aguilar 1967), a reconfigured absorptive capacity (Cohen and Levinthal 1990), and revised political dynamics that favor the newcomers who are oriented toward the new imperative (Hambrick 1981). These mechanisms, in turn, bring about a change in collective attention.

We found that increasing the performance-based element of executive pay was associated with attentional change. In line with incentive theory (e.g., Lawler 1990), executives will change their ways of thinking if they are paid differently. Moreover, we observed an interactive effect between changes in TMT composition and compensation on changes in attention. When the makeup of the TMT changed to reflect the new requirements of the industry and there was a corresponding increase in performance-based pay, the resulting attentional shift was far greater than occurred through the additive effects of changed composition and compensation alone. To our knowledge, this is the first study to consider how alignment of TMT composition and compensation affects organizational outcomes.

Our third major finding is that attention partially mediated the relationship between TMT characteristics and strategy. In the upper-echelons tradition, we found that TMT changes were associated with strategy changes. The effects of TMT changes were greatly diminished once intervening attentional changes were accounted for, however. TMT characteristics affected attention, which in turn affected strategy. This represents one of the first inquiries to link all three constructs. As a result, we now have a better understanding of why different managers, under different pay plans, arrive at different strategies: It is, in part, because they differ in how they notice and interpret the stimuli around them. Managers differ in their attention: where they look, what they notice, the weights they give to contradictory stimuli, and the interpretations they attach (Ocasio 1997). These attentional differences then show up in strategic differences (Cyert and March 1963, Hambrick and Mason 1984).

Future Research and Summary

At one level, the idea of attention as a mediator in strategic outcomes may not seem theoretically provocative. One might ask, after all, whether there are any possible conduits to strategic choice other than attention. But the importance of this perspective becomes more evident by turning the question around: How much attention is needed to prompt action? And what are the factors that engender attention? Our paper develops and tests a partial answer to the latter question by examining the effects of TMT composition and compensation—and the interaction of the two—on attention and strategy. But we can envision a wealth of research opportunities in this domain.

First, our findings of partial mediation suggest three possibilities: (a) changes in TMT attention may occur through additional cognitive or social processes not captured by our model, (b) we have not fully measured changes in attention, and (c) TMT composition and incentive system may influence strategy through another process other than attention. As such, there is also a need to consider additional determinants of changes in managerial attention patterns, beyond TMT characteristics. We can expect, for instance, that the nature of an environmental shift (e.g., how abrupt or permanent it is) will affect whether the change captures the attention of executives. Industry structure might also matter, with highly concentrated or tightly structured industries showing faster and more complete shifts in attention than more fragmented or loosely related industries (DiMaggio and Powell 1983). Although we did not distinguish CEOs from the rest of the TMT, it is also possible that a new CEO brings about more attentional change than does a change in another executive position. Furthermore, the origin of the new CEO (e.g., inside versus outside the focal organization or industry), or his power, or both, may also moderate the relationships.

A second research opportunity is to examine not just the degree, but also the speed, of attentional change. Because of our small sample, we did not have enough observations to undertake more elaborate dynamic analyses, but there are no doubt interesting questions to ask about which firms—when faced with an environmental shift—change their attention the fastest. Furthermore, what are the strategic and performance consequences associated with fast versus slow attentional change?

Indeed, a third thrust would be to examine the performance implications of managerial attention. We omitted any consideration of performance in an effort to maintain analytic focus, and in recognition of our limited sample. But an intriguing hypothesis is that those firms that change their attention the most and the fastest following an environmental shift will be able to lock up the new opportunities and enjoy superior performance. Alternatively, it may be that researchers need to consider multiple layers of attention in order to predict performance. Some firms might exhibit only superficial or

naïve attention to a new contingency but lack any sign of in-depth or sophisticated attention; these firms might undertake strategic changes that are directionally sensible but flawed in execution.

Finally, we cannot help but be encouraged by the potential of automated text analysis for measuring managerial attention. While a number of prior researchers have used content analysis of shareholder letters with beneficial results, our use of word lists to represent conceptual categories (e.g., the entrepreneurial problem) is straightforward and highly replicable. It could be applied to study attentional change in the face of any number of contextual shifts: privatization of a company or industry, altered customer preferences, a change of company ownership or agency conditions, and a host of other shifts. In short, this type of automated text analysis may be a valuable tool for a new wave of research on managerial attention as a mediator between contextual conditions and organizational outcomes. Our project, focusing on the shift in airline attention after deregulation, suggests considerable promise for this type of research formulation.

Endnotes

¹A reviewer correctly points out that the most effective TMTs—at least those that are the most effective information processors—probably change their attention the most. Because we do not include TMT or firm effectiveness in our analytic scope, we are prevented from pursuing this interesting idea.

²With our sampling procedure, we have no way of knowing how the results might change if small or short-lived airlines had been included.

³The complete lists of words are available from the authors. Examples of entrepreneurial words include advertise, consumer, opportunity, and service. Examples of engineering words include expense, efficient, equipment, operational, and safety.

⁴Other operationalizations, including simple counts of entrepreneurial words in the letters, yielded results that were largely consistent with, but somewhat weaker than, those we report here.

⁵Although we do not report details here, we conducted a systematic analysis, using the Compustat database, to confirm our choices in control industries—similar to Hambrick and Finkelstein (1987) and Hambrick and Abrahamson (1995).

⁶In fact, it is primarily due to their relative absence of change on any of the TMT characteristics that we did not attempt to include these two other industries in our subsequent analyses; they exhibited greatly restricted range on a number of key variables.

References

- Abrahamson, E., D. C. Hambrick. 1997. Attentional homogeneity in industries: The effect of discretion. *J. Organ. Behav.* **18** 513–539.
- Abrahamson, E., C. Park. 1994. Concealment of negative organizational outcomes: An agency theory perspective. *Acad. Management J.* **37** 1302–1334.
- Aguilar, F. J. 1967. *Scanning the Business Environment*. Macmillan, New York.

- Allison, P. 1978. Measures of inequality. *Amer. Sociol. Rev.* **43** 865–880.
- Amason, A. C., H. J. Sapienza. 1997. The effects of top management team size and interaction norms on cognitive and affective conflict. *J. Management* **23**(4) 495–516.
- Balkin, D., L. R. Gomez-Mejia. 1990. Matching compensation and organizational strategies. *Strategic Management J.* **11** 153–169.
- Bantel, K., S. Jackson. 1989. Top management and innovations in banking: Does the composition of the top team make a difference? *Strategic Management J.* **10** 107–124.
- Baron, R., D. Kenny. 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J. Personality Soc. Psych.* **51** 1173–1182.
- Barr, P., J. L. Stimpert, A. Huff. 1992. Cognitive change, strategic action, and organizational renewal. *Strategic Management J.* **13** 15–36.
- Bereiter, C. 1963. Some persisting dilemmas in the measurement of change. C. W. Harris, ed. *Problems in Measuring Change*. University of Wisconsin Press, Madison, WI.
- Bergh, D., J. F. Fairbank. 2002. Measuring and testing change in strategic management research. *Strategic Management J.* **10** 107–124.
- Beyer, J. M., P. Chattopadhyay, E. George, W. H. Glick. 1997. The selective perception of managers revisited. *Acad. Management J.* **40** 716–738.
- Blau, P. 1977. *Inequality and Heterogeneity*. Free Press, New York.
- Bowman, E. 1984. Content analysis of annual reports for corporate strategy and risk. *Interfaces* **14** 61–71.
- Business Week*. 1983. Deregulating America: The benefits begin to show—In productivity, innovation, and prices. **2818** 80–83.
- Carpenter, M. 2000. The price of change: The role of CEO compensation in strategic variation and deviation from industry strategy norms. *J. Management* **26** 1179–1198.
- Carpenter, M. 2002. The implications of strategy and social context for the relationship between top management team heterogeneity and firm performance. *Strategic Management J.* **23** 275–242.
- Chaganti, R., R. Sambharya. 1987. Strategic orientation and characteristics of upper management. *Strategic Management J.* **8** 393–401.
- Chan, D. 2003. Data analysis and modeling longitudinal processes. *Group Organ. Management* **28** 341–365.
- Chandler, A. D. 1962. *Strategy and Structure: Chapters in the History of American Industrial Enterprise*. MIT Press, Cambridge, MA.
- Chattopadhyay, P., E. George, W. H. Glick, C. Miller, G. P. Huber. 1999. Determinants of executive beliefs: Comparing functional conditioning and social influence. *Strategic Management J.* **20** 763–789.
- Chen, M.-J., D. C. Hambrick. 1995. Speed, stealth, and selective attack: How small firms differ from large firms in competitive behavior. *Acad. Management J.* **38** 453–482.
- Cialdini, R., R. Reno, C. Kallgreen. 1990. A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *J. Personality Soc. Psych.* **58** 1015–1026.
- Clapham, S. E., C. R. Schwenk. 1991. Self-serving attributions, managerial cognition, and company performance. *Strategic Management J.* **12** 219–229.
- Cohen, J., P. Cohen. 1983. *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*, 2nd ed. Erlbaum, Hillsdale, NJ.
- Cohen, W. M., D. A. Levinthal. 1990. Absorptive capacity: A new perspective on learning and innovation. *Admin. Sci. Quart.* **35** 128–152.

- Corner, P., A. Kinicki, B. Keats. 1994. Integrating organizational and individual information processing perspectives on choice. *Organ. Sci.* **5** 294–309.
- Cronbach, L. J., L. Furby. 1970. How we should measure “change”—or should we? *Psych. Bull.* **74** 68–80.
- Cyert, R., J. G. March. 1963. *A Behavioral Theory of the Firm*. Prentice-Hall, Englewood Cliffs, NJ.
- Daft, R. L., K. E. Weick. 1984. Toward a model of organizations as interpretation systems. *Acad. Management Rev.* **9** 284–295.
- Daft, R. L., J. Sormunen, D. Parks. 1988. Chief executive scanning, environmental characteristics, and company performance: An empirical study. *Strategic Management J.* **9** 123–139.
- Daly, J., R. Poudier, B. Kabanoff. 2004. The effects of initial differences in firms’ espoused values on their postmerger performance. *J. Appl. Behav. Sci.* **40** 323–344.
- D’Aveni, R. A., I. C. MacMillan. 1990. Crisis and the content of managerial communications: A study of the focus of attention of top managers in surviving and failing firms. *Admin. Sci. Quart.* **35** 634–657.
- Dearborn, D. C., H. A. Simon. 1958. Selective perception: A note on the departmental affiliations of executives. *Sociometry* **21** 144–150.
- DiMaggio, P., W. W. Powell. 1983. The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *Amer. Sociol. Rev.* **48** 147–160.
- Dutton, J. E., S. E. Jackson. 1987. Categorizing strategic issues: Links to organizational action. *Acad. Management Rev.* **12** 76–90.
- Eaton, J., H. S. Rosen. 1983. Agency, delayed compensation, and the structure of executive remuneration. *J. Finance* **38** 1489–1505.
- Edwards, J. 2001. Ten difference score myths. *Organ. Res. Methods.* **4** 265–287.
- Eisenhardt, K., L. J. Bourgeois, III. 1988. Politics of strategic decision making in high velocity environments: Toward a mid-range theory. *Acad. Management J.* **31** 737–770.
- Emrich, C. G., H. H. Brower, J. M. Feldman, H. Garland. 2001. Image in words: Presidential rhetoric, charisma, and greatness. *Admin. Sci. Quart.* **46** 527–557.
- England, J. 1967. Personal value systems of American managers. *Acad. Management J.* **10** 53–68.
- Fama, E., M. Jensen. 1983. Separation of ownership and control. *J. Law Econom.* **26** 301–325.
- Feitler, J. N., T. Corsi, C. Grimm. 1998. Strategic and performance changes among LTL motor carriers: 1976–1993. *Transportation J.* **4** 5–13.
- Finkelstein, S. 1992. Power in top management teams: Dimensions, measurement, and validation. *Acad. Management J.* **35** 505–538.
- Finkelstein, S., B. K. Boyd. 1998. How much does the CEO matter? The role of managerial discretion in the setting of CEO compensation. *Acad. Management J.* **41** 179–199.
- Finkelstein, S., D. C. Hambrick. 1990. Top management team tenure and organizational outcomes: The moderating role of managerial discretion. *Admin. Sci. Quart.* **35** 484–503.
- Finkelstein, S., D. C. Hambrick. 1996. *Strategic Leadership: Top Executives and their Effects on Organizations*. West Publishing Company, New York.
- Fiske, S. T., S. E. Taylor. 1984. *Social Cognition*. Random House, NY.
- Geletkanycz, M. A., D. C. Hambrick. 1997. The external ties of top executives: Implications for strategic choice and performance. *Admin. Sci. Quart.* **42** 654–681.
- Goodman, L. A. 1960. On the exact variance of products. *J. Amer. Statist. Assoc.* **55** 708–713.
- Goodman, R. S. 1988. The determinants of banks’ success and failure in a changing regulatory environment: Substantive, methodological, and statistical implications for corporate strategy. Unpublished doctoral dissertation, University of Minnesota, Twin Cities, MN.
- Gottman, J. M., R. H. Rushe. 1993. The analysis of change: Issues, fallacies, and new ideas. *J. Consulting Clinical Psych.* **61** 907–910.
- Grimm, C. M., K. G. Smith. 1991. Management and organizational change: A note on the railroad industry. *Strategic Management J.* **12** 557–562.
- Guthrie, J. P., C. M. Grimm, K. G. Smith. 1991. Environmental change and management staffing: An empirical study. *J. Management* **17** 735–749.
- Hambrick, D. C. 1981. Environment, strategy, and power within top management teams. *Admin. Sci. Quart.* **26** 253–276.
- Hambrick, D. C., E. Abrahamson. 1995. Assessing managerial discretion across industries: A multimethod approach. *Acad. Management J.* **38** 1427–1442.
- Hambrick, D. C., S. Finkelstein. 1987. Managerial discretion: A bridge between polar views of organizations. L. L. Cummings, B. M. Staw, eds. *Research in Organizational Behavior*, Vol. 9. JAI Press, Greenwich, CT, 369–406.
- Hambrick, D. C., P. A. Mason. 1984. Upper echelon: The organization as a reflection of its top managers. *Acad. Management Rev.* **9** 193–206.
- Hambrick, D. C., T. S. Cho, M. J. Chen. 1996. The influence of top management team heterogeneity on firms’ competitive moves. *Admin. Sci. Quart.* **41** 659–684.
- Hitt, M. A., B. B. Tyler. 1991. Strategic decision models: Integrating different perspectives. *Strategic Management J.* **12** 327–351.
- Huff, A. S., ed. 1990. *Mapping Strategic Thought*. John Wiley, Chichester, UK.
- Huff, A. S., C. R. Schwenk. 1990. Bias and sensemaking in good times and bad. A. Huff, ed. *Mapping Strategic Thought*. John Wiley and Sons, New York.
- Jackson, S., J. Dutton. 1988. Discerning threats and opportunities. *Admin. Sci. Quart.* **33** 370–387.
- Kilduff, M., R. Angelmar, A. Mehra. 2000. Top management team diversity and firm performance: Examining the role of cognitions. *Organ. Sci.* **11** 21–34.
- Kim, E., J. C. McIntosh. 1999. Strategic organizational responses to environmental chaos. *J. Managerial Issues* **3** 344–363.
- Kline, Rex B. 1998. *Principles and Practice of Structural Equation Modeling*. Guilford Press, New York.
- Kmenta, J. 1986. *Elements of Econometrics*, 2nd ed. Macmillan, New York.
- Kraatz, M. S., E. Z. Zajac. 2001. How organizational resources affect strategic change and performance in turbulent environments: Theory and evidence. *Organ. Sci.* **12** 632–650.
- LaBerge, D. 1995. *Attentional Processing: The Brain’s Art of Mindfulness*. Harvard University Press, Cambridge, MA.
- Lant, T., Z. Shapira. 2001. *Organizational Cognition: Compensation and Interpretation*. Lawrence Erlbaum Associates, Mahwah, NJ.
- Laschinger, H., J. Finegan, J. Shamian, P. Wilk. 2004. A longitudinal analysis of the impact of workplace empowerment on work satisfaction. *J. Organ. Behav.* **4** 527–545.
- Lawler, E. E., III. 1990. *Strategic Pay: Aligning Organizational Strategies and Pay Systems*. Jossey-Bass, San Francisco, CA.
- Lawrence, B. S. 1997. The black box of organizational demography. *Organ. Sci.* **8** 1–22.
- Leonard, J. 1990. Executive pay and firm performance. *Indust. Labor Relations Rev.* **43** 13–29.

- Levi, A., P. E. Tetlock. 1980. A cognitive analysis of Japan's 1941 decision for war. *J. Conflict Resolution* **24** 195–221.
- Levine, M. E. 1987. Airline competition in deregulated markets: Theory, firm strategy and public policy. *Yale J. Regulation* **4** 393–494.
- Linn, R. L., J. A. Slinde. 1977. The determination of the significance of change between pre- and posttesting periods. *Rev. Ed. Res.* **47** 121–150.
- March, J. G., H. A. Simon. 1958. *Organizations*. Wiley, New York.
- McLaughlin, D. J. 1991. Does compensation motivate executives? F. K. Foulkes, ed. *Executive Compensation: A Strategic Guide for the 1990s*. Harvard Business School Press, Boston, MA, 59–80.
- Meyer, A. D. 1982. Adapting to environmental jolts. *Admin. Sci. Quart.* **19** 45–61.
- Michel, J. G., D. C. Hambrick. 1992. Diversification posture and top management characteristics. *Academy Management J.* **35** 9–37.
- Miles, R., C. Snow. 1978. *Organizational Strategy, Structure, and Process*. McGraw-Hill, New York.
- Miller, D. 1991. Stale in the saddle: CEO tenure and the match between organization and environment. *Management Sci.* **37** 34–54.
- Miller, D., C. Drodge. 1986. Psychological and traditional determinants of structure. *Admin. Sci. Quart.* **31** 544–569.
- Mintzberg, H. 1973. *The Nature of Managerial Work*. Harper and Row, New York.
- Mintzberg, H. 1978. Patterns in strategy formation. *Management Sci.* **24** 934–948.
- Murray, A. I. 1989. Top management group heterogeneity and firm performance. *Strategic Management J.* **10** 125–141.
- Newell, S. E. 1997. The transformation of US steel 1945–1985: Perspective from the corporation and the union. *J. Management History* **3** 166–192.
- Ocasio, W. 1997. Towards an attention-based view of the firm. *Strategic Management J.* **18** 187–206.
- O'Reilly, C. A., III, D. F. Caldwell, W. P. Barnett. 1989. Work group demography, social integration, and turnover. *Admin. Sci. Quart.* **34** 21–37.
- Osborne, J. D., C. Stubbart, A. Ramaorasad. 2001. Strategic groups and competitive enactment: A study of dynamic relationships between mental models and performance. *Strategic Management J.* **22** 435–454.
- Pfeffer, J., G. R. Salancik. 1978. *The External Control of Organizations: A Resource Dependence Perspective*. Harper and Row, New York.
- Postman, J., J. S. Bruner, E. McGinnies. 1948. Personal values as selective factors in perception. *J. Abnormal Soc. Psych.* **43** 142–154.
- Rajagopalan, N., D. K. Datta. 1996. CEO characteristics: Does industry matter? *Acad. Management J.* **39** 197–216.
- Rogosa, D. 1988. Myths about longitudinal research. K. W. Schaie, R. T. Campbell, W. Meredith, S. C. Rawlings, eds. *Methodological Issues in Aging Research*. Springer, New York, 171–209.
- Rogosa, D. R., J. B. Willett. 1983. Demonstrating the reliability of the difference score in the measurement of change. *J. Ed. Measurement* **20** 335–343.
- Rogosa, D. R., D. Brandt, M. Zimowski. 1982. A growth curve approach to the measurement of change. *Psych. Bull.* **92** 726–748.
- Sapir, E. 1944. Grading: A study in semantics. *Philos. Sci.* **11** 93–116.
- Shen, W., T. S. Cho. 2005. Exploring involuntary executive turnover through a managerial discretion framework. *Acad. Management Rev.* **30** 843–862.
- Smith, K. G., C. M. Grimm. 1987. Environmental variation, strategic change and firm performance: A study of railroad deregulation. *Strategic Management J.* **8** 363–377.
- Smith, K. G., K. A. Smith, J. D. Olian, H. P. Sims, Jr., D. P. O'Bannon, J. A. Scully. 1994. Top management team demography and process: The role of social integration and communication. *Admin. Sci. Quart.* **39** 412–438.
- Sobel, M. E. 1982. Asymptotic intervals for indirect effects in structural equations models. S. Leinhardt, ed. *Sociological Methodology*. Jossey-Bass, San Francisco, CA, 290–312.
- Spender, J. 1989. *Industry Recipes: The Nature and Sources of Managerial Judgement*. Basil, Oxford, UK.
- Starbuck, W. H., F. Milliken. 1988. Executives' perceptual filters: What they notice and how they make sense. D. C. Hambrick, ed. *The Executive Effect: Concepts and Methods for Studying Top Managers*. JAI Press, Greenwich, CT, 35–65.
- Thomas, A. S., R. J. Litschert, K. Ramaswamy. 1991. The performance impact of strategy-manager coalignment: An empirical examination. *Strategic Management J.* **12** 509–522.
- Tuckman, B. 1965. Developmental sequence in small groups. *Psych. Bull.* **63** 384–399.
- Tyler, B. B., H. K. Steensma. 1998. The effects of executives' experiences and perceptions on their assessment of potential technological alliances. *Strategic Management J.* **19** 939–965.
- Vidaillet, B. 2001. Cognitive processes and decision making in a crisis situation: A case study. T. K. Lant, Z. Shapira, eds. *Organizational Cognition: Competition and Interpretation*. Lawrence Erlbaum Associates, Mahwah, NJ, 241–264.
- Walker, G. 1985. Network position and cognition in a computer software firm. *Admin. Sci. Quart.* **30** 103–130.
- Waller, M. J., G. P. Huber, W. H. Glick. 1995. Functional background as a determinant of executives' selective perception. *Acad. Management J.* **38** 943–974.
- Weick, K. 1979. Cognitive processes in organizations. B. M. Staw, ed. *Research in Organizational Behavior*. Vol. 1. JAI Press, Greenwich, CT, 41–74.
- Whorf, B. L. 1956. Science and linguistics. J. B. Carroll, ed. *Language, Thought and Reality: Selected Writings of Benjamin Lee Whorf*. MIT Press, Cambridge, MA, 207–219.
- Zimmerman, D. W., R. H. Williams. 1982. Gain scores in research can be highly reliable. *J. Ed. Measurement* **19** 149–154.
- Zumbo, B. D. 1999. The simple difference score as an inherently poor measure of change: Some reality, much mythology. B. Thompson, ed. *Advances in Social Science Methodology*. Vol. 5. JAI Press, Greenwich, CT, 269–304.